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PROTOCOL

Implantation of the Cochlear™ Nucleus® Hybrid S Round Window (S-RW) in Adults

Feasibility Study

Version 5.0

May 2018

Study Sponsor:

Cochlear Americas

13059 E. Peakview Avenue,

Centennial, CO 80111

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Investigator Responsibilities

I, the undersigned, am responsible for the conduct of the study at the site below and by my signature below, I confirm that I have read, understand and will strictly adhere to the study protocol, "Implantation of the Cochlear™ Nucleus® Hybrid S Round Window (S-RW) in Adults."

Clinical Investigational Site
Primary Investigator's Name (print)
Title
Signature
Sponsor Representative
Title
Signature

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Table of Contents

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Clinical Investigational Synopsis

Title	Implantation of the Cochlear™ Nucleus® Hybrid S Round Window (S-RW) in Adults
Study Sites	Single Investigational Site
Study Duration	60 to 96 Months
Study Time	12 months postactivation for each subject
Study Population	Up to 10 subjects aged 18 years and older
Design Overview	The study will be conducted as a prospective, repeated-measure, single-arm, open label clinical study.
Primary Objective	To evaluate the feasibility of implanting the Cochlear™ Nucleus® S-Round Window (S-RW) implant in newly implanted adults with expanded indications for candidacy.
Study Intervals	Candidacy Intraoperative Initial Activation 3 Month Postactivation Evaluation 6 Month Postactivation Evaluation 12 Month Postactivation Evaluation
Primary Safety Endpoint	Report of medical/surgical and device related adverse events compared to the current Nucleus Hybrid approved labeling with regard to type, frequency and seriousness at 12 months postactivation.
Primary Efficacy Endpoint	Report of clinical performance using an open set monosyllabic word recognition measure at 12 months postactivation.

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Glossary

Term	Definition
Acoustic Alone Condition	Hearing that utilizes the natural hearing pathway or with the assistance of a preoperative hearing aid in the ear to be implanted or postoperative in the implanted ear using the acoustic component. The contralateral ear should be plugged during acoustic alone testing.  **HA**
Best Bilateral Listening Condition	Best postoperative bilateral listening condition referring to either Bimodal or Combined Stimulation (defined below).
Best Unilateral Listening Condition	Best postoperative unilateral listening condition referring to either Electric-Only or Hybrid Stimulation (defined below). The contralateral ear should be plugged during testing.
Bimodal Condition	Electric-Only hearing via the cochlear implant in the implanted ear, in addition to acoustic hearing through a hearing aid in the contralateral ear. The implanted ear should be plugged during testing.  **HA** **CI**
Electric-Only Condition	Electric-Only hearing delivered via the cochlear implant alone. Both ears should be plugged during testing.

	 **CI**
Combined Condition	The use of bilateral acoustic hearing plus electric hearing via the hybrid implant in one ear only. **HA**  **CI + HA**
Hybrid Condition	Electric-Only hearing via the cochlear implant in the implanted ear, in addition to acoustic hearing through a hearing aid in the same ear. The contralateral ear should be plugged during testing.  **CI + HA**

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1.0 Introduction

The Food and Drug Administration recently approved the Cochlear Nucleus Hybrid L24 Implant System (P130016) for individuals aged 18 years and older who present with bilateral residual low frequency hearing sensitivity and moderately-severe to profound high frequency sensorineural hearing loss with limited benefit from appropriately fitted bilateral amplification. Additionally, the Nucleus Hybrid S12 Implant has been under evaluation since 2007 (IDE G#070016). The Nucleus Hybrid S-RW is a modification of the current Hybrid S12 implant. The Hybrid S-RW is designed to support implantation via a round window (RW) approach while maintaining the same relative insertion depth as the previous Hybrid S12 when implanted via cochleostomy. Based on the safety and efficacy outcomes collected to date on both the Nucleus Hybrid S12 and Hybrid L24 implant systems, the Sponsor believes the Cochlear Nucleus Hybrid S-RW implant should also be formally evaluated in adults with a similar candidacy criterion.

2.0 Study Objective

To evaluate the feasibility of implanting the Cochlear™ Nucleus® Hybrid S-RW in newly implanted adults with expanded indications for candidacy, using performance on an open set monosyllabic word recognition measure at the 12 month postactivation visit as primary efficacy endpoint.

2.1 General

The Implantation of the Cochlear™ Nucleus® Hybrid S Round Window (S-RW) in Adults study will be conducted as a single site, prospective, open label, single-arm clinical study, evaluating feasibility of implanting the Cochlear™ Nucleus® S-RW in newly implanted adults with expanded indications for candidacy. A single-subject repeated-measures analysis will be employed whereby subjects will act as their own control.

2.2 Study Design Considerations

A single-subject research design is appropriate since it accommodates the heterogeneity that characterizes hearing-impaired populations. Blinding procedures are not appropriate for this trial design, as it is not possible to conceal the presence, or absence, of a cochlear implant from device recipients and/or clinical Investigators.

To minimize order effects and test bias, word and sentence lists assigned to the various test conditions will be randomized across conditions, and the order in which test conditions are completed will be randomized.

2.3 Study Procedures

Subjects will be assessed for study purposes preoperatively as well as at intervals corresponding to the initial activation of the device, 3 months postactivation, 6 months postactivation, and 12 month postactivation. Preoperatively, candidates will be

assessed in the unaided and aided (i.e., with appropriately fit hearing aids) conditions to determine their candidacy for inclusion into the study. Once determined a candidate, a preoperative baseline evaluation will be conducted to establish baseline measures. Postoperatively, Best Unilateral (e.g., Hybrid or Electric Alone) and Best Bilateral (e.g., Combined or Bimodal) conditions will be tested to evaluate performance with the Hybrid implant. The test interval for the primary endpoint of the study for device safety and efficacy is the 12-month postactivation evaluation. Non-study follow-up evaluations may also take place at the discretion of the study site as part of routine care.

2.4 Study Length

It is expected that subject participation will involve a 15 to 18 month commitment, allowing for candidacy assessments, preoperative baseline evaluations, implantation of the device, and postoperative testing.

3.0 Device Description

The Cochlear Nucleus implant system proposed to be studied comprises:

- The Cochlear Nucleus Hybrid S-RW implant,
- The Cochlear Nucleus 6 (CP900 series) sound processor (or commercially available functional equivalent),
    - Optional acoustic component for any individual with aidable hearing postoperatively
    - Cochlear Nucleus CR210 Remote Control
    - Cochlear Nucleus CR230 Remote Assistant
- The Cochlear Nucleus Custom Sound CS4 programming software.

3.1 Implant Description

The Hybrid S-RW (Figure 1) utilizes the same receiver-stimulator mechanical package, materials and hardball electrode as used in both the current Hybrid S12 and commercial Freedom Cochlear Implants (including CI24RE(CA) and Hybrid L24). The internal Electronic Assembly (EA) of the Hybrid S-RW has been modified but with identical functionality to the both the current Hybrid S12 and Freedom Cochlear Implants. The Hybrid S-RW modification includes an increase in intracochlea electrode length by 2mm to support implantation via a round window (RW) approach while achieving the same relative insertion depth when implanting a Hybrid S12 via cochleostomy.

