FOR PROFESSIONALS

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Cochlear® Care Practice

Adult cochlear implant care protocol

CARE PRACTICE



Delivery of optimised cochlear implant care is an area that continues to evolve as new evidence emerges, industry experts align, and patient populations grow.

To support you in providing best-practice care for your adult cochlear implant (CI) patients, Cochlear developed this protocol, which reflects the latest evidence and international consensus recommendations.

The protocol provides guidance at five key stages of the patient CI journey: Candidacy evaluation, Preparing for surgery, Activation, Optimisation and Maintenance.

For each stage, the protocol describes:

- **What to do** - the session goals for each stage
- **How to do it** - clinical tasks to be completed in the session

Candidacy evaluation

Audiological candidacy evaluation should occur as close as possible to the time a valid referral is received.

Session Goals

- ✓ Complete case history and audiological evaluation
- ✓ Verify hearing aid fitting
- ✓ Evaluate aided speech recognition
- ✓ Determine treatment recommendation and counsel

Minimum tasks

Complete case history and audiological testing

- Obtain case history.
- Confirm hearing status with a diagnostic audiogram and objective measurements.

Evaluate hearing aid benefit

- Verification of amplification (e.g., Real Ear Measurement, aided sound-field audiogram). If hearing aids are not meeting targets, refit or refer back to the referral source.

Evaluate aided speech recognition

- Perform aided speech perception testing on each ear and bilaterally, including monosyllabic words in quiet (e.g., CNC Words[1]) and sentence in noise test (e.g., AzBio sentences[2]).

Determine treatment recommendations

- Determine if the patient meets clinical candidacy guidelines for cochlear implants.
- Consider patient specific factors to individualise care recommendations (e.g., aetiology, duration of deafness, communication modality, overall health).
- If the patient is a candidate:
  1. Refer for medical evaluation if they agree to move forward.
  2. If they choose not to move forward, provide them with information about CIs and consider re-evaluation in one year.
- If the patient is not a candidate:
  1. Provide them with information about CIs and consider re-evaluation in one year.
  2. If hearing aids were not optimised, consider referral to hearing aid clinic for ongoing treatment.

Counseling suggestions

- Utilise outcome measures such as APHAB[3], IOHA[4], CI-QOL[5] to supplement a conversation about expectations with a CI vs. a hearing aid.
- Explain the hearing loss, current aided benefit, and expected thresholds with a cochlear implant (i.e., detection thresholds at 25 dB HL at 250-6000 Hz).
- Explain that for most patients with this type of hearing profile, a CI is likely to offer better speech perception and enhanced communication abilities compared to hearing aids.
- Explain next steps, including medical evaluation.
- Help the patient create their Cochlear Account and counsel them on how Cochlear tools and services (including Remote Care) will support their journey.
- Connect the patient to a CI recipient or volunteer if desired.

Preparing for surgery

The pre-surgery visit may take place any time before surgery or during the candidacy visit.

Session Goals

- ✓ Establish expectations
- ✓ Choose sound processor and complete order form

Minimum tasks

Establish expectations

- Provide the patient with information about the surgical logistics (e.g., pre-surgical instructions from the medical team, location of the surgery, timing, etc.).
- Set expectations of wear time for all waking hours (typically 12+ hours per day).[6,7]
- Discuss ongoing use and compatibility of the contralateral hearing aid for bimodal streaming if appropriate.
- Request patients create their Cochlear account prior to surgery (e.g., provide QR code or email account creation link through myCochlear™ Professional).
- Download Nucleus® Smart App using Cochlear account credentials to log in and access services with Cochlear.

Complete order form

- Select processor(s), colours and accessories based on the patient's preferences and hearing goals.
- Select an acoustic component if there is potential to utilise post-operative residual hearing in the ear to be implanted (i.e. post-operative thresholds are likely to be better than or equal to 60 dB HL at 250 and 500 Hz).[8]
- Recommend a Smart Bimodal hearing aid if appropriate.

Complete any outstanding baseline outcome measures

- Complete any outstanding audiological testing or patient reported outcome measures to establish a baseline.

