**Guide for Parents**

*Help your child hear the amazing world sounds, voices and music*

For users of Advanced Bionics’ cochlear implant

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**Dear Parents!**

Your child has received an Advanced Bionics cochlear implant system and is now ready to begin a journey to the amazing world of sounds, voice and music! We are very happy to welcome your child into the hearing world!

You have chosen the most advanced CI technology for your child and your surgeon has successfully implanted the device. From now on your CI team will provide you with all the support you and your child need to help develop your child’s language, social and emotional skills. Your audiologist will make sure the speech processor is correctly programmed and the therapists and teachers will support your child on their journey to hearing.

During your child’s life, especially these first years, you as parents are the most important people in their life and they love spending time with you! More so, your interaction and communication with your child will help lay the foundation to learn to share attention, make eye contact, copy and learn the meaning of facial expressions, learn language and take turns in interactions. By helping your child listen to everyday sounds, you encourage incidental learning. This is the natural way that children intuitively learn - by processing information from everyday situations.

Creating conditions that will allow your child to orientate themselves in the world of sounds, will help them learn and develop in a natural environment, in the same way hearing children intuitively perceive information in the daily interaction with the outside world.

This booklet has been developed especially for you and combines the information about the Advanced Bionics CI system – what are the different parts of the AB CI system, how does it works and what are the advantages – and information about the different steps your child will take to develop listening and language. In the last part of this booklet, you will find some tips and a collection of some fun, quick and easy activities that you can enjoy with your child knowing that you will boost their listening and language development.

**Let’s start your child’s hearing journey!**

*In the beginning, immediately after connecting the speech processor, our task was to draw our child’s attention to the sounds and enjoy the sounds together. (One of my main concerns was how to keep the speech processor on during the day and does it work well? I felt like I had to do seven things at the same time).*

**Part 1: Becoming familiar with a cochlear implant**

A cochlear implant is an electronic device designed to restore hearing in people with severe to profound hearing loss, those who do not fit hearing aids.

The reason that conventional hearing aids cannot help is that the tiny hair cells in the inner ear (cochlea), are damaged or are completely missing. When this happens, sound – even sound amplified by a hearing aid – cannot be properly delivered to the brain.

Why do those with severe to profound hearing loss choose a cochlear implant?

The reason is simple: they want to hear better! Adults tend to be independent and want to be an active part of their environment and want to be able take part in conversations, hear thei children or grandchildren talk, listen to music, or simply enjoy the sounds of nature. They want to be confident that they can hear in all listening situations, even in noisy environments.

Parents choose cochlear implants for their children because they want them to hear the sounds of life. They want to provide their children with the opportunity to learn to listen, talk, and communicate freely and independently. They want their children to participate fully in the world of sounds that surrounds them.

How does a cochlear implant work?

A cochlear implant, bypassing the damaged or missing hair cells, stimulates the hearing nerve directly. The entire process, from incoming sound to processing in the brain, occurs so rapidly that the user hears sound as it happens.

The external components capture environmental sounds as well as speech and music and process these sounds so that they can be transmitted across the skin to the implant. The implant then passes the signals along to the electrode array where individual electrodes deliver them to the hearing nerve. The signals travel up the hearing nerve to the brain where they are perceived as sounds.

Since the introduction of the cochlear implant system, many different sound processing strategies have been developed and all are aimed at increasing the perception of ambient sounds and speech, in a more natural and comfortable way. Many of those who suddenly lost their hearing, as well as children with congenital deafness can now enjoy hearing sounds and understand speech.

**Diagram of the AB cochlear implant system**

Microphone captures the sounds that are picked up at the entrance of the ear.

Sound waves are converted to digital signals by the speech processor which transmits that signals through the headpiece to the implant

Implant receives the digital

information and sends it to the

electrode array which is placed inside the inner ear.

Electrodes send the electrical signals to the hearing nerve that sends the stimulus to the brain where the signals are interpreted

The efficiency and results of the cochlear implantation are impacted by:

- the age of the child at the time of implantation;

- the duration of deafness;

- the presence/absence of residual hearing;

- the level of speech development before the deafness and need for communication;

- the auditory experience, experience of wearing hearing aids;

- status of the inner ear and the hearing nerve at the time of operation, the quality of the operation and programming of the speech processor;

- the willingness of the parents to learn to properly interact and communicate with their child.

