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Evaluation of compliance for treatment of Sudden Hearing Loss; a CHEER Network Study

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Abstract

Objective—The objective of this study is to describe the presentation and management of sudden sensorineural hearing loss (SSNHL) for patients seen in academic and community-based practices within the context of the American Academy of Otolaryngology - Head and Neck Surgery Foundation's (AAO-HNSF) Clinical Practice Guideline: Sudden Hearing Loss. The intention is to use these findings to guide implementation strategies, quality improvement initiatives, and as pilot data for the development of clinical research initiatives.

Study Design—A cross sectional study of patients with sudden hearing loss.

Setting—173 patients were recruited from practices within the Creating Healthcare Excellence through Education and Research (CHEER) network. The CHEER Network is an NIH funded network of thirty otolaryngology sites across the country, half of which are community-based and half of which are academic practices.

Subjects and Methods—173 patients were recruited. Data was gathered via custom questionnaires collected by study site coordinators and entered into a secure online platform. Descriptive analyses and correlation statistics were run utilizing SAS v9.3.1.

Results—Of the thirteen guideline statements in the AAO-HNSF's clinical practice guideline on SHL, eleven statements were evaluable through this study. Compliance for Otolaryngologists was (>95%) for key action statements (KAS) 1,3,6, (90%–95%) in KAS 5, 10, and <90% in KAS 7, and 13. Compliance was (<45%) for non-otolaryngologists in KAS 3,5,6, and 7.

Conclusions—There is opportunity for non-otolaryngologists to improve for statements 3,5,6, and 7. Otolaryngologists are compliant with many of the KAS overall, but there is significant room for improvement.

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Keywords

Sudden Sensorineural Hearing Loss; Practice Guidelines; CHEER network

INTRODUCTION

Sudden hearing loss (SHL) is rapid onset of subjective hearing loss over three days. Sudden sensorineural hearing loss (SSNHL) is a subset of SHL where the hearing loss is sensorineural in nature. If there is no identifiable underlying cause after appropriate evaluation, the term Idiopathic SSNHL (ISSNHL) is often applied. Though SSNHL is primarily a disease of middle age with a median age of forty-eight, cases have been reported in people of nearly all ages.¹ Not all patients with SSNHL present to an otolaryngologist's office for timely evaluation and definitive diagnosis. The true incidence of the disease is difficult to assess, but most current estimates are between two and twenty individuals per hundred thousand.^{2,3} No convincing epidemiologic risk factors for unilateral SSNHL have been distinctly identified to date.^{4,5,6} Different investigators have implicated viruses, ischemic phenomena, and autoimmune processes, but no definitive evidence exists identifying a causative agent.^{7,8,9,10} Patients with SSNHL typically present with sudden loss of hearing, or a loss of hearing upon awakening, which is usually unilateral.¹¹ There is often associated tinnitus and sensation of ear pressure. Ear examination of a patient with SSNHL reveals no anatomic abnormalities while the audiogram confirms elevated hearing thresholds in the affected ear.

The 2012 AAO-HNSF clinical practice guideline (CPG) on the management of SHL provides recommendations to facilitate the timely and appropriate evaluation and management of patients presenting with SHL and specifically SSNHL.³ These guidelines were derived from a multidisciplinary panel that carefully examined the available literature to arrive at evidence-based recommendations in the form of key action statements (KAS). The implementation and knowledge distribution strategy for the guideline includes publication in the specialty's journal, presentation of findings at the Annual Meeting of the American Association of Otolaryngology - Head and Neck Surgery Foundation, development of corresponding educational materials geared toward multiple audiences—consumer and provider alike -- and provision of the guideline through the internet publicly and free of charge.

The goal of our study was to describe the alignment between the guideline and the management experience of patients with SHL. Specifically, we wanted to describe triage of the SHL patient population and quantify compliance with selected guideline KAS.

We hypothesized that while overall adherence to the guideline by Otolaryngologists would be high, there would remain opportunity for improved alignment between practice and evidence including improved resource utilization.

METHODS

This cross-sectional study utilized the Creating Healthcare Excellence through Education and Research (CHEER) Network for recruitment.¹² Patients were recruited in sixteen participating CHEER sites between July 11, 2013 and January 17, 2015. Eight of the participating sites were academic and eight were community-based. This study was approved by the Duke University School of Medicine Institutional Review Board. Community-based sites without their own IRB were covered under the Duke University IRB approval. Other sites received approval from their own IRBs.

