

Cochlear Implants

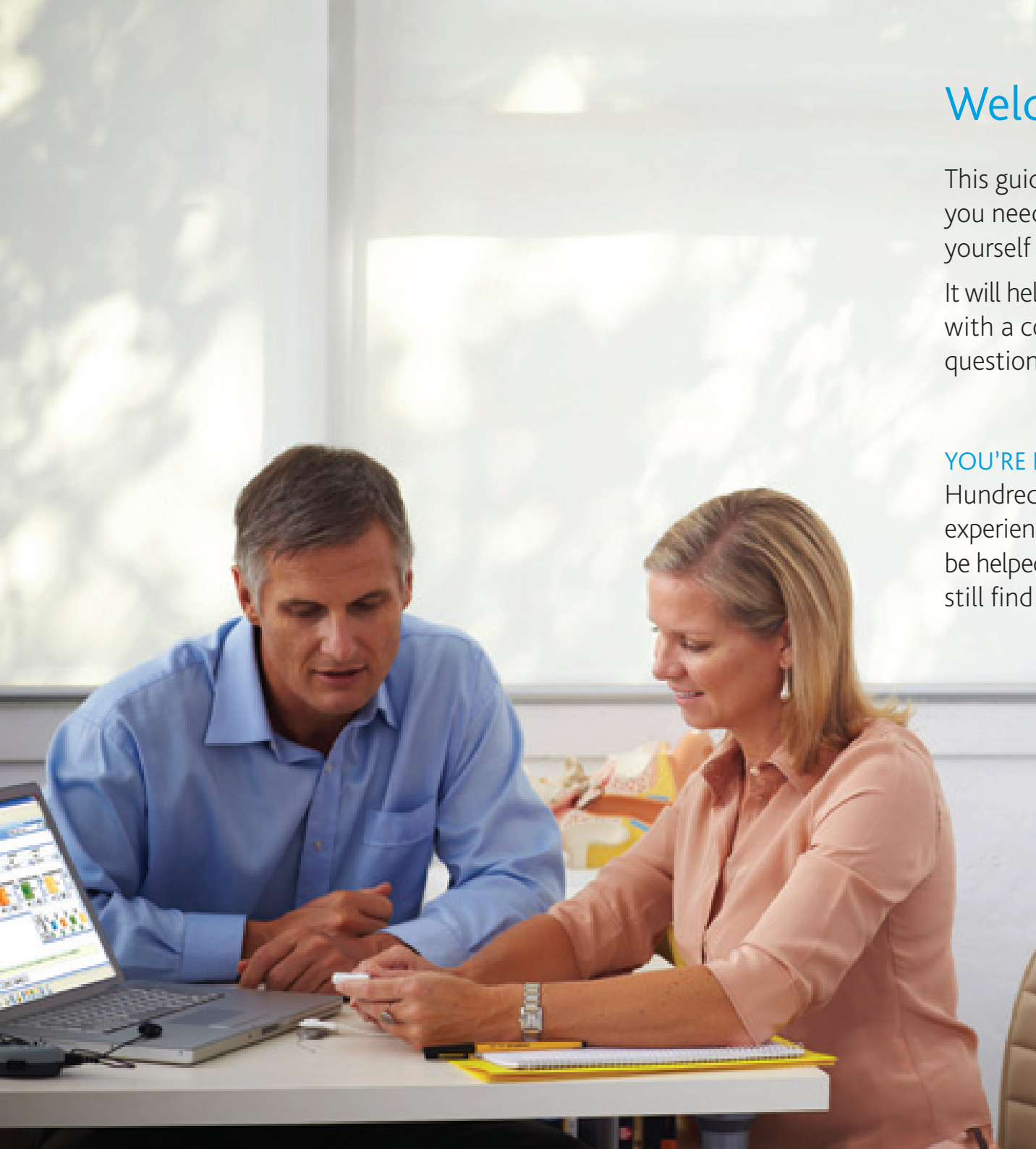
Answers to
your questions



Hear now. And always



Cochlear™



Welcome

This guide is designed to give you the information you need when considering a cochlear implant for yourself or someone important in your life.