All this affects whether a CI user will achieve their greatest hearing potential.

It is important to understand that only you, the parent, can help create the right conditions for your child to successfully communicate with their environment

In addition, you as a parent need to understand that your child *can* hear now that they received their cochlear implant, but it should learn to match the sounds that they hear to the correct sound source (whether that is voice or the washing machine).

At first, your child will learn to understand the sounds and language and will communicate with you and others by actions. It will be a real challenge for you and your family to make all sounds interesting to discover and listen to because your child needs to attend to sound first!

Of course will the technology play an important role in hearing and transmitting the sounds to the brain. So it is very important that you use the latest and most advanced implant system and sound processing strategies. The advanced technology and system flexibility of the HiResolution™ Bionic Ear System is developed to help the user to hear their best. The primary component of Advanced Bionics’ HiResolution System is the HiRes 90K™ implant.

The implant capability is the most important consideration in a cochlear implant system. This will determine how much detailed sound information is ultimately delivered to the hearing nerve. The HiRes 90K implant uses state-of-the-art computer technology to deliver electrical signals to the electrode array with superior resolution. This makes the HiRes 90K the most versatile, flexible and sophisticated cochlear implant technology today, and it has the processing capacity to accept tomorrow’s innovations through simple software upgrades to the implant user’s sound processor. The detailed electrical signals will then be sent to the brain where sounds are interpreted and speech is understood. The accurate representation of sound is very important for speech understanding, especially in challenging sound environment.

To deliver the high resolution electrical signal to the HiRes 90K implant and the electrode Advanced Bionics uses high tech sound processing strategies. HiRes™ Optima sound processing is the latest generation of sound coding strategies which deliver measurable improvement in sound clarity and music quality appreciation, as well as speech understanding in the presence of background noise. With this advanced processing technique, detailed sound information is delivered to the hearing nerve extremely fast, mimicking how normal hearing works, thus allowing for a more natural sound.

To make sure the wide range of sound levels (whispers, soft speech, conversation in background noise, group situations with different voice levels, loud sounds, etc.) that occur naturally and instantaneously in the real world environment are captured and processed, the AB sound processors have been designed with the widest programmable sound window available in cochlear implant technology (up to 95 decibels). And all these sounds are captured by our unique Tmic™2 microphone that allows for a more natural microphone placement and more natural hearing.

AB’s AutoSound™ technology dynamically and continuously adapts to environment the CI user is in, making it easy to listen to all sounds, no matter what the environmental conditions - from a quiet meeting room at a bustling restaurant. AutoSound will automatically adjust the sound level like a normal ear.

Another AB technology called ClearVoice™ sound processing has been designed to automatically analyse and adapt to each listening situation that AB users encounter throughout the day, separating the distracting noises from speech. This technology was developed to help AB users communicate confidently in a variety of challenging listening situations, including restaurants, cars, and classrooms - without ever needing to change a program or make an adjustment to their sound processor. The close collaboration with Phonak provides the AB user with additional state-of-the-art technologies that will make speech understanding in challenging conditions even easier! Moreover, all Advanced Bionics users can also benefit from Phonak’s accessories for industry-leading wireless connectivity.

And finally, the AB’s fully waterproof solutions and flexible wearing options let AB users wear their CI how they like it and hear anytime and anywhere, in and out of the water.

**Part 2: Learning to listen and speak**

From the moment your child has been diagnosed with a hearing loss, they will probably get a lot of hearing tests. Their hearing results will be graphically represented in an audiogram. In the next paragraphs we’ll help you understand it.

**Audiogram**

The intensity or loudness of the signal (measured in decibels) is depicted on the vertical axis of the audiogram. The frequency or pitch of sounds (measured in hertz) is depicted on the horizontal axis. The minimum loudness of the sounds that can be perceived by the human ear is called the ‘threshold of hearing’.