To be eligible, patients were required to meet the three following criteria: Symmetrical hearing prior to the incident of hearing loss (subjective with no requirement for a prior hearing test), new onset hearing loss in only one ear, and a non-affected ear which could be used as baseline comparator. Patients were excluded if they presented with a bilateral sudden hearing loss, a history of recurrent episodes of sudden hearing loss, or if there were focal neurologic findings. These criteria encompass the definition set forth in the AAO-HNSF's clinical practice guideline on sudden hearing loss.⁴

The case report form (CRF) was a questionnaire that was developed with input and review from otology-neurotology experts from within the CHEER Network leadership and reviewed by the AAO-HNSF CPG panel leadership for SHL. The CRF included relevant information from both the patient and provider and was collected on paper and recorded via REDCap, a secure and appropriate online platform for clinical research.²

The main purpose of this study was to describe the patient population in terms of provider compliance with the CPG KAS. We also sought to describe the patient's care pathway to the otolaryngologist. A sub-study regarding use of steroids will be described in a subsequent paper. Recruitment goals were based on power analysis scenarios that were generated for the sub-study. Data was analyzed in Microsoft Excel and SAS v9.3 1 and included descriptive analyses and correlation statistics between key variables.

RESULTS

Patient Characteristics

The dataset included 175 patients. The audiometric data of two patients indicated their hearing loss was conductive and they were excluded. Of the 173 evaluable patients, 31 had one or more conditions which have been implicated as possible causes of sensorineural hearing loss, and which may have associated treatment needs that would affect the care path. 142 (82.1%) had idiopathic sudden sensorineural hearing loss with a 30 dB hearing loss at three consecutive frequencies. Upon enrollment in the study, 68% (n=117) of the patients were new to the Otolaryngologist. The remaining 32% (n=56) were follow-up patients. The median patient age was 60 years and median number of days between sudden hearing loss onset and presentation to the otolaryngologist for initial visits was 15. There was no significant association between days from onset of hearing loss and median pure tone audiometry (PTA). The majority (98.8% n=171) of patients indicated this was their first

occurrence of sudden hearing loss. Table 1a and 1b present the patient demographic and presenting characteristics.

Most (73.4% n=127) patients self-reported they had experienced tinnitus, 65.9% (n=114) of patients experienced fullness, and 31.8% (n=55) experienced dizziness in the prior ten days before the visit to the otolaryngologist. Additionally, in this timeframe, 8.1% (n=14) of patients had experienced noise exposure (including barotrauma) and 1.2% (n=2) had experienced trauma to the ear. For testing performed at the enrollment visit, 99.4% (n=172) had pure tone threshold testing performed, 97.1% (n=168) had speech testing performed, and 86.7% (n=15) had tympanometry performed.

Audiometric and Exam Findings Profile

A summary of the exam findings from the enrollment visit are summarized in Tables 2a and 2b for the overall population and relevant subpopulations: those that indicated they had received prior treatment of oral or IT steroids, and those with no identified potentially causative condition.

Care Pathway to the Otolaryngologist

Data was collected on the referral pathway to the otolaryngologist by provider type. Less than half (43.9%; n=76) of the patients indicated their first presenting visit was either to an otolaryngologist or both an otolaryngologist and audiologist (1.2%; n=2) on the same day. A small proportion (5.8% n=10) indicated they went to a primary care clinic or an emergency/urgent care facility before going to the otolaryngologist on the same day. Patients who did not see an otolaryngologist first went either to primary care (28.3%; n=49) or emergency/urgent care (20.8%; n=36) as their first stop for treatment. Patients who went first to primary care saw the otolaryngologist, on average, 9.1 days (sd=7.8 days) after their primary care visit. Patients who went first to emergency/urgent care saw the otolaryngologist, on average, 5.5 days (sd=4.5 days) after their emergency/urgent care visit. There were no statistically significant differences in PTA related to the provider seen first. The average number of visits per patient to each type of provider seen first, prior to seeing the CHEER otolaryngologist, was: 1.0 emergency/urgent care, 1.1 primary care, 1.4 audiologist, and 1.5 otolaryngologist.

Clinical Practice Guideline Compliance

Of the thirteen guideline statements in the AAO-HNSF's clinical practice guideline on sudden hearing loss, eleven statements were assessed and/or evaluable through this study.⁴ Compliance for Otolaryngologists was high (>95%) for KAS 1,3,6; moderate in KAS 5, 10, (90–95%); and low (<90%) in KAS 7, and 13. Regarding KAS 8 and 11, Otolaryngologists are using the option of oral steroid therapy as initial treatment, and do offer intra-tympanic steroid therapy for salvage. Statements 2, 4, 9, 11, and 12 could not be fully addressed by our study design, although 9, 11, and 12 are further addressed in the sub-study. According to this study, there is opportunity for non-otolaryngologists to improve for statements 3,5,6, and 7. Table 3 (online only) provides a summary of the assessment.