It will help you understand how hearing works, hearing with a cochlear implant and answer some common questions about getting a cochlear implant.

YOU'RE NOT ALONE

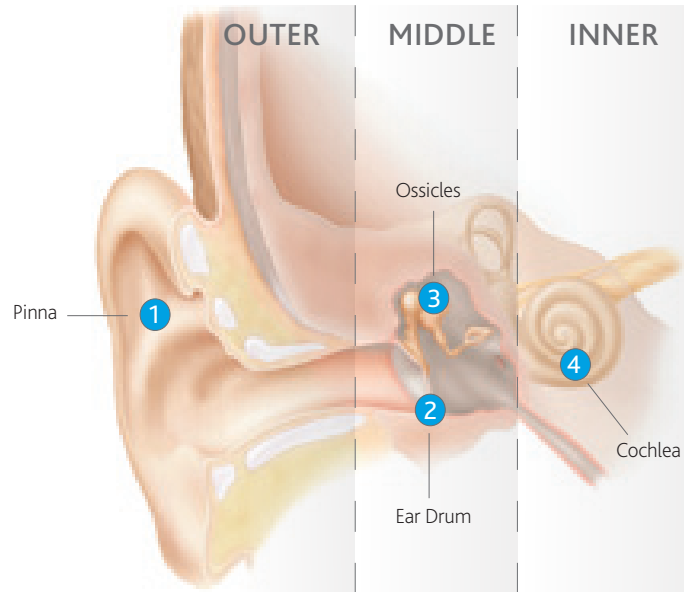
Hundreds of millions of people around the world experience some form of hearing loss. While many can be helped by a hearing aid, more than 75 million people still find the most powerful hearing aids inadequate.

DID YOU KNOW?

More than 170,000 people around the world have received a Nucleus[®] cochlear implant.

How do our ears work?

The ear is made up of three sections:



OUTER

The outer ear consists of the pinna and the ear canal. The pinna is your external ear, which captures sound and funnels it into the ear canal.

MIDDLE

The middle ear consists of the ear drum membrane and an air-filled cavity containing three small bones called ossicles. The individual ossicles are the hammer (malleus), anvil (incus) and stirrup (stapes) – and they vibrate together when the ear drum moves.

INNER

The inner ear consists of a complicated series of channels and chambers. For hearing, the important organ is the spiral shaped cochlea. Roughly the size of a pea, the cochlea contains fluid and about 15,000 tiny hair cells. Each hair cell is connected to the auditory nerve.

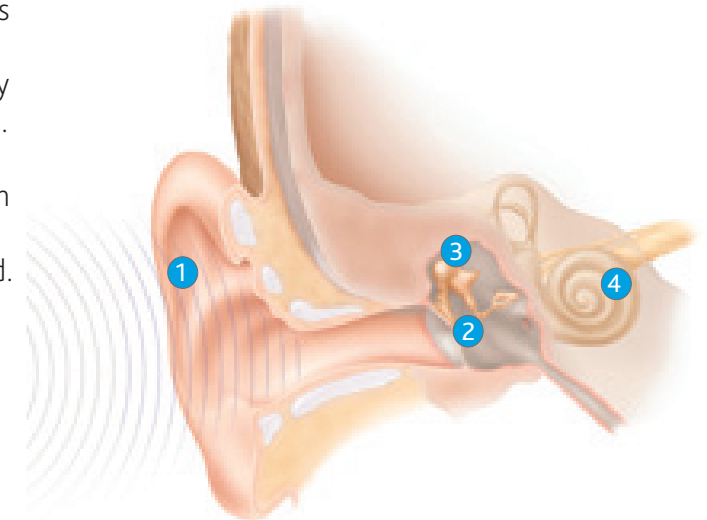
The ear is an amazingly complex but efficient hearing system.

The whole process only takes

a fraction of a second.

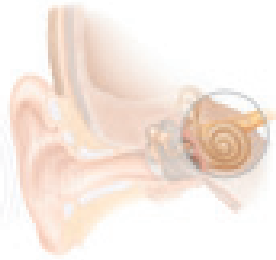
How do we hear?