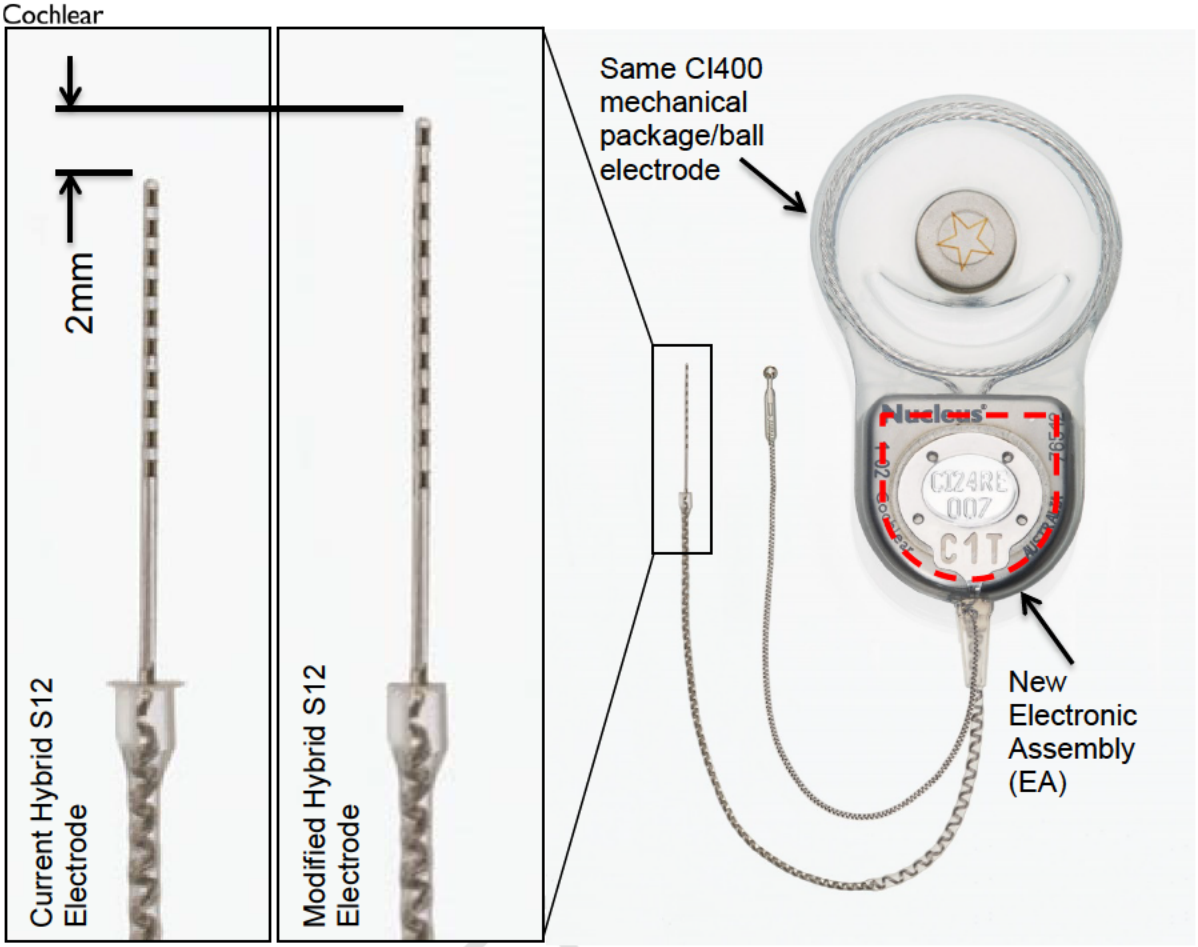

Figure 1: HYBRID S12 Cochlear Implant (right) with current Hybrid S12 electrode (far left) and modified Hybrid S12 Electrode (center)

Similar to the Hybrid S12 implant, the Cochlear Nucleus Hybrid S-RW incorporates a titanium-cased receiver-stimulator and a half banded, thin, straight lateral wall electrode array. The active array length (distance between E1 and E10) for the Hybrid S-RW has increased from 5.4mm to 7.2mm with the pitch between electrodes also increased from 0.6mm to 0.8mm (Figure 2). This change is a function of the increase in the electrode length from 10mm (Hybrid S12) to 12mm (Hybrid S-RW) and to position E1 in approximately the same location as the Hybrid S12 insertion via cochleostomy.

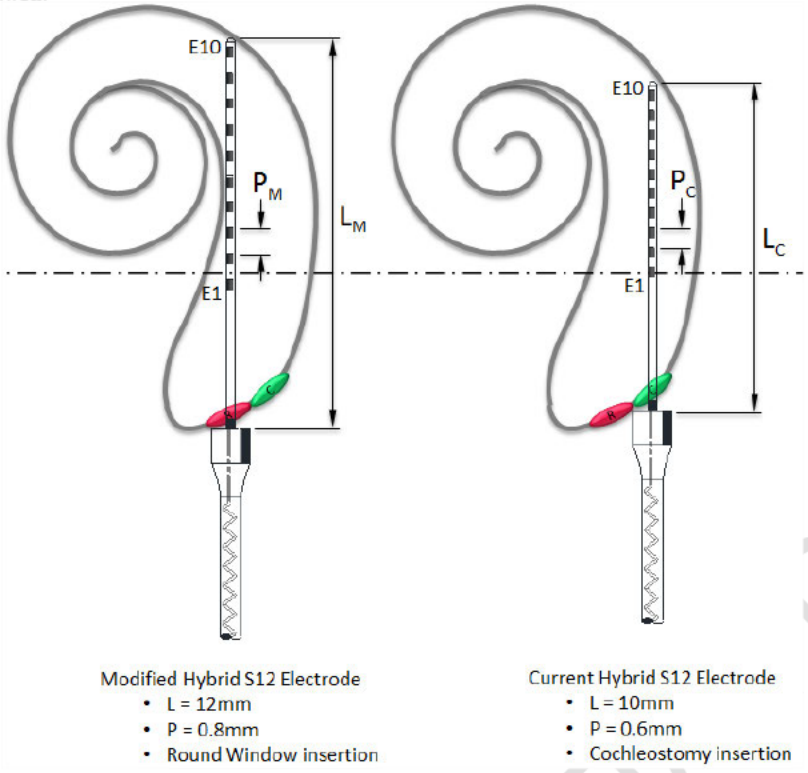

Figure 2. Schematic of the Hybrid S-RW (left) and the previous generation Hybrid S12 (right) device.

3.2 Sound Processor Description

The Cochlear Nucleus 6 (CP900 series) sound processor (submitted under 970051/C096) as shown in Figure 3, is a behind the ear sound processor with a modular design that incorporates a main signal processing module (the “sound processor”) with built-in directional microphones, a battery module (2-zinc air or rechargeable), radio frequency (RF) coil and coil cable.

Figure 3. Cochlear Nucleus 6 (CP900 series) Sound Processor

The Cochlear Nucleus 6 (CP900 series) sound processor can be programmed to provide electrical stimulation alone for patients with a total loss of acoustic hearing following implant surgery, or to provide both electrical and acoustic stimulation to cochlear implant recipients with postoperative audiometric thresholds between 125 and 2000 Hz measured within an aidable range (defined as air conduction thresholds up to 90dB HL). Due to the anticipated time needed to enroll and implant subjects it is possible that new sound processor technology may be introduced during the course of this clinical study. If new technology is released, is proven to be functionally equivalent to the Nucleus 6 Sound Processor, and demonstrates performance at least as good as that from the Nucleus 6 sound processor, subjects may be given the option to start with or upgrade to the new technology as part of this investigation.

3.2.1 Acoustic Component

For recipients with postoperative audiometric thresholds up to 90dB through 2000 Hz, acoustic amplification can be delivered via an acoustic component which connects to the sound processor via a cable molded into the earhook of the speech processor, thereby delivering acoustic amplification in a similar way to a conventional hearing aid (Figure 4). The acoustic component is made up of the EAC200 Series Earhook and the EAC200 Series Power Speaker Unit that is worn in the ear (or functional equivalent paired with sound processor model). The Power Speaker Unit may be fit with either instant-fit disposable domes or customized hard acoustic components.

Figure 4. Acoustic Component Option for the Nucleus 6 (CP900 series) Sound Processor

3.3 Remote Control Description

3.3.1 CR210 Remote Control

The CR210 Remote Control (PMA 970051/C096) as shown in Figure 5, is a compact wireless remote device with two-way telemetry that allows the user to make limited changes to the sound processor (e.g., volume, sensitivity, telecoil, and listening programs). This Remote Control is part of the Nucleus 6 Sound Processor external system.