The gray zone on this audiogram (called the ‘speech banana’) shows the ‘voice zone’, which includes all speech sounds. Access to this area is essential for the understanding of speech and language. The green area shows the normal hearing threshold for a normal hearing child. the threshold of your child is in the range indicated in red, this range does not allow to fully hear speech. Under these residues hearing, even when using a hearing aid, speech perception is severely limited.

A CI gives your child not only access to the sounds of the environment, but is also designed to help you child develop speech understand and communication. The cochlear implant from Advanced Bionics provides its users the opportunity to improve their auditory threshold to a level that allows you to perceive speech and all the beautiful sounds of the world. A child with a severe to profound hearing loss might hear very loud sounds, such as the sound of the vacuum cleaner or an airplane.

However, after cochlear implantation, these children will start to respond to the voice of an adult, and lean to understand their name. Their hearing will keep improving and they will start to hear quieter sounds (in the yellow range of the audiogram), for example, the sound of dripping water, the rustling of leaves, etc.

*See how Judy has become more interested in sound. And for you, Maria, I can now hear all your songs!*



*Audiogram, a year after implantation. There is still work to do, and yet the difference is huge! :)*



**Hearing Development**

Now that your child has received an Advanced Bionics implant, their hearing journey can really start!

From birth, babies hear and listen to the massive amounts of sounds and information of the bustling world around them. They pay close attention to voices, especially high-pitched ones, and respond to familiar sounds. This enables them to develop language, stimulates their brain development and allows them to communicate with the world around them. Hearing all these sounds allow them to strengthen their auditory capabilities and develop speech and language skills to communicate. Over time, their speech understanding will increase dramatically and soon the first words will emerge: mom, dad, give, no.

Despite the fact that normal hearing children are able to hear the of birth, their hearing will also improve over time, and the area of the brain that is responsible for interpreting sounds will continue to evolve up to 12 years.

Switching on the processor allows your child to hear, however they will need time to adjust to the hearing world and will need time to learn to listen. Your child will go through several steps from hearing to speaking, similar to the steps a normal hearing child goes through from birth. It is important to know that all babies and toddlers develop at different rates and times – it is not a race and it takes time, patience, and repetition!

And don’t forget, it also takes a child with normal hearing at least one year, before they will say their first word.

**Listening and Language Development**

**You can distinguish several steps**

The first step in the listening development is **Sound Awareness**. This is the ability to react and respond to the presence or absence of sound. The infant learns to respond to sound and the differences between sounds and to pay attention to. They will also learn what the sound source is, and turn their head to the where the sound is coming from.

The second step is **Sound Discrimination**. This is the ability to hear the differences between male and female voices, to recognise the differences between the sounds of home environment (door bell, telephone, kettle sizzle) and select sounds from background noise.

**Sound Identification** is the third step of the listening development. In this stage the infants will start to label sounds. They can recognise and label all kinds of sounds and words, including male, female and child voices. They will also understand the emotional content of voices.

The final step is **Comprehension**. This is the ability to understand language. The child will be able to answers questions and can follow an instruction. Over time, they will repeat words and start talking themselves. They will be able to play a word game or participate in a conversation.

On the next pages, these four listening skills are explained in more detail and linked to the language development skills that develop simultaneously.

**Step 1. Hearing Sounds**

It all starts with the awareness of sounds. Now that the implant is working and delivering sound to the brain you might notice your child is responding to sounds. In this stage your child will hear whether there is a sound or not.

* Your child might startle or smile to a loud sound such as a door slamming, a dog barking, the sound of drums…
* Other children get quite or still when hearing (new) sounds.

Once the child is aware of sounds in his environment, they will start giving *attention* to sound. Your child might pause its activity to listen to a sound or even look around for the source of the sounds.

Each child will pay attention to sounds and will respond differently to this new hearing experience. No matter how your child responds, every response shows your child is hearing sounds and should be reinforced!

From the moment your child starts to detect sounds, it is ready for the development of speech. Your child will enjoy making sounds, will develop different cries for different needs and will start producing speech-like babbling and vocalize to express excitement and displeasure.

**Step 2. Hearing the Differences between Sounds**

Once your child has been wearing and using its device for longer periods of time, s/he will discover that not all sounds are the same.