DISCUSSION

The purpose of this study was to describe the management pattern for providers who evaluated and patients presenting with SSNHL. We then translated these reported patterns into compliance rates for the applicable KAS of the SSNHL clinical practice guideline published in 2012. The study was conducted in the CHEER practice-based research network as an observational study of current practice. This was the AAOHNF's first study to evaluate guideline compliance either within or outside of our specialty.

Evidence-based clinical practice guidelines are developed by reviewing important published information in order to enhance consistency of care, identify needed quality improvement activities, and support coverage and reimbursement for appropriate care. The development of guidelines by the AAO-HNSF is structured in a multidisciplinary manner to ensure that the guidelines have relevance for non-otolaryngologists who often are the entry point for patients presenting with a new ear, nose, or throat complaint.

The SHL guideline is structured and written to facilitate implementation in practice. This includes checklists for diagnoses, summary statements, and a categorization of the strength of evidence and management for each statement. This study begins to assess which KAS otolaryngologists and other providers are complying with and which statements are proving more difficult to implement; this ideally will guide future quality improvement activities.

Our results show that Otolaryngologists had high compliance in KAS that were actionable within an evaluation and treatment algorithm. This is consistent with our survey-based assessment of the KAS, completed at the 2012 Annual meeting mini-seminar, which showed compliance of 95% or higher among attendees. The low compliance KAS were those that centered on counseling and education (Table 3 (online only)). These activities can be very time consuming compared to interpreting an audiogram or ordering a MRI. As health care moves closer to measuring patient perceptions for reimbursement, effective educational strategies must be developed in order to meet these metrics while efficiently using the time of the physicians and patients. Continuous quality improvement initiatives can potentially help address this deficiency through development of actionable educational strategies for both provider and patient.

Education and shared decision-making are important components for appropriate management of patients with SSNHL. Therefore, conversations with effective exchange of information regarding possible etiologies of their hearing loss, available treatments with associated benefits and risks, and rehabilitation services need both documentation and intentional incorporation into the patients' episodes of care. Readily available strategies to address many of the low compliance KAS include patient education through a leaflet/ brochure or as part of the printed after visit summary for those with an electronic health record. Additionally, the AAO-HNSF offers a frequently asked question webpage, podcasts, and plain language summaries to supplement patient education for selected SHL key action statements. Improved awareness and distribution of these materials and strategies would likely improve perceived and actual compliance as well as overall patient satisfaction and care.

Limitations

All but one participating site (Central Oregon ENT) have neurotologists in the practices, but provider per patient was not captured in the study.

Statement 4 directs the clinician's diagnosis. Our enrollment criteria were in concordance with Statement 4, but we did not ask providers for information on their overall diagnostic patterns, which may differ.

It is possible that some patients were offered education that was not documented in the EMR, or a hearing aid evaluation that was declined, not scheduled, or missed, and not documented to the study. There may also be established referral patterns to specialists which are influencing the data but not clearly captured in this study.

We also note that the proportion of minority patients that enrolled this study is significantly less than what would be expected from our CHEER site database (23.6% minority or ethnic). This may represent a reluctance of provider or patient to enroll in this study or other unknown reasons, rather than and race-related risk in the epidemiology of SSNHL.

Lastly, we did not evaluate the outcome associated with different treatments in this study since it is focused on compliance with KAS in the SHL guideline. A second analysis is underway to describe the outcomes of patients who received oral and/or IT steroid therapy.

CONCLUSION

Most of the patients with ISSNHL were new visits to the otolaryngologist. Most patients are middle aged (in their 60s) and are seen by the ENT specialist in 15 days. Patients can present with tinnitus, ear fullness, and dizziness. Less than half of the patients (43%) saw the otolaryngologist or audiologist initially. If the patient presents to the ER first, their likelihood of seeing the specialist earlier is greater, but this earlier path to treatment does not affect the resultant PTA. Many of the patients are treated with steroids. Otolaryngologists are compliant with the vast majority of the CPGs except for those that are based on education and counseling. Perhaps effective educational strategies can be developed to aid the ENT doctor to obtain better compliance with the KAS. There are many opportunities for the non-otolaryngologist to improve in not ordering CTs of the head and laboratory tests in patients with ISSNHL. These physicians should also order MRIs or ABRs to rule out retrocochlear pathology and should try to educate the patients about the nuances in ISSNHL. Quality is ultimately improved with a clearer knowledge of how to evaluate and treat this particular condition.

