



Auditory Implant Initiative

Research • Collaboration • Outreach

HERMES Data Collection Elements

The value of HERMES lies in its ability to serve three core objectives: 1) To act as a patient tracking tool for providers, 2) To collect and aggregate standardized data for research and analytics and 3) To connect geographically separate providers to facilitate collaboration. With these objectives in mind, the Auditory Implant Initiative has formulated the following flow of data entry, which encompasses the concepts of ‘Patient Events’ and ‘Milestone Care Phases.’

Patient Events

Within HERMES, data is focused on items called Patient Events. These events are meant to track every patient’s cochlear implant care pathway in a standard manner, from pre-implantation to two years post-implantation. Patient events are represented as a timeline of 10 visits that have been identified as milestone ‘Care Phases.’

Care Phase Data Elements

Each of the 10 care phases within every Patient Event contains certain vital data elements to be collected during that milestone. These 10 visits include Candidacy Evaluation, Initial Surgical Consultation, Preoperative Visit, One Week Postoperative Check, Activation (3 week), and 1, 3, 6, 12 and 24 month visits. The list below organizes the data elements that are collected from each of these visits.

1. Candidacy Evaluation

- a. Initial Date of Candidacy Evaluation
- b. Initial Date of Audiologic Evaluation
- c. Duration of Deafness?
- d. Type of Onset?
 - i. Congenital/Acquired/Prelingual/Postlingual (check all that apply)
- e. Age hearing loss was identified?
- f. Who identified the loss?
 - i. Family, School, Provider, Other
- g. Preferred language modality?
 - i. Oral, Total Communication, ASL, Cued Speech
- h. Preferred Listening condition? (R/L)
 - i. Cochlear Implant (Traditional), Hearing Aid, Plugged, Unaided, EAS (Electric Only), EAS (Acoustic Only), EAS (Electro-Acoustic)
- i. Did patient complain of tinnitus? (R/L/B)
- j. Newborn Hearing Screen? (PEDS)

- i. Pass, Fail, Did not test, Unknown
- k. Educational Setting? (PEDS)
 - i. Mainstream, DHH, Special Education
- l. Therapies/services provided? (PEDS)
 - i. ST, OT, PT, Early intervention therapy, Vision, Feeding/Swallowing, Auditory/Verbal therapy, CART, FM System
- m. Additional Disabilities? (PEDS)
 - i. Intellectual Disabilities, Speech and Language Disabilities, Emotional Disturbance, Specific Learning Disability, Deafness, Hard of Hearing, Deaf Blindness, Autism, Traumatic Brain Injury, Multiple Disabilities, Visual Impairment, Orthopedic Impairment, Other Health Impairment
- n. Prenatal History (PEDS)
 - i. Maternal Virus/Infection (Yes/No/Comments)
 - ii. Maternal Meds/Drugs (Yes/No/Comments)
 - iii. Maternal Conditions (Yes/No/Comments)
 - iv. Maternal Complications (Yes/No/Comments)
- o. Birth History (PEDS)
 - i. Birth Hospital
 - ii. Length of stay in birth hospital
 - iii. Startle Response
 - iv. Length of gestation
 - v. Birth weight
 - vi. NICU
- p. Developmental History (PEDS)
 - i. Sitting Milestone (age accomplished)
 - ii. Walking Milestone (age accomplished)
 - iii. Babbling Milestone (age accomplished)
 - iv. Speaking/Signing First Word Milestone (age accomplished)
 - v. Balance problems (age identified)
 - vi. Behavior problems (age identified)
- q. Speech/Language Development (PEDS)
 - i. Number of Vocabulary Words
 - ii. Number of Word in a sentence
- r. Based on candidacy testing, is patient a candidate for implantation?
- s. Audiogram
 - i. Title (Pre Operative Audiogram, Aided Testing, Residual Hearing, Unaided, CI detection, Other (free-text))
 - ii. Transducer (Headphones, Inserts, Speakers)
 - iii. Conditioning Type (Behavioral Observation Audiometry, Visual Reinforcement Audiometry, Play Audiometry, Conventional)
 - iv. Date
 - v. Reliability (Poor, Fair, Good)
 - vi. Tone Threshold Audiograms (R/L)
 - vii. Speech Audiometry: SAT, SRT, Mask