Figure 5. CR210 Remote Control

3.3.2 CR230 Remote Assistant

The CR230 Remote Assistant (PMA 970051/C096) as shown in Figure 6, is a slightly larger wireless remote device that contains all of the functional capabilities of the CR210 Remote Control, as well as providing additional processor status information and troubleshooting assistance to the user similar to the commercially available CR110

Remote Assistant (PMA 970051/S049). This Remote Assistant is part of the Nucleus 6 Sound Processor external system. Access to a functional equivalent of either the CR230 or CR210 as described in Section 3.3.1 will be provided to subjects with new technology.

Figure 6. CR 230 Remote Assistant

3.4 Programming Software Description

Programming of the sound processor is achieved via Cochlear Nucleus Custom Sound 4 (CS4) software, which is a modification of the existing, approved, Custom Sound software CS3. Cochlear Nucleus Custom Sound 4 software permits the characterization of both electric and acoustic parameters required for Hybrid simulation as in Custom Sound 2.1 (G070191). The general approach for the electric programming is the same as for Nucleus Hybrid L24 cochlear implant recipients. The software provides the ability to specify the cut-off frequency at which acoustic stimulation ends (e.g., thresholds up to 90 dB HL) and when electric stimulation begins. In addition, the software provides a user interface for the clinician to program amplification characteristics (gain and maximum output, frequency by frequency) for the low-frequency range of hearing, from 125 to 2000 Hz.

4.0 Subject Population

Cochlear Americas expects to implant up to 10 subjects in this feasibility study at 1 investigational site. The duration of the study is expected to be 5-8 years, depending on subject recruitment. Other than meeting the inclusion criteria below, subjects will be recruited into the study sequentially to ensure a subject pool representative of the general adult population of those with hearing loss, with no pre-selection based on age (other than being an adult, 18 years-of-age or older), ethnicity or gender.

Prior to recruitment of any subjects into the study, written approval of the investigational plan including clinical protocol and informed consent form will be obtained from the FDA and reviewing Institutional Review Board (IRB).

To be included in the study, subjects must meet the criteria below.

4.1 Inclusion Criteria

1. Eighteen years of age or older at the time of implantation
2. Sensorineural hearing loss with the following requirements: a pure tone threshold less (better) than or equal to 60 dB HL at 500 Hz, less than (better) or equal to 80 dB HL at 1500 Hz, and high frequency severe to profound (a threshold average of 2000, 3000, & 4000 Hz) of > 60dB HL.
3. Minimum of 30 days experience with appropriately fit bilateral amplification, fit as described in the *Fitting and Use of Hearing Aids* section below
4. Aided monosyllabic word score (e.g., CNC Word Test) (mean of two lists) between 20% and 60%, inclusive (i.e., 20% ≤ score ≤ 60%), in the ear to be implanted
5. Aided monosyllabic word score (e.g., CNC Word Test) (mean of two lists) in the contralateral ear equal to, or better than, the ear to be implanted but not more than 80%
6. Willingness to use bimodal stimulation (i.e., a cochlear implant on one ear and a hearing aid on the contralateral ear) through 12-months postactivation
7. Ability to complete the required test materials.

4.2 Exclusion Criteria:

1. Individuals aged greater than 75 years
2. Duration of severe to profound hearing loss (above 2kHz) greater than 20 years
3. Medical or psychological conditions that contraindicate undergoing surgery as determined by the Investigator
4. Ossification or any other cochlear anomaly that might prevent complete insertion of the electrode array
5. Conductive overlay of 15 dB or greater at two or more frequencies, in the range 500 to 1000 Hz
6. Deafness due to lesions of the acoustic nerve or central auditory pathway
7. Active middle-ear infection or tympanic membrane perforation in the presence of active middle ear disease
8. Unrealistic expectations on the part of the subject, regarding the possible benefits, risks, and limitations that are inherent to the surgical procedure(s) and prosthetic devices as determined by the Investigator
9. Unwillingness or inability of the candidate to comply with all investigational requirements as determined by the Investigator

10. Additional handicaps that would prevent or restrict participation in the audiological evaluations as determined by the Investigator.

5.0 Investigational Procedures

5.1 Subject Identification

To maintain confidentiality, the subject's name will not be recorded on any study document other than the informed consent form. All individuals who provide informed consent (sign the informed consent form) are considered consented into the study and will be assigned a unique identifier. A unique alphanumeric code will identify the subject throughout the course of the study. For example, US01-SRW-0000, where:

- US = United States
- 01 = a sequential numeral corresponding the order in which a subject is enrolled into the study for a given study site, in this case this would correspond to the first subject recruited into the study for a particular site,
- SRW = an abbreviation for the study,
- 0000 = a unique, numeric study site identification.

5.2 Release of Medical Information

The subject must sign a release that authorizes access of medical records, to the study Sponsor, Investigators, monitors, and the Food and Drug Administration (FDA), prior to proceeding with any screening evaluations.

5.3 Description of Test Measures

5.3.1 Audiometric Thresholds

Unaided audiometric thresholds will be obtained for each ear, with insert earphones, using the standard audiometric technique for pure-tone air-conduction testing (refer to Appendix A for required specifications and calibration requirements). Aided audiometric thresholds will be obtained for each ear in the sound field using narrow band noise and the standard audiometric technique with the speakers positioned at 0° azimuth relative to the subject's head.

Note: As these subjects may have measureable low-frequency hearing, it is important that appropriate consideration be made for masking (procedure outlined in Appendix B) or plugging the contralateral ear during unilateral testing in the sound field. Testing, for both ears, will include the following:

- Air conduction thresholds: 125, 250, 500, 750, 1000, 1500, 2000, 3000, 4000, 6000, 8000 Hz;

- Bone conduction thresholds:125[1], 250, 500, 750, 1000, 1500, 2000, 4000 Hz;

Note: Clinician will need to confirm the subject's response to any pure tone stimulus presented at 125 and 250 Hz as auditory "heard" versus vibrotactile "felt" and record the response accordingly.

- Aided thresholds at 125, 250, 500, 750, 1000, 1500, 2000, 3000, 4000[2] Hz;
- Tympanometry in each ear

5.3.2 Consonant-Nucleus-Consonant (CNC) Word Recognition Test

The CNC Word Test (Peterson & Lehiste, 1962) is a validated test used clinically and in research to assess the performance of adults with hearing aids or cochlear implants on open-set word recognition. The test consists of 10 recorded lists of 50 monosyllabic words in CD format, tested in quiet. Two lists will be administered in at 60 dBA in the sound field and scored as total number of words correct, which will be expressed as a percentage correct for this study.

The AzBio Test (Spahr et al, 2012) is a validated test used clinically and in research to assess the open-set sentence recognition in speech-spectrum noise of adults with hearing aids or cochlear implants. It consists of 15 lists of 20 sentences each. AzBio sentences are spoken by different talkers in a conversational style with limited contextual cues that the listener can use to predict or 'fill in' unintelligible words. The sentences will be presented at a fixed level background noise and fixed signal-to-noise ratio. Each list includes 5 sentences from 4 different male and female speakers. Each word in the sentence counts towards the overall score. Subjects will be tested in noise at +5 dB SNR with speech at 0º and noise at 0º azimuth (S_0N_0) using multi-talker babble.

5.3.3 Abbreviated Profile of Hearing Aid Benefit (APHAB) – Form A

The Abbreviated Profile of Hearing Aid Benefit (APHAB) (Cox & Alexander, 1995) is a 24-item self-assessment scored in four subscales (6 items per subscale). Three subscales, Ease of Communication, Reverberation, and Background Noise address speech understanding in everyday life. The fourth subscale, Aversiveness to Sounds measures negative reactions to environmental sounds.

5.3.4 Speech,Spatial, and Qualities of Hearing Scale 12 (SSQ 12)

The SSQ (Gatehouse & Noble, 2004) scale, full version, is comprised of 49 questions designed to measure self-reported auditory disability in various listening situations. Questions cover many aspects of speech perception, spatial hearing, and more general qualities of hearing, such as listening effort. Recently, Noble et al., (2013) published an abbreviated version, the SSQ12. The SSQ12 was derived from experiences in use of

[1] Bone conduction measures at 125 Hz are optional based on potential audiometric equipment limitations.