Counselling suggestions

- Cover any questions your patient may ask regarding the surgical procedure.
- Counsel your patient on activation, including the following:
  - When Surgery and Activation will occur.
  - When the implant is first activated, many adults report that the sound quality is not clear (sometimes described as beeping or robotic).
  - The sound quality improves over time as the brain adjusts to the electric stimulation.
  - What to bring to the appointment (smartphone etc.).

Counsel your patient on next steps after activation:

- Discuss follow-up care using a combination of Remote Care and in-person care.
- Discuss the goals the patient has for treatment (e.g., using COSI[9]).

Activation

Initial activation should occur within two weeks following CI surgery.[10-13]

Session Goals

- ✓ Confirm status of the implanted ear
- ✓ Ensure C levels are set to 'Loud'
- ✓ Ensure audibility of soft sounds
- ✓ Ensure an adequate dynamic range (minimum 40 CL)
- ✓ Set expectations of wear time for all waking hours (typically 12+ hours per day)

Minimum tasks

Inspect the implant site

- Inspect implant site, incision, ear canal and area behind pinna for any issues such as redness or discharge and ask the patient about pain or earache. Any medical concerns should be referred to the appropriate medical provider.
- Select correct magnet strength to obtain balance between comfort and retention.

Evaluate hearing status of the implanted ear

- If pre-operative unaided hearing thresholds are 60 dB HL or better at 250 and 500 Hz, assess candidacy for electroacoustic fitting by completing a post-operative unaided audiogram in the implanted ear.[8]
- Review surgical data for factors that may impact programming.

Create an initial MAP

- Create an initial MAP using population mean or objective measures.[14-16]
- Go "On Air" with the MAP.
- While speaking at a conversational level, use the categorical loudness scaling chart[17], and gradually raise the T and C profile until the patient rates the speech as 'very loud' (45 on the chart). Continue speaking for a few minutes then use a descending approach to obtain a final loudness rating just below very loud (40 on the chart).[18] This ensures MAPs will remain at adequate loudness levels for speech understanding as the brain further adapts to electrical stimulation.[19]
- Aim for a minimum dynamic range of 40 CLs.[20]
- In the Comfort Screen, sweep in bands across C levels ensuring loudness is generally equivalent across all frequencies.[17]

Ensure audibility of soft sounds

- Confirm detection of soft sounds using a live voice Ling Six Sound check at a conversational level (AA/ EE/ OO/ M/ S/ SH).[21]

Finalise sound processor settings

- Configure processor settings in the Finalise screen.
- Consider enabling automatic or manual ForwardFocus as well as Master Volume, Bass and Treble (MVBT) to support patients in self-managing their sound tolerance, overall loudness and sound quality.[22,23]
- Save MAPs to the sound processor while the coil is on the patient's implant and counsel on expected battery life.
- End session.

Address hearing needs in the contralateral ear

- If the patient is bimodal, continued full-time device use of both sides is encouraged.[24,25]
- Link a Smart Bimodal device if applicable.[26] Check hearing aid compatibility at www.cochlear.com/compatibility
- If the patient uses a CI in the contralateral ear, informally check for equal loudness between the two ears.
- End session.
- Further loudness balancing may be completed during the optimisation phase.

Install the Nucleus® Smart App

- Check the patient has installed the Nucleus Smart App and created a Cochlear Account.
- Pair the patient's devices and demonstrate the key features if required.

Counsel on device use

- Review basic device operation and materials (e.g., device placement, changing and charging batteries, operating the sound processor, and app usage).
- Provide guidance on use of the sound processor including setting expectations for wear time of 12+ hours per day.[6,7]

Optimisation

Typically up to 90 days post activation. The duration of the optimisation phase depends on individual patient needs.

Session Goals

- ✓ Confirm status of the implanted ear and equipment
- ✓ Discuss at-home experience and review datalogs
- ✓ Confirm audibility and evaluate progress
- ✓ Optimise MAP and check loudness
- ✓ Check the contralateral ear

Minimum tasks

Inspect the implant site and equipment

- Inspect implant site, incision, ear canal and area behind pinna for any issues such as redness or discharge and ask the patient about pain or earache. Any medical concerns should be referred to the appropriate medical provider.
- Check for correct magnet strength to obtain balance between comfort and retention.
- Inspect equipment and user settings, do a listening check of the sound processor microphone, and replace the microphone covers.