- 1 Sound waves are guided down your ear canal by the pinna.
- 2 The sound waves hit your ear drum and it vibrates.
- 3 The small ossicles vibrate with the ear drum, transferring the sound across the middle ear to the cochlea.
- 4 The fluid inside the cochlea picks up the vibrations and carries them to the thousands of tiny hair cells. These hair cells change the movement into electrical impulses which are sent along the auditory nerve to the brain. The hearing centre of the brain interprets the impulses as sound.



Different types of hearing loss

There are three basic types of hearing loss:



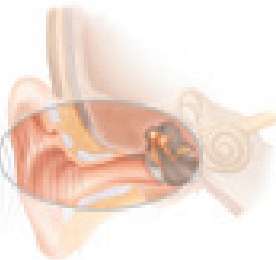
SENSORINEURAL HEARING LOSS

Sensorineural hearing loss is often called 'nerve deafness'. It's caused by damage to the cochlea, or the nerve pathways between the cochlea and the brain. Sensorineural hearing loss can be mild, moderate, severe, or profound. It can affect one or both ears, and is usually permanent.

Mild-to-moderately severe sensorineural hearing loss can usually be helped with hearing aids or a middle ear implant. Moderately severe to profound hearing loss can usually be helped with a cochlear implant.

Sensorineural hearing loss can be caused by:

- Inherited hearing loss
- Ageing (prebycusis)
- Viral infections such as rubella, measles, mumps and cytomegalovirus
- Drugs which damage the hearing system
- Birth trauma
- Complications from premature birth
- Trauma (usually long term exposure to extremely loud noise, commonly called industrial deafness)

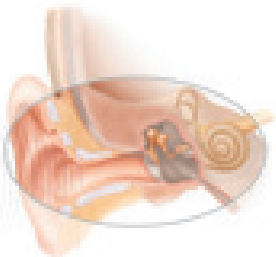


CONDUCTIVE HEARING LOSS

Conductive hearing loss occurs when there is a problem with the outer or middle ear. This means that sound is unable to travel or 'conduct' from the outer ear to the eardrum and the tiny bones, or ossicles, of the middle ear. A conductive hearing loss may occur in both ears or just one and can often be helped by medical or surgical treatment.

Conductive hearing loss can be caused by:

- Congenital
- Excess wax or a foreign object in the ear canal
- Outer ear infection
- Chronic 'glue ear' or middle ear infection, called otitis media
- A hole in the eardrum (perforation)



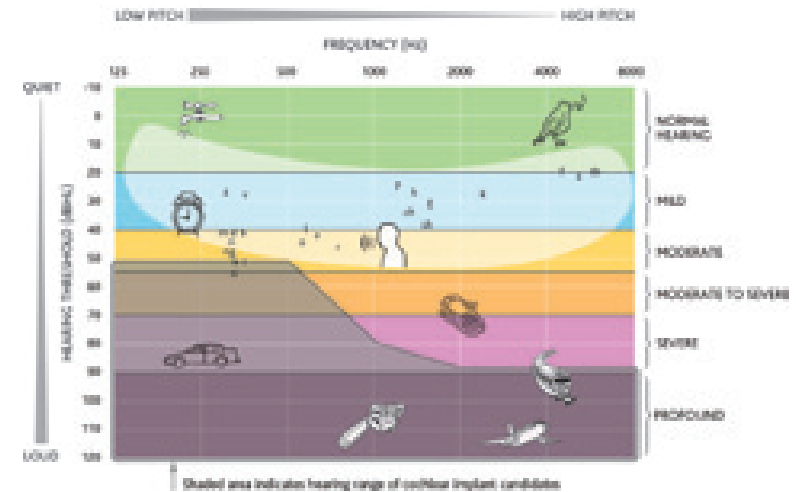
MIXED HEARING LOSS

Mixed hearing loss combines problems with the conductive pathway (outer and middle ear) and the cochlea or auditory nerve (the inner ear). Mixed hearing loss can occur in both ears, or just one.