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APPENDIX 1: Key Action Statements

STATEMENT 1 (Strong Recommendation). EXCLUSION OF CONDUCTIVE HEARING LOSS: Clinicians should distinguish sensorineural hearing loss (SNHL) from conductive hearing loss (CHL) in a patient presenting with sudden hearing loss.

STATEMENT 2 (Recommendation). MODIFYING FACTORS: Clinicians should assess patients with presumptive sudden sensorineural hearing loss for bilateral sudden hearing loss, recurrent episodes of sudden hearing loss, or focal neurologic findings.

STATEMENT 3 (Strong Recommendation Against). COMPUTED TOMOGRAPHY (CT): Clinicians should not order computerized tomography of the head/brain in the initial evaluation of a patient with presumptive SSNHL.

STATEMENT 4 (Recommendation). AUDIOMETRIC CONFIRMATION OF ISSNHL: Clinicians should diagnose presumptive ISSNHL if audiometry confirms a 30-dB hearing loss at 3 consecutive frequencies AND an underlying condition cannot be identified by history and physical examination.

STATEMENT 5 (Strong Recommendation Against). LABORATORY TESTING: Clinicians should not obtain routine laboratory tests in patients with ISSNHL.

STATEMENT 6 (Recommendation). RETROCOCHLEAR PATHOLOGY: Clinicians should evaluate patients with ISSNHL for retrocochlear pathology by obtaining an MRI, auditory brainstem response (ABR), or audiometric follow-up.

STATEMENT 7. PATIENT EDUCATION (Strong Recommendation): Clinicians should educate patients with ISSNHL about the natural history of the condition, the benefits and risks of medical interventions, and the limitations of existing evidence regarding efficacy.

STATEMENT 8 (Option). INITIAL CORTICOSTEROIDS: Clinicians may offer corticosteroids as initial therapy to patients with ISSNHL.

STATEMENT 9 (Option). HYPERBARIC OXYGEN THERAPY: Clinicians may offer hyperbaric oxygen therapy within 3 months of diagnosis of ISSNHL.

STATEMENT 10 (Recommendation Against). OTHER PHARMACOLOGIC THERAPY: Clinicians should not routinely prescribe antivirals, thrombolytics, vasodilators, vasoactive substances, or antioxidants to patients with ISSNHL.

STATEMENT 11 (Recommendation). SALVAGE THERAPY: Clinicians should offer IT steroid perfusion when patients have incomplete recovery from ISSNHL after failure of initial management.

STATEMENT 12 (Recommendation). OUTCOMES ASSESSMENT: Clinicians should obtain follow-up audiometric evaluation within 6 months of diagnosis for patients with ISSNHL.

STATEMENT 13 (Strong Recommendation). REHABILITATION: Clinicians should counsel patients with incomplete recovery of hearing about the possible benefits of amplification and hearing-assistive technology (HAT) and other supportive measures.

Table 1a

Demographics

Characteristic	New Patients (n=117)	Follow-up Patients (n=56)	All (n=173)
Enrolled in Substudy	91 (85.8%)	37 (75.5%)	128 (82.6%)
Does subject meet study criteria	117 (100.0%)	56 (100.0%)	173 (100.0%)
Site Type			
Academic	26 (22.2%)	23 (41.1%)	49 (28.3%)
Community	91 (77.8%)	33 (58.9%)	124 (71.7%)
Demographics			
Age (median, 25th–75th)	59, 46–68	61, 49–71	60, 47–69
Mean (SD)	56.1 (15.8)	57.7 (16.7)	56.6 (16.1)
Gender			
Male	57 (49.1%)	27 (48.2%)	84 (48.8%)
Female	59 (50.9%)	29 (51.8%)	88 (51.2%)
Declined to answer	1 (0.9%)	0 (0.0%)	0 (0.0%)
Race			
Caucasian	104 (89.7%)	48 (85.7%)	152 (88.4%)
Black or African American	4 (3.4%)	6 (10.7%)	10 (5.8%)
Asian	2 (1.7%)	1 (1.8%)	3 (1.7%)
American Indian or Alaska Native	0 (0.0%)	0 (0.0%)	0 (0.0%)
Other	5 (4.3%)	1 (1.8%)	6 (3.5%)
Declined to answer	1 (0.9%)	0 (0.0%)	1 (0.6%)