[2] Many audiometers are not calibrated for testing at 6000 and 8000 Hz.

the full version. The data reported demonstrate that the SSQ12 closely concurs in its average performance with the full version SSQ, while exhibiting a greater sensitivity to differences in hearing status.

5.4 Preoperative Procedures (within-90 days prior to surgery)

The preoperative assessment will be composed of two evaluations. The Informed Consent form must be signed prior to any study related evaluation taking place. Preoperative Candidacy Evaluation will be completed to determine if the candidate meets the inclusion and exclusion criteria to qualify for enrollment in the study. The Preoperative Baseline Evaluation will be completed to establish baseline measures after candidacy has been determined. Information gathered during these preoperative procedures will be reported on the appropriate case report forms (CRFs[3]). There will be no predetermined time period required between candidacy and baseline measures. However, candidacy must be re-assessed if more than 90 days have elapsed prior to the surgery date[4].

5.4.1 Preoperative Candidacy Evaluation

5.4.1.1 *Informed Consent*

A preoperative interview (as part of the informed consent process) will be conducted by the surgeon and/or audiologist to inform the candidate about all aspects of implantation with a cochlear implant, study expectations, surgical procedure, as well as the evaluation schedule. The risks of surgery shall be explained to the subject as outlined in the Informed Consent Form. These include the risks associated with general anesthesia, as well as other risks such as loss of residual hearing, facial paralysis, dizziness, meningitis, postoperative discomfort, and flap complications. The potential limitations and advantages of cochlear implantation shall also be explained.

After reviewing the Informed Consent Form, the candidate will be given the opportunity to review and ask questions about the Informed Consent Form and/or the study prior to signing the Informed Consent Form. The candidate will be offered the opportunity to take the form home to discuss with family members should they choose to do so. If

[3] May be a hardcopy or electronic CRF (eCRF), depending on EDC accessibility at the study site.

[4] If it is more than 90 days past the date of the Candidacy Evaluation, candidacy needs to be re-confirmed by repeating aided CNC word recognition test measures. If a patient experiences a 10% or greater decrement in their word recognition scores, audiometric thresholds must be re-assessed to confirm continued candidacy and the Preoperative Baseline Evaluation must be repeated. Scores from the most recent test session will be used for analysis. If a patient experiences less than 10% decrement in CNC word recognition, the evaluation does not need to be repeated and scores from the initial candidacy/ baseline assessment can be utilized. Any changes observed will need to be reviewed in consultation with the Sponsor prior to surgery occurring.

they sign the Informed Consent Form, the candidate will then be given a copy of the signed Informed Consent Form to take home.

A candidate is not considered enrolled until a properly executed Informed Consent Form has been obtained and, along with the results of the preoperative candidacy evaluation, reviewed and approved by Cochlear representative.

5.4.1.2 *Fitting and Use of Hearing Aids*

Preoperatively, subjects will undergo candidacy testing using their own hearing aid devices. If a candidate does not own hearing aids, testing using loaner hearing aid devices may be provided by the candidate's hearing health provider.

Note: The speech perception criterion for enrollment into the study must be met with appropriately fit hearing aids, (both for the ear to be implanted as well as the non-implant ear), even if amplification proves to provide no measurable benefit over natural acoustic hearing for the particular subject.

To ensure standardization of hearing aid fitting, it is required that hearing aid settings for target and gain are set and verified. Real-ear measures are to be utilized to verify that the slope of the frequency response is within 5 dB per octave of the target slope.

During the fitting process, optimization of the response slope will be the priority for those frequencies where thresholds correspond to aidable hearing. Taking a conservative approach, aidable hearing will be defined by hearing thresholds up to 90 dB HL for this study.

It is recognized that prescriptive methods are based on average requirements, and that individuals may find deviations from target values optimal for sound loudness, quality, or clarity. For example, individual adjustments required to relieve occlusion effects will be permitted.

If the subject does not use hearing aids on a daily basis, does not own hearing aids, or uses hearing aids that are identified as inappropriately fit or poor functioning, the subject will undergo a hearing aid trial and/or readjustment period. The hearing aid trial period will be for a minimum of 30 days or longer as recommended by their study audiologist. At the end of the trial period, aided word recognition testing will be assessed to confirm that candidacy criteria are met.

Subjects will need to be willing to use bimodal stimulation (i.e. a cochlear implant on one ear and a hearing aid on the contralateral ear) through at least 12-months postactivation.

5.4.1.3 *Candidacy Assessment*

- Air conduction thresholds at 125, 250, 500, 750, 1000, 1500, 2000, 3000, 4000, 6000, 8000 Hz;
    - Unilateral each ear

- Bone conduction thresholds at 125[5], 250, 500, 750, 1000, 1500, 2000, 4000 Hz;
  - Unilateral each ear

Note: Clinician will need to confirm the subject's response to any pure tone stimulus presented at 125 and 250 Hz as auditory "heard" versus vibrotactile "felt" and record the response accordingly.

- Aided thresholds at 125, 250, 500, 750, 1000, 1500, 2000, 3000, 4000[6] Hz;
  - Unilateral each ear with contralateral ear plugged
- Tympanometry in each ear
- CNC Word Test – Two lists at 60 dB(A) in each of the following conditions:
  - Unilateral aided each ear with contralateral ear plugged

5.4.1.4 *Hearing History and Counseling*

Information regarding subject hearing-history (e.g., etiology, onset of hearing loss, duration of severe-to-profound hearing loss, amplification use) will be obtained and reported on the respective case-report form. In addition, patients will be carefully and extensively counseled to ensure that their expectations from cochlear implantation are reasonable and appropriate (as determined by the Investigator).

5.4.1.5 *Candidacy Determination*

Once the candidacy evaluation is completed the Investigator is required to submit the candidacy CRFs for review by the Sponsor's study manager, or designee. The data will be reviewed and candidacy assessed by the study manager.

5.4.2 Preoperative Baseline Evaluation

Once candidacy has been established, the following additional testing will be administered to each subject:

5.4.2.1 *Speech Perception Testing*

- CNC Word Test – Two lists at 60 dB(A)
  - Bilateral Aided
- S_0N_0 AzBio Sentences in Noise – One list at 60dB(A) with a +5 dB SNR in each of the following conditions
  - Unilateral Aided, ear to be implanted with contralateral ear plugged
  - Bilateral Aided

[5] Bone conduction measures at 125 Hz are optional based on potential audiometric equipment limitations.

[6] Many audiometers are not calibrated for testing at 6000 and 8000 Hz.

5.4.2.2 *Questionnaire/Assessment*

- Abbreviated Profile of Hearing Aid Benefit (APHAB)
- Speech Spatial and Qualities of Hearing Scale 12 (SSQ12)

Note: The Surgical Procedure must be completed within 3 months of the Candidacy Evaluation. If the interval exceeds 3 months, candidacy needs to be re-confirmed by repeating aided CNC word recognition test measures in quiet for each ear. If a patient experiences a 10% or greater decrement in their word recognition scores, audiometric thresholds must be re-assessed to confirm continued candidacy and the Preoperative Baseline Evaluation must be repeated. Scores from the most recent test session will be used for analysis. If a patient experiences less than 10% decrement in CNC word recognition, the evaluation does not need to be repeated and scores from the initial candidacy/ baseline assessment can be utilized. Any changes observed will need to be reviewed in consultation with the Sponsor prior to surgery occurring.

5.5 Surgical Procedure

The surgical procedure for implantation of the Hybrid S-RW implant will be according to currently approved labeling as outlined in the surgical manual (P130016), specifically the procedure for a round window and/or extended round window insertion found on page 17 of the Nucleus® Hybrid™ L24 cochlear implant CI24REH Surgeon's Guide.

The postoperative hospital stay will be determined by the subject's recovery with surgeon recommendation.

