University of Michigan-Department of Otolaryngology
Division of Otology-Neurotology
Otology-Neurotology Residency Goals & Objectives

Overall Goal: To develop special expertise in the diagnosis and medical/surgical management of conditions relating to the following disciplines within otology-neurotology:

- auditory system
- vestibular system
- facial nerve
- temporal bone and related skull base structures
- tumors and other lesions of the cerebello-pontine angle.

To accomplish these goals, the academic structure of the two year residency is divided into several rotations. The goals and objectives for each rotation are listed. These will guide the resident's scholarly activities during the rotation and will form the basis for evaluation of resident performance.

Auditory System Preceptorship (1 month)

- Understand physiologic function of the external ear and external auditory canal and their contribution to human hearing.
- Understand the mechanism of middle ear function and the impedance matching characteristics of the ossicular chain and tympanic membrane.
- Understand anatomical relationships within the cochlea and their physiologic correlates.
- Understand functional characteristics of the basilar membrane, inner and outer hair cells, the traveling wave theory, tonotopic organization and characteristic frequency tuning of the cochlea and higher auditory system structures.
- Understand cochlear innervation and the neural pathways of the auditory brainstem and cortex.
- Understand utility and execution of a basic audiometric evaluation, including air and bone conduction audiometry, use of clinical masking, and acoustic reflex testing.
- Understand the potential pitfalls in audiometric testing that may have important impact in clinical diagnosis and surgical decision-making.
- Understand utility and execution of impedance audiometry in clinical diagnosis.
- Understand the utility and execution of otoacoustic emission testing in the context of newborn hearing screening, clinical otologic care, and preoperative applications.

- Understand the physiology, execution and utility of auditory brainstem response (ABR) testing in relation to cochlear integrity, auditory neural pathways, and its use in newborn screening programs, clinical diagnosis, and intra-operative surgical monitoring.
- Understand performance and interpretation of electrocochleography (ECoG).
- Understand performance and execution of intra-operative facial nerve monitoring and cochlear nerve monitoring via ABR.
- Understand the essentials of evaluating and managing a patient with pseudohypoacusis.

Vestibular System Preceptorship (1 month)

- Understand the anatomic pathways and the physiologic and functional mechanisms that subserve human balance, especially in relation to the inner ear, the vestibular-ocular reflex and postural control.
- Understand the central vestibular neural pathways and their interaction in the brainstem, cerebellum and cerebral cortex.
- Understand the generation of physiologic and pathologic nystagmus and its relationship to peripheral and central manifestations of vestibular and neurologic disorders.
- Understand the clinical indications for performance of each mode of modern vestibular testing, along with the limitations or contraindications of each one.
- Understand performance and interpretation of electronystagmography and advanced analysis of oculomotor function, including video and electro-oculographic recordings.
- Understand the three means of performing caloric irrigations, along with clinical and interpretive pitfalls associated with each method.
- Understand performance and interpretation of rotational chair testing and vestibular autorotation testing.
- Understand performance and interpretation of dynamic posturography testing.
- Demonstrate competence in interpretation of vestibular test results from the raw data, including an ability to integrate the results and articulate the clinical implications of the findings.
- Understand the common clinical disease processes causing vertigo and disorders of equilibrium.
- Understand indications for vestibular rehabilitation referrals. Be able to articulate the essential components of the therapist's evaluation.
- Be able to describe the typical components of a therapy program, and how they may differ depending upon the nature of the disorder.
- Understand indications and risks of vestibular surgical procedures, including perilymph fistula repair, endolymphatic sac decompression, posterior semi-circular canal occlusion, vestibular nerve section, singular neurectomy and labyrinthectomy.

Clinical Neurotology Rotation (12 months)

Anatomy of the Temporal Bone and Related Structures

- Demonstrate knowledge of radiographic anatomy of the temporal bone, adjacent skull base structures, and the cerebello-pontine angle using CT and MRI.
- Recognize and describe radiographic manifestations of congenital abnoi:malities within the temporal bone.
- Demonstrate knowledge of surgical anatomy and anatomical relationships of vital structures within the temporal bone in the dissection laboratory.
- Demonstrate the capacity to perform facial nerve decompression and translocation without injury to the nerve.
- Demonstrate the capacity to perform a transmastoid labyrinthectomy without violation of the dura, superior petrosal sinus, facial nerve, or internal auditory canal.
- Demonstrate the capacity to approach and safely expose the contents of the internal auditory canal from transtemporal (e.g. translabyrinthine and transcochlear) approaches, as well as from middle fossa and posterior fossa approaches.

Surgical Procedures

- In a graduated fashion, based upon reading and preparation in the dissection laboratory, the resident will gain experience and competence in sophisticated neurotologic procedures as follows
- Surgical treatment of vertigo: endolymphatic sac procedures, semi-circular canal occlusion, labyrinthectomy, and vestibular nerve section.
- Cerebello-pontine angle tumors: translabyrinthine, posterior fossa, middle fossa, and transcochlear procedures for access and excision of disease processes.
- Lateral skull base: Surgical treatment of glomus jugulare tumors and disease processes involving the skull-base, jugular foramen and temporal bone via skull-base approaches.
- Cochlear implantation: Cochlear implantation in anatomically normal temporal bones as well as in special populations such as congenital malformations or ossified cochleae after meningitis, explantation of implanted devices, revision surgery, and correction of surgical wound problems. • Otosclerosis and non-otosclerotic lesions of the stapes, including congenital fixation. Understand the use of the surgical laser in stapes surgery.

Clinical Skills & Judgment

- Demonstrate advanced History and Physical Exam skills specific to the neurotologic patient, including sophistication in the performance and interpretation of the neurologic exam in this patient population.