- viii. Word Recognition: Presentation Source, Test, % Correct, Stimulus, Mask, Noise
- ix. Tympanometry: Type, Pressure, Compliance, Probe Tone
- x. Acoustic Reflex Test
- xi. Comments/Notes
- t. Otoacoustic Emissions
 - i. Select date of test
 - ii. Type (TEOAE, DPOAE)
 - iii. Left Ear (Pass/Refer/Noisy, Comments)
 - iv. Right Ear (Pass/Refer/Noisy, Comments)
- u. ABR
 - i. Select date of test
 - ii. Sedation (Yes/No)
 - iii. Comments on Sedation: Dose Taken/Given
 - iv. Reason For ABR (Follow Up NBHS, Unable to perform Audiogram, Other)
 - v. Impedance Check (<5 Ohms, >5Ohms, Other)
 - vi. Evidence of ANSD
 - a. Yes
 - i. Which ear (Left/Right/Both)
 - b. No
 - vii. Threshold Response Table
 - a. L/R dBeHL/dBnHL
 - b. Click, Bone Conduction Click, 500 Hz, 1000 Hz, 2000 Hz, 4000 Hz
 - c. Chirp or Tone Burst
 - d. Comments
 - viii. Tympanometry: Type, Pressure, Compliance, Probe Tone (226 Hz, 1000Hz)
 - ix. Other Comments (free-text)
- v. Speech Perception Testing
 - i. NOTE: For each test, there are fields to list:
 - ii. Ear Conditions (Cochlear Implant (Traditional), Hearing Aid, Plugged, Unaided EAS (Electric Only), EAS (Acoustic Only), EAS (Electro-Acoustic), Masked)
 - iii. Sound Configuration (0 degrees, 90 degrees, 180 degrees, Face to face)
 - iv. Presentation Source (Recorded, Monitored live voice)
 - v. Presentation Method (Auditory Only, Auditory /Visual, Visual Only)
 - vi. Adult Tests
 - a. AzBio
 - b. CNC
 - c. BKB-SIN
 - d. Overlearned Sentences
 - e. HINT
 - vii. Pediatric Tests
 - a. Parental Questionnaires
 - i. ASC
 - ii. LittleEars

- iii. IT-MAIS
- iv. MAIS
- b. Auditory Discrimination
 - i. VRISD
 - ii. ESP (Standard Version)
 - iii. ESP (Low Verbal Version)
- c. Word Recognition
 - i. PSI Words
 - ii. NU-CHIPS
 - iii. WIPI
 - iv. MLNT
 - v. LNT
- d. Sentence Recognition
 - i. PSI Sentences
 - ii. BKB (Single Track)
 - iii. BKB-SIN
 - iv. Pediatric AzBIO (BabyBio)
 - v. HINT-C

2. Initial Surgical Consultation

- a. Date of Encounter?
- b. Height?
- c. Weight?
- d. Did patient complain of tinnitus? (R/L/B)
- e. History of Chronic Mastoiditis? (Y/N, if yes, which ear, R/L/B)
- f. History of vertigo within last 6 months?
- g. Better Hearing Ear? (R/L/N)
- h. Exam Findings? (R/L)
- i. History of Tobacco Use?
- j. History of DM? (Type)

3. Pre-operative visit

- a. Date of Encounter?
- b. CT performed? (if yes, document course of facial nerve, aerated middle ear, tegmen dehiscence, Cochlea Patent, Well-Partitioned)
- c. MRI performed? (if yes, document course of facial nerve, adequate cochlear fluid signal, 7/8 nerve complex normal,
- d. VNG performed? If yes, was there a caloric weakness? (y/n, side), were there central findings (y/n, side)
- e. Dix-Hallpike normal? (y/n, dnt)

4. One week post-op visit

- a. Date of encounter?
- b. Name of operating surgeon?
- c. Type of cochlear opening?
- d. Which ear was implanted?
- e. Type of device (manufacturer, implant, electrode, processor)?
- f. Full insertion?

- g. Number of electrodes left outside the cochlea?
- h. Time to insert the electrode (<10 sec, 10-20 sec, > 20 sec, not timed)?
- i. Date of implantation?
- j. Surgeon's (xth) implant?
- k. Were perioperative abx given?
- l. Were intraoperative steroids given?
- m. Were perioperative oral steroids given?
- n. Was pneumonia vaccine given in accordance to CDC?
- o. Was intraoperative NRT/NRI performed?
- p. Was a Stenver's view X-ray performed?
- q. Intraoperative complications (CSF leak, facial nerve injury, etc)?
- r. Wound complications during post op week?
- s. Vertigo/tinnitus during Post op week?