How to read your audiogram

As part of the hearing tests done for you or your child, you'll be given an audiogram, which shows the hearing profiles for the left and right ears. The audiogram plots the usable hearing and hearing loss for each ear. Your audiologist will test sounds one frequency at a time and plot the softest level

at which the frequency can be heard. The closer the marks are to the top of the graph, the quieter the sound that can be heard in that frequency band. The most important pitches for speech fall into the lightly shaded area, which we call the 'speech banana'.



The Air and Bone Conduction Tests

It's important to check both the air and bone conduction of both ears, to see which part of the hearing system isn't working properly.

THE AIR CONDUCTION TEST

Checks the natural hearing pathway, where sound travels through the air into the outer and middle ear to reach the cochlea.

THE BONE CONDUCTION TEST

Checks the function of the cochlea. A metal band with an attachment called a bone oscillator is placed against the bone behind the ear. Sounds are sent directly to the cochlea through the bone bypassing the outer and middle ear to test the function of the cochlea.

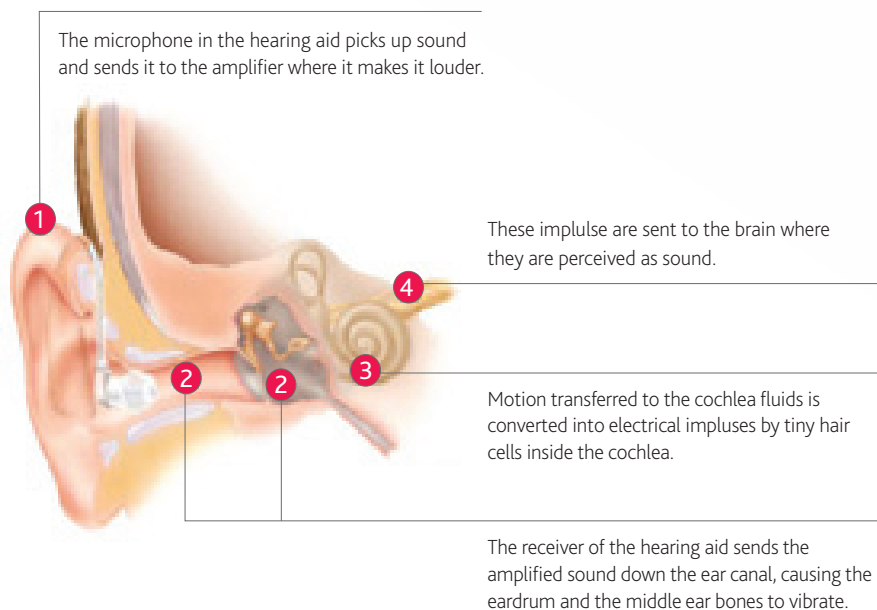
Why hearing aids can't work for everybody

Hearing aids help a lot of people with hearing loss. However they can't help everyone.

For many people with severe-to-profound sensorineural hearing loss in both ears, even the most advanced hearing aids can be like listening to a loud, badly tuned radio. While you can certainly hear the broadcast, it's broken up and hard to understand.

That's because hearing aids simply make sounds louder, which doesn't always make them clearer. In fact, understanding complex sounds like speech can actually be even more difficult.

HOW A HEARING AID WORKS



WHEN HEARING AIDS ARE NO LONGER EFFECTIVE

When people with severe-to-profound hearing loss don't benefit from hearing aids, medical experts consider a cochlear implant to be a more effective long-term solution.

Why cochlear implants are different

Unlike hearing aids, cochlear implants don't just amplify sounds. They mimic the natural hearing function of the inner ear through electronic stimulation. The system has two parts – an external sound processor and the actual cochlear implant. Incoming sounds are processed into electrical signals and then transmitted directly to the hearing nerve, bypassing the damaged parts of the inner ear.



Is a cochlear implant right for you?

Ask yourself, **when you use a hearing aid:**

- Do you have to ask people to repeat themselves, even in one-on-one conversations in a quiet room?
- Do you depend on lip-reading to help you understand what's being said?
- Do you avoid social activities because you don't always know what's being said – and are worried about responding incorrectly?
- Are you exhausted at the end of the day because listening takes so much concentration?
- Are you having a hard time keeping up at work?
- Is it hard for you to talk on the phone, and does that make you avoid answering or using your phone?
- Is listening to music no longer enjoyable?