- Adequately evaluate and treat manifestations of acute and chronic middle ear disease, including intratemporal and intracranial complications of chronic otitis media.
- Demonstrate skills of atraumatically removing cerumen and foreign bodies in the external ear canal, office placement of pressure equalization (PE) tube and PE tube care, office placement of promontory stimulating needle electrodes, and proper care of post-operative and long term chronic ear cavities.
- Adequately evaluate and treat patients affected by acute and chronic vertigo, Meniere's disease, sudden hearing loss, chronic progressive hearing loss, conductive and sensorineural hearing loss, presbycusis, autoimmune ear disease, external auditory canal lesions, and peripheral and central vestibular disorders.
- Demonstrate depth of knowledge of disease processes affecting the temporal bone with regard to primary diseases, trauma, metastatic cancer, and otologic manifestations of systemic disease processes.
- Understand and properly utilize multi-disciplinary consultants as appropriate to aid in the diagnosis and management of the neurotologic patient.
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<u>Patient Interaction & Professionalism</u>

- Provide patient care that is compassionate, appropriate, and effective for the treatment of current health problems and the promotion of health.
- Display interpersonal and communication skills that result in effective information exchange and collaboration with patients, their families, and other health professionals.
- Demonstrate the ability to display empathy to the patient, as well as to patiently counsel those with significant adjustment disorders related to tinnitus, vestibular symptoms, or other disorders that pose a perceived threat to the patient's well being.
- Gaining medical knowledge about established and evolving biomedical, clinical, and social-behavioral sciences related to otology and the application of this knowledge to patient care.
- Demonstrate practice-based learning and improvement that involves investigation and evaluation of their own patient care, appraisal and assimilation of scientific evidence, and improvements in patient care.
- Demonstrate consistent professionalism, as manifested through a commitment to carrying out professional responsibilities, adherence to ethical principles, and sensitivity to a diverse patient population.
- Systems-based practice, as manifested by actions that demonstrate an awareness of and responsiveness to the larger context and system of health care, and the ability to effectively call on system resources to provide care that is of optimal value.

Research Rotation (6 months)

- Formulate a research proposal for approval by the departmental Research Committee and, when necessary, by the University of Michigan Institutional Review Board or the University Laboratory Animal Medicine committee.
- Gain the scientific knowledge base and laboratory skills needed to prepare for and complete the research project.
- Perform a clinical or basic science research project of scientific significance, which contributes meaningfully to the advancement of the fund of knowledge in otology-neurotology.
- Prepare a manuscript with research collaborators and pursue publication in a suitable peer-reviewed subspecialty journal.
- When proceeding into an academic appointment, use the data obtained from the study to begin grant proposal preparation for extramural funding.

Elective Rotations (4 months)

The resident will design an educational program for the final four months to include elective time in those disciplines that overlap meaningfully with neurotology. This is not meant to exclude the freedom to potentially pursue other elective rotations with special relevance to clinical or research interests that will be pursued during the resident's future academic career.

<u>Neurosurgery</u>

- Gain additional insight and expertise in the neurologic evaluation.
- Understand clinical presentations, radiographic features, and surgical implications of diseases affecting the cerebellum and brainstem.
- Understand neurosurgical approaches to handling brain tissue, with special emphasis on the cerebellum and brainstem.
- Understand aftercare following neurosurgical procedures, including the indications for neuropharmocologic management such as the use of corticosteroids, hormonal replacement and anticonvulsant therapy.
- Demonstrate ability to recognize CSF leak, subarachnoid hemorrhage, intraparenchymal hemorrhage, subdural hematoma, epidural hematoma, thromboembolic stroke, and brainstem infarction.
- Understand dynamics of CSF production and reabsorption, including their implications for preventing or managing spinal fluid leaks.
- Understand the management of lumbar drains and the surgical repair of spontaneous or postoperative spinal fluid leaks related to the temporal bone.

Neuroradiology

- Supplement prior knowledge and understanding of disorders affecting the temporal bone, skull base, brain and brainstem from a neuroradiographic imaging perspective.
- Supplement knowledge of neuro-anatomic structures and their function.
- Gain special expertise in the interpretation of CT and MRI as they intersect the subspecialty of otology-neurotology.
- Recognize the potential contributions of imaging modalities such at SPECT, PET and Functional MRI to the diagnosis of neurotologic disorders.

Neurology/Gait Disorders

- Gain additional insight and expertise in the neurologic evaluation.
- Improve understanding of migraine management, with particular emphasis on vestibular manifestations of migraine.
- Understand presentation, diagnosis, and management of movement and gait disorders, including pertinent findings in the vestibular testing environment.
- Understand and perform appropriate evaluation and management of neurologic conditions that may present with otologic symptoms.

Neuro-ophthalmology

- Gain a more sophisticated understanding of the diagnosis of eye movement disorders.
- Understand diagnostic techniques utilized by the neuro-ophthalmologist in evaluating patients with eye movement disorders, particularly those that might present with a complaint of dizziness or unsteadiness.
- Acquire the ability to clinically document oscillopsia.

PM&R/Vestibular Rehabilitation

- Understand the role of the physical therapist in evaluating, treating, and counseling the acute and chronic patient with vestibular symptoms or balance disturbance.
- Understand the systems approach to evaluating the unstable patient.
- Learn to delineate which semicircular canal is affected by benign positional vertigo, and to perform the appropriate particle-repositioning maneuver for each canal.
- Understand appropriate exercise therapies for treating chronic disequilibrium from aging and/or uncompensated vestibular lesions.
- Understand the role of multidisciplinary management in treating the patient with multiple cranial neuropathies.