4. Activation

- a. Date of encounter?
- b. Date of activation?
- c. Since the last visit, have there been any of the following complications? (Check all that apply) (List: tinnitus, vertigo or dizziness, wound complication, device malfunction, device migration, other)
- d. Audiogram
 - a. Title (Pre Operative Audiogram, Aided Testing, Residual Hearing, Unaided, CI detection, Other (free-text))
 - b. Transducer (Headphones, Inserts, Speakers)
 - c. Conditioning Type (Behavioral Observation Audiometry, Visual Reinforcement Audiometry, Play Audiometry, Conventional)
 - d. Date
 - e. Reliability (Poor, Fair, Good)
 - f. Tone Threshold Audiograms (R/L)
 - g. Speech Audiometry: SAT, SRT, Mask
 - h. Word Recognition: Presentation Source, Test, % Correct, Stimulus, Mask, Noise
 - i. Tympanometry: Type, Pressure, Compliance, Probe Tone
 - j. Acoustic Reflex Test
 - k. Comments/Notes
- e. Mapping
 - i. Impedance, Procedure used, Responses/Actions, Neural Response, eSRT, Processor info/maps

6. Audiometric Follow Up (Audiology visits at 1, 3, 6, 12 and 24 months)

- a. NOTE: Other non-milestone audiometric testing, speech therapy visits, comments, etc can be added from the buttons located in the toolbar at the top of the patient dashboard. (See Toolbar Data Elements below.)
- b. Date of Encounter?
- c. Preferred language modality?
 - i. Oral, Total Communication, ASL, Cued Speech
- d. Preferred listening (Best aided) condition for LEFT/RIGHT ear:

- e. Typical listening condition for LEFT/RIGHT ear:
- f. Number of active channels
- g. Hours of device use per day?
- h. Complications since last visit?
- i. What is the patient's educational setting? (PEDS)
 - i. Mainstream, DHH, Special Education
- j. Check any therapies/services that are provided to the patient (PEDS)
 - i. ST, OT, PT, Early intervention therapy, Vision, Feeding/Swallowing, Auditory/Verbal therapy, CART, FM System
- k. Additional Disabilities? (PEDS)
 - i. Intellectual Disabilities, Speech and Language Disabilities, Emotional Disturbance, Specific Learning Disability, Deafness, Hard of Hearing, Deaf Blindness, Autism, Traumatic Brain Injury, Multiple Disabilities, Visual Impairment, Orthopedic Impairment, Other Health Impairment
- l. Audiogram
 - i. Title (Pre Operative Audiogram, Aided Testing, Residual Hearing, Unaided, CI detection, Other (free-text))
 - ii. Transducer (Headphones, Inserts, Speakers)
 - iii. Conditioning Type (Behavioral Observation Audiometry, Visual Reinforcement Audiometry, Play Audiometry, Conventional)
 - iv. Date
 - v. Reliability (Poor, Fair, Good)
 - vi. Tone Threshold Audiograms (R/L)
 - vii. Speech Audiometry: SAT, SRT, Mask
 - viii. Word Recognition: Presentation Source, Test, % Correct, Stimulus, Mask, Noise
 - ix. Tympanometry: Type, Pressure, Compliance, Probe Tone
 - x. Acoustic Reflex Test
 - xi. Comments/Notes
- m. Mapping
 - i. Impedance, Procedure used, Responses/Actions, Neural Response, eSRT, Processor info/maps
- n. Otoacoustic Emissions
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- o. ABR
 - i. Sedation (Yes/No)
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 - iii. Reason For ABR (Follow Up NBHS, Unable to perform Audiogram, Other)
 - iv. Impedance Check (<5 Ohms, >5Ohms, Other)
 - v. Evidence of ANSD (Left/Right/Both)
 - vi. Threshold Response Table
 - a. L/R dB_eHL/dB_nHL
 - b. Click, Bone Conduction Click, 500 Hz, 1000 Hz, 2000 Hz, 4000 Hz
 - c. Chirp or Tone Burst

- d. Comments
- vii. Tympanometry: Type, Pressure, Compliance, Probe Tone (226 Hz, 1000Hz)
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- p. Speech Perception Testing
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 - v. LNT
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 - i. PSI Sentences
 - ii. BKB (Single Track)
 - iii. BKB-SIN
 - iv. Pediatric AzBIO (BabyBio)
 - v. HINT-C

Toolbar Data Elements

For each patient, there are also the following items that may be relevant throughout their care and can be added/updated at any point from a constant Toolbar.