Table 1b

Presenting Characteristics

Characteristic	New Patients (n=117)	Follow-up Patients (n=56)	All (n=173)
Presenting Characteristics			
Onset of Hearing Loss, Days Before Enrollment (median, 25th–75th)	15, 7–30	30, 16–46	20, 9–35
Mean (SD)	36.4 (89.6)	36.6 (31.2)	36.5 (75.7)
Ear affected			
Right	58 (49.6%)	26 (46.4%)	84 (48.6%)
Left	59 (50.4%)	30 (53.6%)	89 (51.4%)
First Occurrence	116 (99.1%)	55 (98.2%)	171 (98.8%)
Type of Visit			
Initial visit (first time seen at this site for presenting condition)	117 (100.0%)	0 (0.0%)	117 (67.6%)
Follow-up visit	0 (0.0%)	56 (100.0%)	56 (32.4%)
Patient has the following			
Neoplasm, either untreated or under active treatment with chemotherapy or radiation therapy	1 (0.9%)	4 (7.1%)	5 (2.9%)
Autoimmune disorder	2 (1.7%)	5 (8.9%)	7 (4.0%)
Diabetes	11 (9.4%)	9 (16.1%)	20 (11.6%)
Neurological disorder that may predispose to hearing loss (ie, multiple sclerosis)	3 (2.6%)	1 (1.8%)	4 (2.3%)
None of the above	101 (86.3%)	41 (73.2%)	142 (82.1%)

Table 2a

Exam Findings

Characteristic	All SSNHL (n=173)		Prior Oral Steroid Use (n=79)		Prior TI Steroid Use (n=18)		Idiopathic SSNHL Patients (n=142)	
	Affected Ear	Unaffected Ear	Affected Ear	Unaffected Ear	Affected Ear	Unaffected Ear	Affected Ear	Unaffected Ear
Pinna and periauricular area are normal	171/173 (98.8%)	168/173 (97.1%)	79/79 (100.0%)	78/79 (98.7%)	18/18 (100.0%)	18/18 (100.0%)	141/142 (99.3%)	138/142 (97.2%)
Canal: Ear canal skin is not inflamed or edematous	167/173 (96.5%)	166/173 (96.0%)	77/79 (97.5%)	76/79 (96.2%)	18/18 (100.0%)	18/18 (100.0%)	138/142 (97.2%)	137/142 (96.5%)
Tympanic membrane intact	168/173 (97.1%)	169/173 (97.7%)	77/79 (97.5%)	78/79 (98.7%)	15/18 (83.3%)	18/18 (100.0%)	138/142 (97.2%)	139/142 (97.9%)
Exceptions noted	1/173 (0.6%)	0/173 (0.0%)	1/79 (1.3%)	0/79 (0.0%)	0/18 (0.0%)	0/18 (0.0%)	1/142 (0.7%)	0/142 (0.0%)
Tympanometry								
Normal	140 (80.9%)	145 (83.8%)	62 (78.5%)	62 (78.5%)	13 (72.2%)	15 (83.3%)	116 (81.7%)	120 (84.5%)
Flat	21.2 (%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (5.6%)	0 (0.0%)	1 (0.7%)	0 (0.0%)
Negative Pressure	5 (2.9%)	2 (1.2%)	2 (2.5%)	1 (1.3%)	1 (5.6%)	1 (5.6%)	4 (2.8%)	1 (0.7%)
Speech Testing								
Speech Discrimination Score								
Median, 25th-75th	80, 16-96	100, 92-100	52, 8-96	100, 96-100	24, 8-75	98, 90-100	80, 16-96	100, 96-100
Mean (SD)	59.0 (39.6)	95.4 (8.4)	50.7 (41.5)	95.9 (9.1)	42.4 (39.7)	91.9 (17.3)	60.4 (40.1)	95.9 (6.8)
Speech Reception Score								
Median, 25th-75th	40, 20-70	15, 10-20	53, 20-73	15, 7-20	70, 25-80	15, 5-20	35, 20-65	15, 10-20
Mean (SD)	43.3 (27.9)	17.9 (12.5)	47.8 (28.4)	16.5 (13.8)	54.6 (30.9)	19.2 (20.9)	40.6 (27.4)	15.8 (10.2)

Table 2b

Air and Bone Pure Tone Audiometry (PTA) by Ear (Affected, Unaffected)