* Your child might notice the difference between the sound of a drum and the maracas
* Your child might notice the difference between long and short words/sounds
* Your child might notice the difference between soft and loud sounds

In addition to their improving hearing skills, your child’s speech will continue to develop. Your child enjoys listening to mummy’s and daddy’s voice and loves to imitate what you are saying. The babbling of your child will progress from simple vocalisations to more vowel-like vocalizations which vary in loudness, intonation and duration. This will eventually turn into consonant-vowel combinations such as pa-pa-pa and ma-ma-ma which are the building blocks of future words.

*On the second day after the connection, Vadim was playing the glockenspiel the entire evening playing. "How cool is it that you can now play music!"*

**Step 3. Knowing what Sounds Mean**

During this phase your child will be able to identify sounds and understand the meaning of single words, simple every day commands and common phrases. For example, your child might give a specific toy when asked. Simultaneously your child will develop the skill to adjust their own voice and repeat numbers, letters or words in the correct order.

* Your child might identify an instrument by pointing at it
* Your child might carry out simple instructions

First, your child will learn to understand and perform simple tasks that are repeated daily like ‘Shall we go for a walk?’, ‘Take of your coat’,… After a while your child will be able to understand and enjoy doing simple games or activities like ‘Shall we feed your doll?’ or ‘Throw the ball to me’. You as a parent will notice that as your child’s hearing is improving and s/he recognise more and more sound, they will be able to hear you when you are in a different room or when you are on the phone. For example: you’ll see that your child once it recognises the doorbell, s/he know that that sound will be followed by a guest coming in the room and that s/he should say ‘hello’.

As your child understands more of the sounds and speech around him, s/he will start using single words in the right context. Initially, your child might imitate the sound of the object to refer to it, for example ‘woof woof’ represents ‘dog’. However, after a while your child will use the correct word to describe the object. At first, your child might pronounce the word incorrectly (e.g. ‘*soe*’-‘*shoe*’) but this will change as s/he hears the word repeatedly.

**Step 4. Understanding language**

Your child will now understand more complex expressions such as simple sentences and eventually stories, songs and rhymes. Your child will use all its hearing skills in combination with other elements, such as body language and intonation, to fully comprehend the meaning of what is said.

* In order to fully understand the meaning of “Take your shoes off!”, your child will need to detect, discriminate, identify the different components of sounds and speech and combine the other information such as body language and intonation to decide whether it is a command or a question.

Your child will learn more words every month, s/he will pronounce them more and more clearly and use longer and more complex sentences to express their feelings and communicate with others. Furthermore, your child will master the rules for social language and will learn to read and write.

*My mummy says ‘Hi, friend!’ and will now say "Hi" too!*

**Part 3: Creating an optimal environment for listening and language development**

It is a very exciting time when your child hears for the first time. They will visit a certified speech-language pathologist that can help your child on its hearing journey and in addition to those sessions, you can support your child’s listening and language development in (and around) your own home!

In this last part of the booklet you can find ideas, tips and activities that will help your child develop early communication and language in a fun and meaningful way in typical everyday situations. We hope that with these ideas you’ll gain the confidence to stimulate listening and language during every day routines and help your child understand a world of sounds and voices!

You can feed back your experiences with these tips and activities to your therapists. This will be much appreciated and will be very helpful for their clinical activities.

It Is Important that

1) you make sure your child wears their CI system all day and enjoys listening to sounds, the equipment is working correctly and the headpiece stays on your child’s head (e.g. use a headband or hair clips to secure the headpiece).

2) you use the same words and play the same games over and over and gradually increase the difficulty. **Repetition is key!**

3) you and your child enjoy daily activities that help them develop their listening skills and language. Make sure you make the activities fun!

4) you keep a journal of with your observations, which can help you and the professional monitor your child's development.