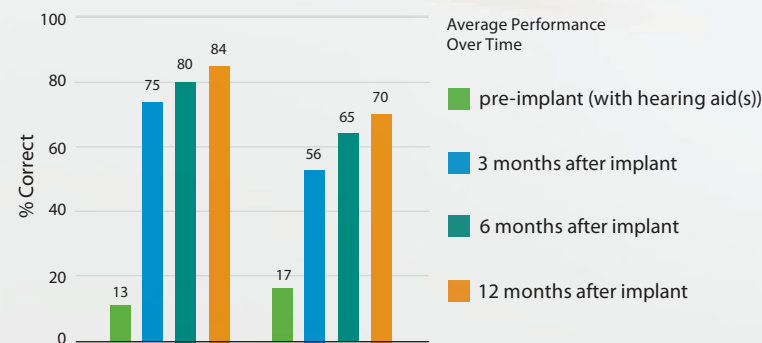
If you answered yes to any of these questions, you may be a good candidate for a cochlear implant.

Don't wait. Every moment matters.

The sooner you receive a cochlear implant, the sooner you can start hearing, interacting and enjoying your life to the full.

Instead of the isolation and loneliness that often accompanies significant hearing loss, you can look forward to rediscovering the activities that you may have abandoned because of your hearing. You won't just reconnect with the world of sound, but with a whole wide world of enjoyment and opportunity.

Performance with cochlear implants compared with best-aided testing with hearing aids*



*In patients with moderate to profound hearing loss

Cochlear implants can deliver rapid improvements over hearing aids, especially in the crucial area of speech recognition. Studies have shown that, on average, adults can achieve 75% sentence understanding after using a cochlear implant for just 3 months and 80% after 6 months, compared to 13% previously, when using just their hearing aids.¹

It's important to realise that not all hearing losses are the same. Results can vary and people may experience different hearing outcomes with their cochlear implant. You should talk to your hearing professional about your individual situation and raise any questions or concerns you might have.

DID YOU KNOW?

If you have severe-to-profound hearing loss in both ears, having cochlear implants on both sides (bilateral) may give you a more natural hearing experience. Bilateral implants are an option you can discuss with your audiologist, surgeon or ear, nose and throat (ENT) specialist.

Crucial considerations for your child

It's vital that you act early

A cochlear implant early in your child's life can make a huge difference. Your child's mind is programmed to learn foundational language skills during the first few years of life.²

So early access to hearing will give your child a far greater chance of realising their personal best speech and language skills.³⁻¹¹ Studies have shown that children who receive a cochlear implant and appropriate rehabilitation at a young age (before the age of 18 months) have a greater potential to develop language skills equal to or close to those of their same aged peers with normal hearing.^{4,5,7,9 & 13}

Language means more than speech

Speech and communication skills are among one of the most important benefits a cochlear implant can give your child.³⁻¹¹ Language is not just critical for communication and life skills, but for cognitive skill development as well. A child's neural pathways are always developing, and learning speech and language helps spur other developments too.²

It is well documented that children who can hear and use spoken language also develop better reading and academic skills.¹²

This means the sooner your child can hear and use spoken language, the more likely they'll be to:

- Learn to read near the same level as children of a similar age with normal hearing
- Attend a mainstream school with their peer group
- Converse confidently with family, friends and teachers
- Use the phone
- Listen to and even play music
- Have the greatest opportunity to enjoy higher education successes
- Achieve employment and pursue a career
- Engage fully with the hearing world

While you may find it difficult to make the decision for your child, proceeding with a cochlear implant on the advice of your hearing health care team could be the greatest gift you ever provide.



Questions that parents ask

What can I do for my child right now?



An important first step in your child's hearing journey is to start the learning and listening process before they get their cochlear implant.