The surgeon is required to complete following each surgery:

- A surgical questionnaire

5.6 Postoperative Procedures

5.6.1 Audiometric Testing

- Tympanometry, each ear
- Pure tone air-conduction hearing thresholds with insert earphones: 125, 250, 500, 750, 1000, 1500, 2000, 3000, 4000, 6000, 8000 Hz
  - Unilateral, each ear
- Bone conduction thresholds: 125[7], 250, 500, 750, 1000, 1500, 2000, 4000 Hz
  - Unilateral, each ear

[7] Bone conduction measures at 125 Hz are optional based on potential audiometric equipment limitations.

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Note: Clinician will need to confirm the subject's response to any pure tone stimulus presented at 125 and 250 Hz as auditory "heard" versus vibrotactile "felt" and record the response accordingly.

5.6.2 Initial Activation

5.6.2.1 *Sound Processor Fitting*

Initial activation will occur 4 weeks post-surgery, plus or minus 1 week. Threshold (T) and comfort (C) values will be determined for the electrical stimulation for each channel. Impedance telemetry results using common ground (CG) and monopolar (MP1, MP2 and MP1+2) stimulation modes will also be recorded. This information will be used to program the sound processor and also to monitor the device for possible degradation of function and/or damage to neural elements.

For subjects with preserved hearing, the basic programming approach will be to assign frequency channels to the electrode array that supplement the acoustic sensitivity. In other words, the frequency assignment of the electrical stimulation will begin at the frequency where acoustic hearing is no longer useful. For this purpose, hearing thresholds up to 90 dB HL will be considered not useful from an amplification perspective and not aidable acoustically.

An anonymous export of the test map will be sent to the Sponsor.

5.6.2.2 *Acoustic Component Fitting*

All patients will be fit with the Cochlear™ Nucleus® 6 Sound Processor (CP900 series). In the event that a subject retains aidable hearing, they will also be fitted with the acoustic component. The acoustic component will be appropriately fit using the same fitting algorithm as used preoperatively for hearing aid verification to assess the degree to which real-ear targets are met for each subject. Fitting methodology with the acoustic component is no different than that of conventional acoustic hearing aids.

Note: For any subject with aidable hearing post-surgery, the acoustic component should be fit. For postoperative testing, the best unilateral condition for the implanted ear will be the Hybrid Mode and the best bilateral condition will be the Combined Mode.

Note: For any subject with un-aidable hearing post-surgery, the best unilateral condition for the implanted ear will be CI alone Mode and the best bilateral condition will be the Bimodal Mode.

5.6.2.3 *Aided Audiometric Testing*

- Aided soundfield hearing thresholds: 125, 250, 500, 750, 1000, 1500, 2000, 3000, 4000 Hz

In effort to monitor hearing preservation following the introduction of electrical stimulation, it is recommended that audiometric status be assessed on a weekly basis for 4 weeks

following initial activation. If a change in audiometric status is observed, please see Appendix E for associated steroid considerations.

5.6.3 3, 6 & 12 Month Post Activation Evaluations

5.6.3.1 *Audiometric Testing*

- Tympanometry, each ear
- Pure tone air-conduction hearing thresholds with insert earphones: 125, 250, 500, 750, 1000, 1500, 2000, 3000, 4000, 6000, 8000 Hz
  - Unilateral, each ear
- Bone conduction thresholds: 125[8], 250, 500, 750, 1000, 1500, 2000, 4000 Hz
  - Unilateral, each ear

If sound processor settings are adjusted, an anonymous export of the test map will be sent to the Sponsor.

5.6.3.2 *Aided Audiometric Testing*

- Aided soundfield hearing thresholds: 125, 250, 500, 750, 1000, 1500, 2000, 3000, 4000 Hz
  - Best unilateral condition, implanted ear with contralateral ear plugged

5.6.3.3 *Speech Perception Testing*

- S_0N_0 AzBio Sentences in Noise – One list at 60 dB(A) with a +5 dB SNR

Ipsilateral Listening Conditions:
- Electric alone (both ears plugged)
- If applicable, Acoustic Alone (contralateral ear plugged)
- If applicable, Hybrid (contralateral ear plugged)

Bilateral Listening Conditions:
- Bimodal (ipsilateral ear plugged)
- If applicable, Combined

- CNC Word Test (Quiet) – Two lists at 60 dB(A)

Ipsilateral Listening Conditions:
- Electric alone (both ears plugged)
- If applicable, Acoustic Alone (contralateral ear plugged)
- If applicable, Hybrid (contralateral ear plugged)

Bilateral Listening Conditions:

[8] Bone conduction measures at 125 Hz are optional based on potential audiometric equipment limitations.

- Bimodal (ipsilateral ear plugged)
- If applicable, Combined

Note: If the subject lost acoustic hearing in the implanted ear and does not utilize the acoustic component, the best unilateral condition is the same as electric alone and therefore does not need to be evaluated.

5.6.3.4 *Questionnaires/Assessments*

- Abbreviated Profile of Hearing Aid Benefit (APHAB)
- Speech Spatial and Quality (SSQ)12

5.7 Summary of Data Collection Visits

Test	Condition	Preoperative			Postoperative			
		Candidacy	Baseline	Surgery	Activation	3 Month	6 Month	12 Month
Informed Consent		X						
Air Conduction Audiogram	Unilateral Each Ear	X			X	X	X	X
Bone Conduction Audiogram	Unilateral Each Ear	X			X	X	X	X
Aided Audiogram	Hearing Aid Unilateral Each Ear	X						
	Best Unilateral Implanted Ear				X	If >10dB ▲ unaided	If >10dB ▲ unaided	If >10dB ▲ unaided
Tympanometry	Unilateral Each Ear	X			X	X	X	X
CNC words	Hearing Aid Unilateral Each Ear	X						
	Hearing Aids Bilateral		X					
	Best Unilateral Implanted Ear					X	X	X
	Best Bilateral					X	X	X
	Electric Alone					X	X	X
AzBio Sentences In Noise	Hearing Aid Ear to be Implanted		X					
	Hearing Aids Bilateral		X					
	Best Unilateral					X	X	X

	Implanted Ear							
	Best Bilateral					**X**	**X**	**X**
	Electric Alone					**X**	**X**	**X**
Surgical Questionnaire				**X**				
APHAB			**X**			**X**	**X**	**X**
SSQ 12			**X**			**X**	**X**	**X**

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6.0 Adverse Events

An Adverse Event (aka Adverse Effect or AE) is the development of an untoward medical occurrence or the deterioration of a pre-existing medical condition following or during exposure to an investigational product, whether or not considered causally related to the product or the surgical procedure to implant it. An untoward medical condition can be symptoms (e.g., nausea), signs (e.g., tachycardia, fever) or clinically significant abnormal results of an investigation (e.g., laboratory findings, chest x-ray).

Adverse events that occur during this study may be associated with the implant procedure, including adverse effects from general anesthesia, or specifically associated with the use of the device. An adverse event will be considered to be device-related when, in the judgment of the Primary Investigator, there is a logical connection between the use of the device and the occurrence of the event, above and beyond the study procedure itself.

A **Serious Adverse Event (SAE)** is any untoward medical occurrence which:

- Results in death;
- Is life-threatening;
- Requires in-patient hospitalization for > 24 hours or prolongation of hospitalization which is not specifically required by the protocol;
- Results in permanent impairment of a body function or permanent damage to a body structure; or
- Requires medical or surgical intervention to preclude permanent impairment of a body function or permanent damage to a body structure.

An **unanticipated adverse device effect** (UADE) is "any serious adverse effect on health or safety or any life-threatening problem or death caused by, or associated with, a device, if that effect, problem, or death was not previously identified in nature, severity, or degree of incidence in the investigational plan or application (including a supplementary plan or application), or any other unanticipated serious problem associated with a device that relates to the rights, safety, or welfare of subjects" [FDA 21 CFR 812.3(s)]. The Sponsor will promptly conduct an investigation upon notification by an Investigator of a UADE and will notify the FDA and all reviewing IRBs and participating Investigators within 10 working days after the sponsor first receives notice of the effect. Thereafter, the Sponsor will submit such additional reports concerning the effect as FDA requests.