**Tips to create an Optimal Listening Environment**

- Make sure that the child can see your face

- Use listening cues to alert your child to interesting sounds

- Point to the sound source or put your hand around your ear when you hear a sound

- Make sure you contrast sounds with quiet periods

- Make quiet times to play with your child

- Keep background noise low

- Get close to the microphone of the processor to make your voice clearer

- Sit next to your child or sit your child on your lap when e.g. sharing books so they can listen to your voice

**Tips to Communicate with your Child**

- When you talk to your child, make sure you use natural language, use short phrases and then model natural language again. Start with simple sentences and slowly increase the complexity of the sentence (e.g., "Let's go!", "Let's go and walk to the park!", "Let's go and walk to the playground in the park to play with the other children!").

- Imitate any sounds your child makes and repeat back your child’s babble using real words (e.g., “Yes it’s your shoe”)

- Answer the babble of the child and add a bit more to what your child says (for example, the child wants his teddy bear, and asks: "a-a-a" The adult can say: "Take the bear. Here is your teddy bear. Teddy bear is climbing up up up. Oh no! He fell to the floor! ")

- Use toys when you sing and use a special “baby voice” to make your voice more interesting to your child, and actions notable

- Remember to use the same phrase with the same routine

- Put extra stress on the most important part of what you say (e.g., “More *water*?”, “Cold *water*!”)

- Give your child lots of choices so they have real reasons to talk (e.g. ‘Would you like to have milk or juice? In a big or a little cup?)

**Tips to Encourage your Baby to Listen to you**

- Give your child lots of attention and praise when they use their voice

- Help your child to associate sounds with what's going on and repeat your child’s favourite games and stories every day, even if you’re not in the mood or bored with them

- Give your child time to anticipate what is going to happen next

- Encourage your child to join in social routines (e.g., say ‘please’, ‘thank-you’, ‘hello’)

- Wait until your child shows you that they want to continue playing or start all over again

- Talk about your daily routines together: dressing, walks, eating or bathing. (Describe all actions in as much detail as possible: ‘and now we take soap and wash our hands with warm water. Let’s go and eat our delicious dinner, use your spoon!’). The more you talk about what you are doing together and use that special baby voice, the faster your child will develop listening and language skills

- Respond to what you think your child is trying to tell you and encourage your child to speak as much as possible

- Recognise a few “real” words in your child’s babble, which they use regularly to describe the same thing. These may not sound the same as the adult version, but are clear attempts at a word (e.g., “Taa” for “Thank you”)

- Think about what your child is trying to tell you and respond by giving them the right words (e.g., my child babbles with arms up I say “Pick me up, mommy!”)

- Repeat what your child says and give them lots of praise even if the words aren’t very clear yet

- Listen to environmental sounds like everyday sounds (doorbell, phone ring, watch, sounds of running water) or traffic sounds, voices of animals and birds. Or use toys that make sounds and musical instruments

*Talking with her sister really expanded Emir’s vocabulary. I wonder if she will be like her sister: talking all the time!*

If the speech processor is correctly programmed and your child is hearing all these sounds, you should see a reaction to those sounds. When using sound sources like toys, musical instruments or even your voice, your child should react with an action (like for example turn to the sound source or put the pieces in a box or remove the ring from the pyramid). Be aware that sounds can vary in loudness (loud sounds vs soft sounds), in duration (long vs short) or style.

Help your child recognise the different sounds (car, ringing the door, keys, hair dryer, vacuum cleaner, microwave, TV ...) and find the sound source together in quiet and noisy environments.

**Tips for Games**

- When playing a game with your child share emotions, facial expressions and listen to sounds together.

- Dance together, using all the space. Stop when the music stops and start to move again when the music starts again.

- Pay attention to the rhythm and mood of the music (slow, fast, funny, sad, smooth, sharp).

- Let your child listen to a sound and point to the sound source. When your child is older you can ask them to point to the correct object.

- When your child looks for the sound source, enjoy the game together and praise them when they find the source.

- Pretend that you are asleep and let your child wake you up by playing on a drum. Look surprised or look startled when you hear sounds or voices.

- Use a scarf to hide your face and say ‘boo’ when you pull of the scarf.

- Take care of a doll: wash it, bath it, feed it, put it in bed, go on walks

- Sing along songs and dance to simple, repetitive songs ("The walking ducklings look like want ...").