1. Demographics
 - a. Patient Name
 - b. Date of Birth
 - c. Gender
 - d. Race
 - e. Patient Contact Information (Address, Email, Phone)
 - f. Parent Information, Contact, Employment Status, Highest Level of Education
 - g. Primary/Secondary Insurance Information
 - h. Primary Language Spoken at Home (Drop down list of common languages)
 - i. Hearing DOB for Left/Right Ear
2. Syndromes / Etiologies
 - a. Autosomal Dominant Syndromes
 - i. Branchiootorenal Syndrome, Neurofibromatosis 2, Stickler Syndrome, Waardenburg Syndrome, Other
 - b. Autosomal Recessive Syndromes
 - i. Biotinidase Deficiency, Jervell and Lange-Nielsen Syndrome, Pendred Syndrome, Refsum Disease, Usher Syndrome, Other
 - c. X-Linked Syndromes
 - i. Alport Syndrome, Mohr-Tranebjaerg Syndrome, Other
 - d. Mitochondrial Syndromes
 - i. Mitochondrial DNA Mutations
 - e. Nonsyndromic Hereditary Hearing Impairment
 - i. Autosomal Dominant (DFNA), Autosomal Recessive (DFNB), Mitochondrial (MT), X-Linked (DNFX)
 - f. Temporal Bone Malformations
 - i. Common Cavity Malformation, Enlarged Vestibular Aqueduct, Membranous Malformation, Michel's aplasia, Mondini Malformation, Other
 - g. Perinatal Etiologies
 - i. Birth trauma, anoxia, Infectious (TORCH), Kernicterus, Low birth weight, Metabolic (Cretinism, etc), Ototoxicity, Perinatal Meningitis, Prematurity, Other
 - h. Adult and Other Causes
 - i. AutoImmune, Cerebrovascular, Infectious (excluding Meningitis), Meniere's Syndrome, Meningitis, Metabolic, Ototoxicity, Presbycusis, Progressive, Sudden Sensorineural Hearing Loss, Trauma, Vasculitis, Other
3. Surgeries
 - a. Implant History
 - i. Cochlear Implant, Cochlear Implant Removal (Explant), Cochlear Implant Revision (Removal/Replacement)
 - ii. Side (R/L/B)
 1. Device/Implant/Processor/Electrode Type
 - iii. Date of activation
 - iv. Date of implantation
 - b. Otologic (non-implant) surgeries

- i. Mastoidectomy, Pressure equalizing tubes, Stapedectomy, Tympanoplasty, Other otologic (free-text),
 - ii. Side (R/L/B)
 - iii. Date
 - c. Non-otologic surgeries
 - i. Type
 - ii. Date
- 4. Hearing Aid Info (PEDS)
 - a. Side (R/L/B)
 - b. Device manufacturer
 - i. Phonak, Resound, Oticon, Widex, Other
 - c. Device model
 - d. Style of hearing aid
 - i. Behind-the-ear (BTE), In-the-ear (ITE), In-the-canal (ICC), Completely-in-canal (CIC), Receiver-in-canal (RIC), Other (free-text)
 - e. Serial #
 - f. Date of Fitting
 - g. Location of Fitting
 - h. Hours of Use per day
 - i. Other Assistive FM system devices
 - i. T-Coil, Ear Level Receivers, Sound Fields Speakers, Bluetooth remote microphone
 - j. Additional Comments

In addition, the toolbar also allows for entry of non-milestone audiometric testing and speech and language development data. You may also view all audiometric and S/L data as well.

- 5. Non-Milestone Audiometric Testing
 - a. Includes Audiogram, ABR, OAE, and Speech Perception Testing.
- 6. Speech and Language Development/Education
 - a. S/L includes Evaluations and Therapy Visits: evaluations record parent report, behavioral statements, observations, assessments, impressions and recommendations, therapy visits record Ling 6 sounds, subjective information, baseline, goals, session comments, plan and summary
 - b. Speech Assessments include:
 - i. Arizona Articulation Proficiency Scale-3
 - ii. Comprehensive Assessment of Spoken Language (CASL)
 - iii. Expressive Vocabulary Test-2 (EVT-2)
 - iv. Goldman Fristoe Test of Articulation-2 (GFTA-2)
 - v. Macarthur Communication Development Inventory: Words and Gestures
 - vi. Macarthur Communication Development Inventory: Words and Sentences
 - vii. Oral Written Language Scales-2 (OWLS-2)
 - viii. Peabody Picture Vocabulary Test-4 (PPVT-4)
 - ix. Pre-Reading Inventory of Phonological Awareness (PIPA)
 - x. Preschool Language Scales- 5 (PLS-5)
 - xi. Rosetti Infant-Toddler Language Scale

- xii. SKIHI Language Development Scale
- xiii. Test of Auditory Processing-3 (TAPS-3)
- xiv. Woodcock Johnson Tests of Achievement III (WJ ACH III)
- xv. Ling Phonetic Evaluation