For the purposes of this study, only unanticipated adverse device effects will be reported to FDA promptly following occurrence. Annual progress reports will contain information regarding SAE/AE occurrences.

6.1 Assessment and Reporting of Adverse Events

6.1.1 Investigator's Responsibilities

Throughout the course of the study, all efforts will be made by the Investigators to remain alert to possible AEs. The first concern will be the safety and welfare of the subject and for providing appropriate medical intervention, as indicated. Detailed information regarding adverse events (AEs) will be recorded by the Investigator at the time an adverse event occurs using an *Adverse Event Questionnaire*, provided as part of the CRFs for the study. All adverse events will be recorded from the day of enrollment (Day 0) to termination of study, approval of the PMA, or when the subject exits the study, whichever is the last, even if the event was acknowledged as a risk factor in the *Informed Consent Form*.

AEs will be recorded on an *Adverse Event Questionnaire* and will include the following information:

- Date of onset
- Date reported to the clinic
- Description of the AE
- Seriousness
- Investigator's assessment of the relationship of the AE to the device and/or procedure
- Treatment
- Outcome

6.1.1.1 *Unanticipated Adverse Device Effects*

Unanticipated adverse device effects (UADEs) must be reported directly to the clinical center's reviewing IRB and the Sponsor, Cochlear Americas, within 10 working days of knowledge of the event, or as dictated by the specific IRB policy, whichever is sooner. Information regarding the UADE will be recorded on the *Unanticipated Adverse Device Effect Report,* provided with the CRFs for the study.

6.1.1.2 *Adverse Event Follow-up*

All AEs must be followed until resolution, or the condition stabilizes. The Investigator is responsible to ensure that follow-up includes any supplemental investigations as may be indicated to elucidate as completely as possible the nature and/or causality of the AE. This may include additional laboratory tests or investigations, or consultation with other health care professionals. Cochlear or its designee may request that the Investigator perform or arrange for the conduct of supplemental measurements and/or evaluations. AE follow up information will be recorded using a *Follow Up to a Previously Reported Adverse Event Questionnaire,* provided with the CRFs for the study.

6.1.2 Sponsor's Responsibilities

All AEs will be reported annually to FDA in accordance with the IDE regulation [FDA 21 CFR Part 812.150(b)(5)]. All unanticipated adverse device effects (UADEs) will be reported

to FDA within 10 calendar days of the event in accordance with FDA 21 CFR Part 812.46(b) and 812.150(b)(1).

Cochlear Americas or its designee will notify all participating Investigators of any new information that alters the current risk-benefit assessment of the study device or that would be sufficient to consider changes in management of the Nucleus cochlear implant or in the overall conduct of the trial.

6.2 Protocol Deviations

A protocol deviation refers to a study-related activity that is not in compliance with the investigational protocol. Deviations that are required to protect the life or well-being of a subject do not require prior approval from the Sponsor and should be implemented immediately. The IRB and Sponsor must be notified within 5 (five) days of the event.

If a subject is unable to return for follow-up before the closure of a study visit window (+/- 30 days for postactivation study visits), or if protocol defined assessments or parts thereof are omitted or completed incorrectly, the event is to be noted on the Protocol Deviation Log provided to the Investigator in the study Regulatory Binder. Depending on the type or severity of the deviation the Investigator may be required to notify the IRB and/or Sponsor if the deviation impacts safety or performance of the subject or data integrity.

7.0 Study Completion

7.1 Completed Subjects

Each subject in the study will be considered completed when all assessments through 12 months postactivation have been performed in accordance with the study protocol. To be considered a primary endpoint success, subjects must retain their originally implanted device.

7.2 Evaluation PRIOR to Re-implantation with a Long Electrode

Some individuals may to have the Nucleus Hybrid S-RW cochlear implant removed and replaced with a standard, long electrode array cochlear implant. This has typically been in cases where individuals have experienced a profound or complete loss of residual hearing (6 of the 50 subjects implanted as of November 8, 2013 as documented in the Nucleus Hybrid L24 pivotal trial (P130016).

In order to ensure that accurate information is gathered for any subject electing to undergo explantation and re-implantation with a long array, additional data will be collected prior to re-implantation. This evaluation will include the following information and will follow the procedures described in the annual evaluation schedule:

- Audiometric testing
- Speech perception testing
- Psychophysical and electrical impedance measurements
- Otologic/medical questionnaire

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7.3 Evaluation FOLLOWING Re-implantation with a Long Electrode

Subjects who elect to be implanted with a standard cochlear implant in the test ear in place of the Nucleus Hybrid S-RW cochlear implant will be required to complete the study protocol as outline above. That is, they will be asked to follow the same postoperative schedule and procedures up to their 12 Month post-activation interval.

7.4 Discontinued Subjects

Any subject may voluntarily discontinue the study at any time without prejudice. The Investigator may discontinue a subject from the study at any time if (s)he considers that remaining in the study compromises the subject's health or the subject is not sufficiently cooperative. In either event, reason(s) for discontinuation should be recorded on a study withdrawal form, provided as part of the CRFs for the study.

Possible reasons for study discontinuation include the following:

- AE necessitating discontinuation from the study.
- The subject is lost to follow-up.
- Voluntary decision to withdraw consent made by the subject[9].
- Investigator decision[10].
- Other reason.

In case of a subject lost-to-follow-up, the Investigator must attempt to contact the subject (or relative/family contact) by phone, email or letter at least three times. If attempts are unsuccessful, the 'subject withdrawal' form is to be completed in the study file and reported, as appropriate, in required reports to the Sponsor, IRB and FDA.

7.5 Premature Study Termination

The Sponsor reserves the right to discontinue the study for any safety, ethical or administrative reason at any time. Subjects already implanted with the device being

[9] Withdrawal of consent is defined as the subject's voluntary decision to revoke consent to continue participation in the study.

[10] Subject withdrawal from the study is defined as an Investigator decision. The Investigator may elect to withdraw a subject from the study at any time if he/she considers that remaining in the study compromises the patient's health or if the Investigator considers the subject lost to follow-up.

studied will continue to be supported, independent of any decision made about study continuation.

8.0 Data Analyses

8.1 Sample Size

Since this protocol describes a feasibility study in a limited number of subjects, sample size estimates were not made. Individual outcomes will be compared, along with group effects, across pre- and postoperative test conditions for both audiometric and speech perception outcomes.

8.2 Safety Measurements

No formal statistical hypothesis will be tested. The number and percent of patients with adverse events will be reported and tabulated; as well as compared to the commercially available Hybrid L24 system. Adverse events will be summarized by event type, severity, seriousness, as well as relatedness to the device and implant procedure. Since the proposed study involves a limited number of subjects, group analyses are not planned.

8.3 Efficacy Measurements

As appropriate under a feasibility study protocol, the goal is to establish preliminary effectiveness data to facilitate the development of a pivotal study. As such, no formal statistical hypotheses will be tested. At a minimum, individual data will be tabulated and summarized for all measures to establish the proportions of those subjects showing improvement, no change, and decrement in performance.

8.3.1 The efficacy objectives include:

1. To understand if measurable low frequency thresholds can be maintained with implantation through the round window using the Hybrid S-RW

2. To understand if implantation through the round window with the Hybrid S-RW results in improved postoperative speech perception outcomes in both quiet and noise for patients with measurable postoperative low frequency thresholds

3. To understand if implantation through the round window with the Hybrid S-RW results in improved postoperative speech perception outcomes in both quiet and noise for patients without measurable postoperative low frequency thresholds

9.0 Missing Data

All efforts will be put forth to ensure near complete follow-up, with particular focus on the assessment of the primary outcome and occurrence of adverse events. Regular

reminders of subject follow-up due dates will be provided to participating centers to facilitate scheduling of follow-up visits.

In the event a subject is withdrawn prior to the 12month assessment, the primary analysis of the primary efficacy endpoint will involve imputing the pre-operative CNC word test score for the 12 month CNC word test. This is equivalent to treating each subject with a missing 12 month result as unchanged from baseline.