- Use well-known words: use gestures or signs if necessary and praise your child when they understood your question correctly (‘good’, ‘well done’!).

*Moms of children with cochlear implants often call each other between themselves “magpies”, because a habit to voice every single thing could look strange for the others. But as the result the child being in everyday volumetric speech field quickly catching up his peers in the hearing and speech development. And this approach helps as well to children with normal hearing to start to talk early and correctly.*

**What do you need to get started?**

Make sure that the complexity of the game corresponds to the child's age. If you’re playing with young children, make sure the games are short and simple.

All games have two main aims: develop listening and language skills. So when asking your child a question, give your child time to think!

**Animal toys:**

- Collect 2 or 3 animals of different sizes, different materials and colors, cats, dogs, frogs, horses and cows. For example, three cats one of white plastic, another one made out of grey rubber and a red a furry cat, they are all very different, and yet all of them represent a cat. It is important that your child can explore all items.

- Learning to listen, who is making a sound, guess which animal is under the blanket (place a few familiar toys under the blanket). You can say ‘Woof, woof!’, then lift the blanket up and your child should point to the dog.

- Describe all the different sizes (large-small; short-long).

- Look at and describe all the details of the toy animals (eyes, ears, noses, tails etc.).

- Talk about their habits and how they move.

**Cubes & Balls**

- Gather big and small ones in various colors.

- Learn to distinguish between the size: large-small.

- Learn to identify the different shapes: round (roll between palms on the table), square (show that it doesn’t roll but you can use it to build a tower, destroy the tower, use facial expressions and movement when you push it and say ‘aaya the tower was so high but now it fell! Oh, the cubes fell on the floor.’)

- Pay attention to the colors (red, blue, green, yellow ...). Learn to find the colours: ‘Where is red ball?’ Or to carry out orders: ‘Remove the green cube’.

**Musical instruments**

- Gather drums, rattles, a tambourine, a glockenspiel, a flute.

- Remember the sounds of different instruments.

- Learn to hear the difference in sound (Let your child close their eyes, make a sound and when your child opens their eyes again, they must guess which instrument was played).

- Let your child reproduce sound (doo-doo-doo, drum-drum-drum, boom-boom-boom).

- Listen to simple melodies and play to the correct rhythm (using bells or rattles).

- Sing and play the instrument at the same time in the correct rhythm.

**Conclusion**

This is an exciting time as your child begins to hear for the first time! You are at the centre of your child’s world and we hope that this booklet has shown you what you can do to help your child as they embark on their hearing journey. Now that you know which steps your child will make from hearing to speaking you will be able to guide them and help them make the most of their device(s) and technologies. Furthermore, you’ll be able to see their progress!

And remember: don’t wait to communicate with your child! The emotional bond you develop with your child lays the foundation for language. The tips and games in this booklet hopefully let you see that spending time and having fun with your child is the most important thing you can do to help build your child’s growing understanding of the wonderful world of sounds and voices.

And know that you are not alone! Many specialists and professionals will support you and will share their knowledge with you. Learn from their experiences and ask them all the questions you might have. Remember, there are a lot of people, professionals but also teachers and your family, that will help you during this journey.

"I see the goals we are working towards and we will overcome any barriers we might encounter!" - let that be your motto for the future!

And let your primary goal for your child be: helping them grow into an healthy and happy child. Everything is in your hands, dear parents and loved ones, enjoy this journey together!

*I am in the world of sounds, as if in a dream*

*Listen to everything that is new.*

*Now I can hear birds singing and chirping.*

*I now have no boundaries in learning.*

*I have to run to new knowledge.*

*I hear the sound of the surf, splash of waves,*

*And for me, now all is not in vain.*

*And I do not want more silence,*

*After all, I live in a world of sounds so perfectly!*

*The torch relay is a big holiday for the whole country. I'm just very lucky in life. Last spring was advertising "light the Olympic flame."*

*I had to write an essay on "Why I am worthy to carry the torch with the Olympic flame."*

*I helped to write an essay for my mother. Why I am worthy:*

*"I'm good at school; I do sports, I love swimming and now I have a second level of swimming.*

*"I wanted to carry the torch. So dreams do come true!*