Discuss at-home experience and review datalogs

- Ask about their listening goals, their listening experience, sound quality and cover any other questions.
- Review datalogs and program use to determine if MAP changes are needed.[27,28]
- Discuss rehabilitation and usage reminders (e.g. wear time of 12+ hours per day[6,7]).
- Review patient goals (e.g. COSI[9]).

Confirm audibility and evaluate progress

- Progress may be evaluated in different ways depending on how long the patient has been using their device.[29]
- Up to one month:
  - Perform a sound-field audiogram or review a recent Remote Check Aided Threshold Test to ensure soft sounds are audible to the patient (i.e. 20-30 dB HL thresholds or better at 250, 500, 1K, 2K, 4K, 6KHz in the free field.[20,30,31] Note: Remote Check aided thresholds are typically better than sound-field due to direct streaming).
  - Assess detection of soft sounds using a live voice Ling Sound check at a conversational level (AA/ EE/ OO/ M/ S/ SH).[21]
  - Complete informal speech perception measures (e.g., common phrases, numbers).
- One to three months:
  - Monosyllabic words in quiet (e.g., CNC Words[1]).
  - Sentence in noise test (e.g., AzBio sentences[2]) or Remote Check Speech in Noise (Digit Triplet) test.[32]
  - Patient-reported satisfaction measure (e.g., SSQ[33], COSI[9], CI-QOL[5]).

Optimise MAP and check loudness

- T levels:
  - At least once, measure a minimum of five T levels spaced across the array ensuring they are set to the lowest stimulation level that can be detected 100% of the time.
  - Only remeasure T levels if indicated by changes on repeat sound-field audiograms or Remote Check Audiogram test.[34]
- C levels:
  - At least once, compare C levels to values obtained with objective measures such as ESRT[35,36,37] or AutoNRT.[18]
  - Sweep in bands to ensure all C levels are of equal loudness, adjusting any which are not.
  - Compare C levels to the expected range (shaded area in Custom Sound® Pro fitting software).
  - Ideally the headroom between C levels and compliance limits is greater than 10CLs so the patient can use the Master Volume control in the Nucleus Smart App and the MAP is suitable for Remote Assist.

Review processor settings

- Review processor settings based on usage and datalogging (e.g., discuss user-controlled ForwardFocus if it hasn't been used or consider adding or removing a program).

Optimisation

Typically up to 90 days post activation. The duration of the optimisation phase depends on individual patient needs.

Session Goals

- ✓ Confirm status of the implanted ear and equipment
- ✓ Discuss at-home experience and review datalogs
- ✓ Confirm audibility and evaluate progress
- ✓ Optimise MAP and check loudness
- ✓ Check the contralateral ear

Check the contralateral ear

- Bimodal:
  - If the patient is using a Smart Bimodal hearing aid, ensure the patient can stream to both sides and informally check the overall loudness.
  - Prioritise adjusting the hearing aid when checking loudness balance.
- Bilateral:
  - Informally check the loudness balance between the two ears.

Introduce and schedule Remote Care (if available)

- Remote Care (Remote Check and/or Remote Assist) should be introduced to the patient during the optimisation phase if not already done during the activation appointment.
- Remote Care usage during optimisation[30]:
  - Confirm audibility, evaluate hearing performance, measure impedances and review datalogging with Remote Check.
  - Individual ear testing that enables isolation of the implanted ear in patients with Unilateral Hearing Loss (UHL) and Single-Sided Deafness (SSD).
  - Interim evaluation of performance and checking of the device with Remote Check and/or global adjustments with Remote Assist in lieu of in-person appointments.
  - Establish baseline speech perception measure (e.g., Digit Triplet Test) for comparison when the patient has graduated to the maintenance phase.
  - Use of Remote Check and/or Remote Assist for troubleshooting and triaging.