10.0 Risk Benefit Statement

It is expected that the risks associated with the procedure to place the cochlear implant are no greater than those associated with cochlear implantation in general. Cochlear implantation is an accepted treatment option for adults with bilateral moderate (for low frequencies) to profound sensorineural hearing loss.

The inclusion criterion for this study is similar to the commercially approved Nucleus Hybrid L24 implant system. Since the study intends to evaluate a very similar subject population, it is anticipated that the risks and benefits associated with the device will be similar to that of the Nucleus Hybrid L24 pivotal clinical trial (P130016P).

The loss of residual hearing is a risk of receiving the Cochlear Nucleus Hybrid S-RW implant. In the Nucleus Hybrid L24 pivotal trial (P130016), most individuals at six months post-implant (90%) retained a level of acoustic hearing and many (66%) utilized that hearing with or without amplification at the implant ear. For some individuals (34% in this study), a profound loss of functional acoustic hearing in the implanted ear occurred. It is very important for Investigators and subjects alike to understand that this hearing loss is permanent. Audiometric data will be summarized in sufficient detail over the study period to assess any changes in hearing sensitivity. The impact of any such changes will be assessed in light of overall speech perception outcomes. These risks are described in more detail within the patient Informed Consent Form.

11.0 Good Clinical Practices Statement

This trial will be conducted in compliance with all applicable U.S. Federal Regulations pertaining to investigational devices including but not limited to: 21 CFR, Parts 11, 50, 54, 56, and 812 and Good Clinical Practice (GCP) standards. This trial will be conducted in compliance with the protocol as approved by the FDA and each Investigative Site's Institutional Review Board (IRB). Any deviations from the protocol will be reported to the Sponsor and in accordance with the IRB's institutional guidelines.

12.0 Access to Study Documents and Study Monitoring

The Sponsor will designate appropriately trained monitors to review the progress of this study and assure the quality and integrity of data accumulated. Clinical monitors, as representatives of the Sponsor, have the obligation to provide site qualification and

initiation visits as well as regular site visits. The study monitors will be employees of the Sponsor, Cochlear Americas, or any contracted vendors qualified by experience and training to conduct study site monitoring for this investigation.

Study monitors, employed by Cochlear Americas, for this study will be:

[redacted]
Cochlear Americas
13059 E. Peakview Ave.
Centennial, CO 80111

[redacted] AuD, CCRP
Cochlear Americas
13059 E. Peakview Ave.
Centennial, CO 80111

[redacted]
Cochlear Americas
13059 E. Peakview Ave.
Centennial, CO 80111

[redacted]
Cochlear Americas
13059 E. Peakview Ave.
Centennial, CO 80111

[redacted]
Cochlear Americas
13059 E Peakview Ave
Centennial, CO 80111

[redacted]
Cochlear Americas
13059 E. Peakview Ave
Centennial, CO 80111

All data generated during this study and the source documents from which they originated are open to inspection by the Sponsor or its representative, the FDA, and other regulatory agencies.

Upon completion of the study, the clinical monitor will conduct a final visit, or close-out of the site. The objectives of this visit are to ascertain that all subjects are accounted for, that the regulatory records and reports are complete, verify that study device and other supplies have been accounted for and ensure that the Investigator is aware of his/her responsibilities post-study.

13.0 Quality Control and Assurance

Sponsor employees and/or their contracted representatives utilize Standard Operating Procedures (SOP) designed to ensure that clinical study procedures and documentation are consistently conducted/prepared to the highest quality standards. Safety data adjudication will be conducted by the Sponsor's Chief Medical Officer, in accordance with these SOPs. These SOPs require compliance with federal regulations and Good Clinical Practice guidance.

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14.0 Institutional Review Board

Prior to the initiation of the study, the Protocol, the Informed Consent Form, and other supporting documentation must be submitted to the Institutional Review Board (IRB) for approval after FDA conditional or final approval. A copy of the IRB approval letter for the Protocol, the Informed Consent, and the Investigator Agreement must be submitted to the Sponsor prior to the consent of the first subject. The study site must maintain an accurate and complete record of all reports, documents, and other submissions made to the IRB concerning this protocol.

A list of the IRB members, their titles or occupations, and their institutional affiliation, or an IRB assurance number and their contact information must be provided to the Sponsor or its designee prior to release of study supplies. Additionally, the Chair of the IRB must be identified.

FDA/relevant health authority regulations require that all advertisements for subject recruitment be approved by an IRB prior to implementation. The complete text and format must be submitted to the Sponsor or its designee for approval prior to IRB submission.

15.0 Informed Consent Process

It is the responsibility of the Investigator to inform each subject prior to the initial study evaluation, of the purpose of this clinical trial, including possible risks and benefits, and document the informed consent process in the subject's chart.

A sample informed consent form containing the required elements of informed consent is provided by the Sponsor to each IRB once FDA approved. Any changes made to this sample by the IRB must be approved by the Sponsor, or its designee, prior to final submission to the IRB. After approval by the Sponsor, the final informed consent must be approved by the IRB. Prior to entry into the study or initiation of any study-related procedures, each subject must read, sign, and date the informed consent form. The person executing the consent must also sign and date the consent form. One original informed consent form is to be retained by the study site and a copy is to be given to the subject.

16.0 Confidentiality

In accordance with Good Clinical Practices (GCPs) and with the Health Insurance Portability and Accountability Act of 1996 ("HIPAA") all information concerning the subjects in the study must be treated as strictly confidential by all persons involved in the study.

The Investigator acknowledges that any and all information acquired from the Sponsor or its designee or developed or acquired in connection with the study are strictly confidential. The Investigator will not disclose any confidential information to any third party nor use confidential information for any purpose without first obtaining the consent of Sponsor in writing. Such consent shall be deemed to have been given for disclosure to any person for whom the Investigator is responsible at his/her center, but only so far as required for the

purposes of the study, and, in the case of disclosures to staff, only if such staff are bound by obligations of confidentiality no less strict than those set out herein.

17.0 Protocol Amendments

The Sponsor will document modifications to the protocol in the form of a written amendment. Amended protocols must be acknowledged by Investigator signature and date upon receipt. Protocol modifications that impact subject safety or the validity of the study must be approved by the FDA and IRB before implementation. In the case of a medical emergency, to remove immediate apparent hazard to subjects, a change may be made preferably after discussion with the Sponsor or its designee. In these instances, the IRB and FDA will be notified as soon as possible.

18.0 Data Management

All study data will be entered into an Electronic Database Capture (EDC) system. Study personnel requiring access will have their own Login/Password. Access to clinical study information will be based on an individual's role and responsibilities. The application provides hierarchical user permission for data entry, viewing, and reporting options. For optimum security, all communications between the users and the EDC operate on a secured socket layer (SSL) using 256-bit encryption. The web servers are protected by a managed firewall from potential web and network attacks and the network is guarded by an intrusion detection and protection surveillance system against malicious threats.

This application is designed to be in full compliance with International Conference on Harmonization and Good Clinical Practices (ICH-GCP), FDA CFR 21 Part 11 Electronic Record and Electronic Signatures, the FDA's "Guidance: Computerized Systems Used in Clinical Trials (May 2007), and the Privacy Rule of the Health Insurance Portability and Accountability Act of 1996 (HIPAA)."

As part of the data entry and validation process, the data stored in the EDC is checked against the source data, and also against edit check queries to confirm that the data received is within expected ranges. If any data is missing or is outside of expected limits, a query is created and sent to the site coordinator so that data may be verified and corrected. All changes made to a form are stored in an audit trail.

19.0 Record Keeping and Retention

Data generated for the study should be stored in a limited-access file area and be accessible only to representatives of the study site, the Sponsor and its representatives, and FDA/relevant health authorities/regulatory agencies. All reports and communications relating to study subjects will identify subjects only by subject unique identification code. Complete subject identification will be kept by the Investigator. This information will be treated with strict adherence to professional standards of confidentiality.