1. It is important to begin your child's path towards spoken language development as early as possible. Hearing aids may provide some access to sounds – and the earlier you start, the better.
2. You can also begin a program of family-centred auditory therapy as soon as the first hearing aid has been fitted. This will help your child begin the process of learning to listen.
3. Parents are a child's first and most important teacher. An auditory therapist can show you how to help you child achieve spoken language skills and learn about the hearing world. Cochlear provides a range of habilitation and support materials that you can use to help begin your journey – so the whole family will already be on the spoken language development path by the time your child receives their cochlear implant.

Will my child be able to take advantage of future advances?

It's natural to worry about your child being left behind as technology improves. However you can rest assured that Cochlear's implants and processors are designed to give your child a lifetime of access to new technological innovations without further surgery.

Because getting a cochlear implant early in life is more important than waiting for future improvements, this is a crucial point. Your child can enjoy the lifetime advantages of having their speech and language pathways stimulated early and access improvements in implant technology as they grow up.

DID YOU KNOW?

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Things to consider in a cochlear implant

Although all cochlear implants work on the same principals, the way they're designed and manufactured can vary. It's important to understand the distinctions and ask the right questions, so you can choose the best implant solution for you or your child.

Can you or your child rely on the implant for life?

Audiologists and cochlear implant surgeons agree that reliability is essential in a cochlear implant – it should be designed to last a lifetime. So it's worth asking about the manufacturer's record and whether there is any known history of technical complications or problems. Reliability data is reported as a Cumulative Survival Rate (CSR) and the most telling record is what happens beyond the first year of implantation. Independent research and a comparison of the various manufacturers' CSR data has shown that the Nucleus® Cochlear Implant is the most reliable implant available.¹⁴⁻¹⁸

How good is the implant for speech understanding?

The cochlear implant you choose must be able to improve your hearing and understanding of speech in everyday settings. Of course, activities like enjoying music are also important, but most experts agree that developing speech and spoken language skills should be considered the first priority.

Is the system flexible, for an active lifestyle?

The durability and versatility of the system's external sound processor has to let you or your child enjoy everyday life – listening to music, talking on the phone, bathing, playing sports, even getting

caught in the rain – all with minimal disruption. Not all sound processors offer the same high level of water resistance, for example, so you should consider your needs carefully.

Manufacturers may also offer different battery options for their external sound processor – rechargeable, disposable or the flexibility of both. Rechargeable batteries are often preferred, however their life on one charge can vary greatly between manufacturer's so ask what you can expect. Disposable batteries are convenient if you don't have easy access to a power source, if you're out travelling, camping or caught by a power outage for example.

What factors can affect the benefits of cochlear implants?

Everyone is different so not all recipients have the same experience when they get their implant. It's important for you to have a realistic expectation of your hearing outcomes. The following factors can have an impact on the benefit of cochlear implants:

- How long you've had your hearing loss
- How severe your hearing loss is
- The condition of your cochlea (inner ear)
- Other medical conditions
- The amount of practise you do with your cochlear implant system

Recipients and health professionals all agree that practise, patience and perseverance are important. Please talk to your hearing health professional to discuss your hearing needs and expectations.

WHAT IS CSR?

Cumulative Survival Rate (CSR) is a reliability standard established by the International Organisation for Standardisation (ISO). It indicates the likelihood of a device continuing to function properly after a given period of time.

Will you have easy access to future technology upgrades?

Today's implant systems are designed to let you benefit from future developments without needing any additional surgery. This is an important consideration, because you or your child will want to live with the implant you choose for a lifetime. At the same time, it's important to know that the manufacturer you choose is committed to investing in new, improved technologies and making them available to their recipients. There are many examples of recipients who had a Cochlear system implanted 25 years ago and can still access the most advanced processors available today. Read Holly's story on page 22.

Will you have the support of rehabilitation and education services?

Rehabilitation is essential for getting the best hearing and speech outcomes from a new cochlear implant and sound processor. Regardless of the technology, it's well documented that successful results depend on the recipient and their audiologist, speech and language therapist, and healthcare team working together. You'll need to put time into ongoing habilitation, so you need to consider how well each manufacturer's support services can meet your needs.

Does the manufacturer have a reputation for quality?