Provide further counselling (in-clinic or remotely)

- Review device management (e.g., placement, changing and charging batteries, mic cover replacement, app and accessory use).
- Discuss ongoing aural rehabilitation and provide further support if needed (e.g., hearing therapy and rehabilitation resources).
- Encourage the patient to connect with Cochlear through Cochlear Family and/or social media for ongoing updates and support.

Confirm optimisation milestones have been met

- Confirm key milestones have been met to graduate the patient to the maintenance stage of aftercare:
  - Speech perception targets achieved, and performance plateau reached (e.g., using post-op CNC word scores[39,40]).
  - Audibility target achieved.
  - Wear time target achieved.
  - Patient satisfaction confirmed.
  - If the patient has not yet reached these milestones or if other concerns exist, remain in the optimisation phase and provide continued support.

Maintenance

Typically commences 90+ days post-activation. Performance typically plateaus and MAP levels normally stabilise within this time-period.[39,40]

Session Goals

- ✓ Confirm status of the implanted ear and equipment
- ✓ Evaluate progress
- ✓ Determine need for ongoing support and technology upgrades

Minimum tasks

Performed using Remote Care solutions where possible

Inspect the implant site and equipment

- Inspect implant site, incision, ear canal and area behind pinna for any issues such as redness or discharge and ask the patient about pain or earache. Any medical concerns should be referred to the appropriate medical provider.
- Check correct magnet strength to obtain balance between comfort and retention.
- Inspect equipment and user settings, do a listening check of the sound processor microphone, and replace the microphone covers.

Evaluate progress

- Audibility: Perform a sound-field audiogram or review a recent Remote Check Aided Threshold Test to ensure soft sounds are audible to the patient (i.e. 20-30 dB HL thresholds or better at 250, 500, 1K, 2K, 4K, 6KHz in the free field.[20, 30, 31] Note: Remote Check aided thresholds will be better due to the direct streaming).
- Datalogging: confirm wear time of 12+ hours per day.[6,7]
- Speech Perception Testing (e.g., CNC Words[1], AzBio sentences[2], Remote Check Hearing in Noise test[32]).
- Patient satisfaction (e.g., SSQ[33], COSI[9], CI-QOL[5]).
- Discuss any lifestyle, health or medication changes since the previous visit that may impact hearing health.

Check progress against previous test results

- Using hearing assessments used in your clinic, compare results against previous scores and determine if changes are clinically significant and require adjustment of programs or MAPs (e.g., Remote Check Speech in Noise (Digit Triplet) Test: 2.6 dB change[32]).

Review MAP levels and processor settings

- Adjust T and C levels only if indicated and retest as required. Levels have usually stabilised by this stage.[34,40]
- Discuss real-world experience and patient goals and modify processor settings if needed (e.g. ForwardFocus, MVBT, Volume Control).

Discuss technology upgrades

- Review device, accessories and app usage.
- Discuss new technology upgrades (e.g., sound processors, firmware enabled features, or accessories).
- Encourage patients to connect with Cochlear for ongoing updates or to access available resources through Cochlear Family and/or social media channels.
- Discuss ongoing bimodal support.
- Discuss bilateral implantation if indicated.

Confirm ongoing support plan

- Discuss and agree on options for ongoing support including the use of Remote Care.
- Encourage self-monitoring of hearing health for increased patient autonomy.
- Follow-up with referring provider with a progress update including ongoing care plans.

Categorical Loudness Scaling Chart

Use the Loudness Scaling Chart on the next page when making global adjustments to the loudness of a MAP or performing loudness balancing tasks.[17,18]