An Investigator must in reasonable time, upon request from any properly authorized officer or employee of FDA/relevant health authority or regulatory agency, permit such officer or

employee to have access to requested records and reports, and copy and verify any records or reports made by the Investigator. Upon notification of a visit by the FDA, the Investigator will contact the Sponsor or its designee immediately. The Investigator will also grant Sponsor representatives the same privileges offered to FDA/relevant health authority or regulatory agents/officers/employees.

The Investigator must provide the Sponsor or its designee with the following documents at the time of site qualification and prior to study initiation and retain a copy in the site study file:

- Signed and dated curriculum vitae for the Principal Investigator.
- A copy of the original approval for conducting the study by the IRB. Renewals, with continuance of the study, must be submitted at yearly intervals or as required by IRB policy and a copy of the approved and dated renewal provided to the Sponsor.
- A copy of the IRB approved informed consent form along with any modifications initiated by the Sponsor over the course of the study.
- An IRB member list and Federal Wide Assurance (FWA) Number.
- A signed Financial Disclosure Form for each Investigator.
- An Investigator Agreement for this protocol signed and dated by each Investigator.

In addition to the documents listed above, the study site will also retain the following items and make them available for Sponsor review upon request.

- Certifications, applicable study equipment (audiometers, etc.) calibration records and laboratory reference ranges for all local laboratories used for this study. The Sponsor will verify all equipment requirements at the study qualification and/or initiation. If the study site has outdated and/or non-compliant equipment they will not be approved for study participation or will be advised to discontinue study-related activities should non-compliance be noted during regular study monitoring visits.
- All original informed consent forms with required signatures.
- All IRB correspondence (i.e., informed consent [including any approved revisions], protocol, AEs, advertisements, newsletters).
- Copy of the Study Monitoring Log Sheet.
- Clinical and non-clinical supply shipment forms and device accountability logs.
- Copies of all correspondence pertaining to the study between Sponsor and the site.
- Copies of all SAEs reports submitted to the Sponsor.
- Copies of all FDA progress reports submitted to the site by the Sponsor.
- Site Delegation Signature Log.

All study-related records must be maintained for at least 2 years after a marketing application (PMA) is approved for the study device; or if the application is not approved,

until at least 2 years after shipment and delivery of the last device for investigational use is discontinued and FDA/health authorities or regulatory agencies have been notified of study closure. The Sponsor will notify the principal Investigator when records are no longer needed. The Investigator will not discard any records without notifying the Sponsor. If the Principal Investigator moves from the current investigational site, the Sponsor should be notified of the name of the person who will assume responsibility for maintenance of the records at the investigational site or the new address at which the records will be stored. The Investigator will notify the Sponsor as soon as possible in the event of accidental loss or destruction of any study documentation.

20.0 Study Report and Publication

A description of this clinical trial will be available on http://www.ClinicalTrials.gov, as required by U.S. Law.

The aggregate data resulting from this study will be the proprietary information of the Sponsor and may be made public after all data have been analyzed and the study results are available. None of the data resulting from this study will be allowed to be presented or published in any form, by the Investigator or any other person, without the prior written approval of the Sponsor. At the end of the study, a clinical study report will be written by the study Investigators or their designee and reviewed by the Sponsor.

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21.0 References

Gatehouse S, Noble W. (2004).The Speech, Spatial and Qualities of Hearing Scale (SSQ). *International Journal of Audiology,* 43(2):85-99.

Noble, W., Jensen, N.S., Naylor, G., Bhullar, N., & Akeroyd, M.A. (2013). A short form of the Speech, Spatial and Qualities of Hearing scale suitable for clinical use: The SSQ12. *International Journal of Audiology, 52*, 409-412.

Peterson, G.E., & Lehiste, I. (1962). Revised CNC lists for auditory tests. *The Journal of Speech and Hearing Disorders, 27*, 62-70.

Spahr, A. J., Dorman, M. F., Litvak, L. M., Van Wie, S., Gifford, R. H., Loizou, P. C., Loiselle, L. M., Oakes, T., & Cook, S. (2012). Development and validation of the AzBio sentence lists. *Ear and Hearing, 33*, 112-117.

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22.0 Appendix A: Procedural considerations

- All pre and postimplantation testing will be completed using an audiometer, such as a Grason Stadler GSI 61 (Grason Stadler, Inc., Milford, NH, U.S.A.) or equivalent, calibrated to American National Standards Institute (ANSI) standards with maximum output for frequencies of 0.5 to 4 kHz of no less than 120 dB HL.

- Speech and hearing evaluations will be completed in, at a minimum, a single-walled sound booth capable of accommodating a calibrated, 90-degree, speaker orientation.

- Stimuli will be administered using either insert earphones and/or sound field speakers. Applicable ANSI standards are: ANSI/ASA S3.6-2004; **ANSI S3.1-1999** (R 2003).

- Pure tone threshold exploration will be completed using the adaptive Hughson & Westlake procedure (1944).

- Sound field calibration will be completed as recommended by Katz (2002). The sound level meter should be set to the "A scale" and "slow" settings. The sound level meter will be placed in the center of sound booth, approximately 1m from the loud speaker face, at the height of which would represent the center of an average subjects head. The calibration noise (test specific, however preferably speech spectrum noise) will be administered through the audiometer output to the loud speaker within the sound booth. The sound level meter detects the audiometer output through the loud speaker. With the VU meter on the audiometer set to 0 while, the dial on the audiometer is adjusted until the sound level meter within the sound booth detects the desired output.

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23.0 Appendix B: Instructions for Masking

1. Puretone threshold is established in the test ear.
2. Masking noise is introduced to the non-test ear at the initial masking level (10dB above the established threshold in the non-test ear). Puretone threshold then is re-established.
3. Level of the masking tone or noise is increased subsequently by 5 dB. If there is a response to the tone in the presence of the noise, the level of the noise is increased by 5 dB. If there is no response to the tone in the presence of the noise, the level of the tone is increased by 5-dB steps until a response is obtained.
4. A plateau has been reached when the level of the noise can be increased over a range of 15 to 20 dB without shifting the threshold of the tone. This corresponds to a response to the tone at the same HL when the masker is increased in three to four consecutive levels.
5. Masked puretone threshold corresponds to the HL of the tone at which a masking plateau has been established.

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24.0 Appendix C: Hearing Aid Fitting Guidelines

Step 1 Create Hearing Aid Program

Method:

1. Using the hearing aid software, create a hearing aid program using the recipients' audiogram.

Step 2 Obtain Real Ear Unaided Response

Method:

1. Calibrate the probe tube.
2. Position the patient one meter in front of the speaker.
3. Place the probe tube in the ear canal approximately 25 to 30 mm past the tragal notch.
4. Select recorded speech at conversational level, 65 dBSPL.
5. Ensure the cochlear implant sound processor is turned OFF.
6. Using the prescriptive algorithm of choice (NAL-NL1 or NAL-RP), obtain REUR.

Step 3 Obtain Real Ear Aided Response

Method:

1. With the probe tube in place, insert the hearing aid. Ensure that it is ON and detected by the hearing aid software. Ensure the cochlear implant sound processor is turned OFF.
2. Select recorded speech at conversational level, 60 dBSPL.
3. Allowing for subjective report, adjust hearing aid software to match real ear target gain and maximum output.

Step 4 Balance hearing aid and cochlear implant loudness

Method:

1. With the hearing aid connected to the hearing aid software, turn the cochlear implant sound processor ON.
2. Select recorded speech at conversational level, 60 dBSPL.
3. Ask the patient to point to which side is loudest or if the sound is balanced.
4. Use the conversational recorded speech to adjust the gain in the hearing aid software as needed to balance the loudness the between the two devices.
5. Repeat for soft speech (50 dB SPL).
6. Adjust the compression ratio and/or compression threshold in the hearing aid as needed so that soft speech is audible and equal in volume.
7. Repeat for loud speech (85 dB SPL).
8. Adjust the maximum power output of the hearing aid as needed so that loud sounds do not exceed the patient's loudness discomfort level.