Remember that you or your child are entering into a lifelong relationship with your cochlear implant manufacturer. So you need to feel you can trust them to be there with you. Find out all you can from healthcare professionals, as well as other people or parents with implant experience. You can also contact each manufacturer and ask them a few questions. It's surprising how much you can tell from a few minutes speaking directly to a company representative.

Is that all?

There will always be some 'nice to have' options when you're considering a cochlear implant, and you should feel free to discuss your lifestyle and needs with your audiologist and surgeon. However most healthcare professionals readily agree that reliability, speech understanding, flexibility and reputation are the essential factors in every choice.

Connecting to a world of sound

Assessment for a cochlear implant, the surgery and follow-up usually takes place at a specialist cochlear implant centre.

The members of your specialist team will probably include:

Audiologists	Hearing evaluation, sound processor programming and fitting (mapping)
Cochlear Implant Surgeon	Medical evaluation, surgery, and post operative care
Speech and Language Therapists	Speech and language evaluation, (re)habilitation
Social Worker/Psychologist	Psychological evaluation and expectations guidance
Teachers of the Deaf	Assist in educational planning for your child

Assessment

As a cochlear implant candidate you or your child will undergo a number of tests to make sure a cochlear implant is the right solution. These will include:

- Audiology tests such as hearing levels with and without hearing aids, speech understanding, and auditory nerve function.
- Medical tests and MRI scans to determine general health, evaluate the cause of the hearing loss and assess the hearing anatomy.
- Psychological tests to confirm your ability to cope with surgery and participate in follow-up.
- Speech and language testing, as a benchmark for ongoing assessment of speech and language development.

Surgery

The cochlear implant procedure usually takes between 1 and 3 hours. Thousands of cochlear implant surgeries are performed each year. The risks involved are small, and your surgeon will discuss them with you.

Activation

Within a few weeks of surgery, your audiologist will be able to activate the cochlear implant. They will program the device to suit your unique hearing needs, fine tuning the settings over a few follow-up sessions.



Living with a Cochlear Implant

While there aren't many limitations when it comes to living with a cochlear implant, there are a few things to remember:

- Contact sports, such as football and boxing, that may result in severe blows to the head are not advised.
- Cochlear sound processors offer the industry's highest level of water resistance – however they are not water proof. So you'll need to remove your sound processor before taking part in water sports like swimming, diving and surfing.
- Check with your audiologist before you have an MRI scan. Most MRI scans can be undertaken with a Cochlear implant (including the internal magnet) in place. However if you need a high-strength MRI scan or a brain scan, Cochlear implants are designed so that the magnet can be removed with relatively simple surgery.
- You should plan for on-going costs such as maintenance as well as upgrading your sound processor so you can take advantage of new technology.

Risk of device failure

As with any technical devices, there is a risk that a cochlear implant could stop working. This occurs very rarely and Cochlear leads the industry in implant reliability. If your implant did fail, a new one would need to be implanted.



Connected for life

22 years after her implant, 26 year-old Holly McDonell has enjoyed multiple sound processor upgrades, without the need for further surgery.

THEN

Holly McDonell lived in a world of silence. Holly's Mum wanted to give her a normal childhood and a bright future.

1987

At age 4, Holly became the first paediatric recipient of a commercial Nucleus cochlear implant.

1988

Holly started school and attended mainstream education for 13 years, from Kindergarten to Yr 12.

2000


Holly graduated from high school in the top 2% of students in the state.

2007

Holly graduated from University with first class honors in Law.

NOW

Happily working as a lawyer and lives life to the full.



"With my cochlear implant, I was able to happily attend mainstream schools and successfully achieve my own personal and career goals."

HOLLY MCDONELL

Hear now. And always

This is Cochlear's promise to you. As the global leader in hearing solutions, Cochlear is dedicated to bringing the gift of sound to people all over the world. In fact, Cochlear has reconnected over 250,000 people to their families, friends and communities in more than 100 countries.

Along with the industry's largest investment in research and development, we continue to partner with leading international researchers and hearing professionals, ensuring that we are at the forefront in the science of hearing.

Our commitment to those who have received a Cochlear hearing solution is that for the rest of their life, they will Hear now. And always.

For further information please contact your local Cochlear representative or visit us on the web at: www.cochlear.com

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