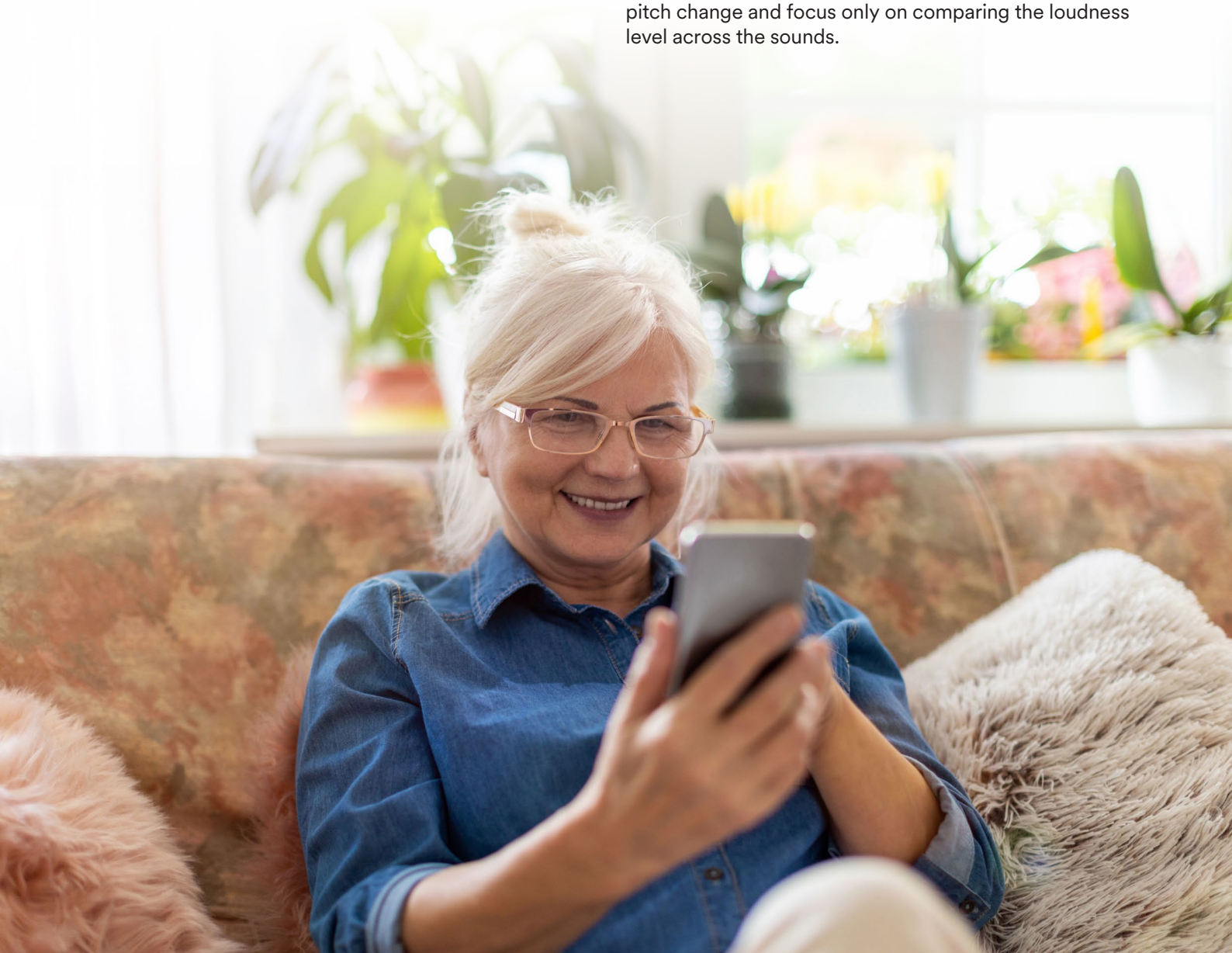
Patient Instructions

For Global Adjustment tasks

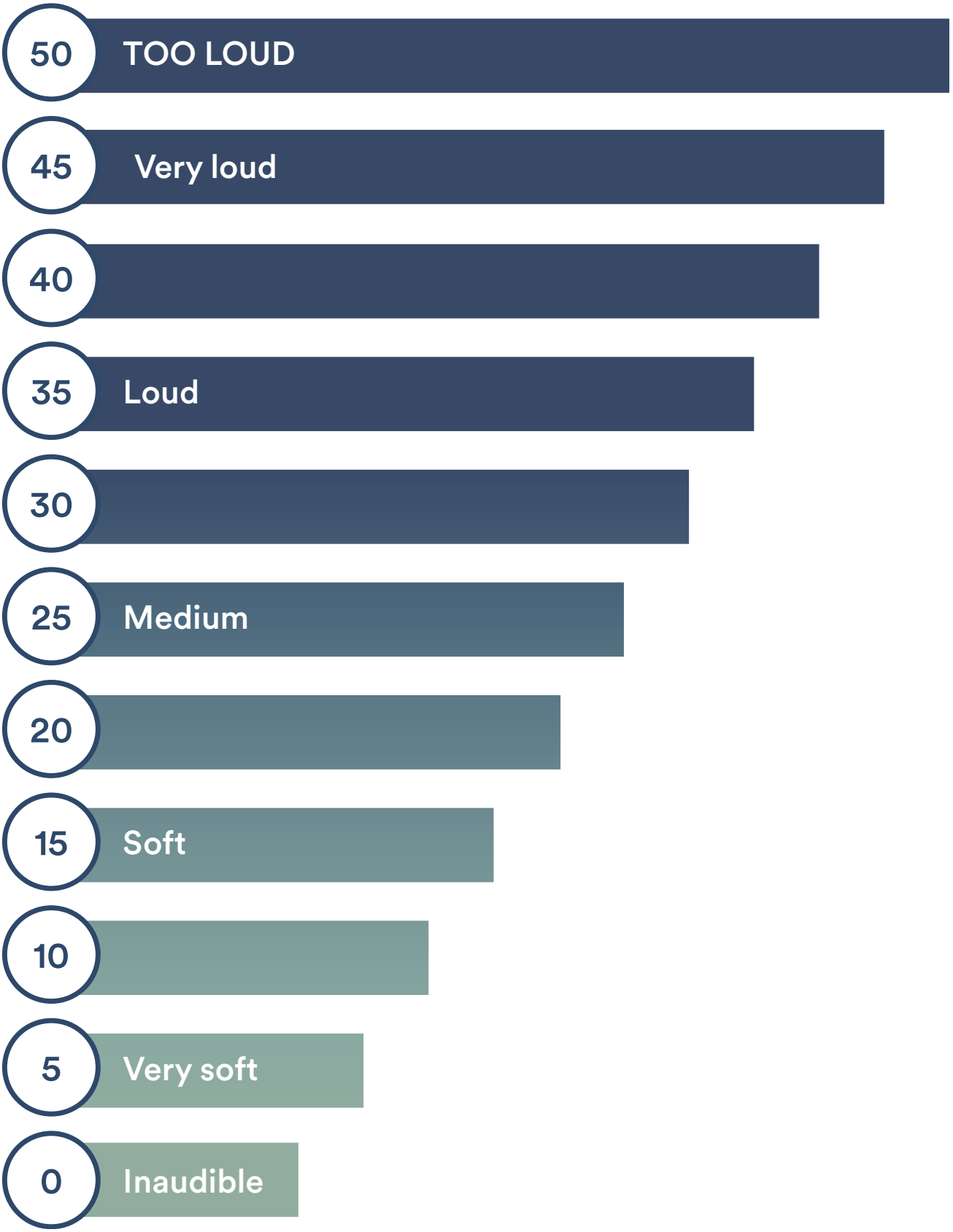
In a moment you will start to hear me speaking and my voice will then become louder. Please indicate the overall loudness level of my speech as it changes, by choosing the corresponding level on the loudness chart.

For Loudness Balancing tasks

In a moment you will hear a set of short sounds (e.g. tones, beeps) that may differ in loudness and pitch. We are checking if the sounds are equally loud and balanced. Following each set you hear, please indicate the overall loudness level of the sounds by choosing the corresponding level on the loudness chart. Ignore the pitch change and focus only on comparing the loudness level across the sounds.



Categorical Loudness Scaling Chart



Hear now. And always

Cochlear is dedicated to helping people with moderate to profound hearing loss experience a world full of hearing. As the global leader in implantable hearing solutions, we have provided more than 750,000 devices and helped people of all ages to hear and connect with life's opportunities.

We aim to give people the best lifelong hearing experience and access to next generation technologies. We collaborate with leading clinical, research and support networks to advance hearing science and improve care.

That's why more people choose Cochlear than any other hearing implant company.

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