Characteristic	All SSNHL (n=173)		Prior Oral Steroid Use (n=79)		Prior IT Steroid Use (n=18)		Idiopathic SSNHL Patients (n=142)	
	Affected	Unaffected	Affected	Unaffected	Affected	Unaffected	Affected	Unaffected
Air								
PTA Std (N)	168	169	75	76	15	16	137	138
Median, 25th–75th	50, 32–79	15, 10–22	65, 38–87	15, 10–21	70, 45–78	16, 12–20	48, 30–77	13, 10–20
Mean (SD)	55.3 (27.3)	17.3 (10.4)	61.2 (27.2)	16.2 (9.8)	64.2 (22.6)	17.0 (8.8)	53.8 (27.6)	16.1 (9.9)
PTA MidFreq (N)	167	168	75	76	15	16	136	137
Median, 25th–75th	55, 35–78	18, 12–30	68, 38–85	17, 10–28	68, 40–77	17, 12–27	52, 33–78	17, 10–28
Mean (SD)	57.1 (26.9)	21.6 (13.9)	62.6 (27.2)	19.5 (12.7)	63.0 (22.8)	20.0 (12.4)	55.4 (27.5)	19.9 (13.5)
PTA HiFreq (N)	64	65	37	38	9	10	50	51
Median, 25th–75th	71, 54–92	27, 15–42	80, 57–97	25, 13–42	78, 57–87	28, 20–42	68, 52–92	27, 13–37
Mean (SD)	68.8 (24.8)	32.4 (22.0)	71.2 (27.4)	29.6 (20.7)	71.7 (19.2)	32.0 (17.5)	67.6 (25.5)	28.3 (19.9)
Bone								
PTA Std (N)	157	158	69	69	12	11	127	128
Median, 25th–75th	47, 30–70	13, 8–20	58, 35–72	12, 7–18	64, 53–78	17, 10–25	42, 27–67	13, 8–18
Mean (SD)	50.4 (26.1)	16.6 (13.8)	55.9 (26.2)	13.5 (9.5)	64.9 (23.2)	18.0 (10.5)	48.7 (26.3)	15.2 (12.2)
PTA MidFreq (N)	152	152	68	68	12	11	125	125
Median, 25th–75th	52, 32–74	17, 10–27	63, 38–76	15, 8–26	70, 48–75	20, 12–30	48, 30–70	15, 8–27
Mean (SD)	53.2 (27.0)	20.6 (15.8)	58.0 (26.8)	17.3 (11.9)	63.8 (25.8)	21.7 (13.3)	51.6 (27.4)	18.9 (14.5)
PTA HiFreq (N)	22	22	14	14	4	4	17	17
Median, 25th–75th	64, 22–91	19, 10–42	73, 22–100	15, 10–30	73, 51–76	36, 23–57	63, 22–78	18, 10–27
Mean (SD)	56.7 (34.4)	28.9 (27.1)	64.3 (37.1)	22.7 (20.1)	63.3 (22.4)	40.0 (23.5)	55.0 (34.9)	22.8 (18.8)
Bone Masked	150/160 (93.8%)	16/158 (10.1%)	67/72 (93.1%)	6/72 (8.3%)	15/16 (93.8%)	0/16 (0.0%)	125/132 (94.7%)	12/129 (9.3%)

Pure Tone Audiometry (Std) = 500Hz, 1000Hz, 2000Hz

Pure Tone Audiometry (MidFreq) = 1000Hz, 2000Hz, 4000Hz

Pure Tone Audiometry (HiFreq) = any three consecutive frequencies beginning at >1000Hz

Table 3. (online only)**Results and Compliance Assessment by Guideline Statement**

Statement	Results	Compliance Assessment
Statements 1–3 are specific to all SSNHL patients (n=173).		
STATEMENT 1 (Strong Recommendation). EXCLUSION OF CONDUCTIVE HEARING LOSS	Assessed via review of audiometric statistics at the patient level. Two patients were ultimately excluded (or 1.1%) reducing the final data set to 173 patients.	The results suggest high (98.9%) guideline compliance based on the definition implemented in practice in this study.
STATEMENT 2 (Recommendation). MODIFYING FACTORS	This was part of the eligibility criteria and therefore was not specifically assessed.	N/A
STATEMENT 3 (Strong Recommendation Against). COMPUTED TOMOGRAPHY (CT)	<p>CT Scan indicated as prior treatment by "first seen" provider:</p> <ul style="list-style-type: none"> 2 of 20 (30.0%) patients seen in urgent care 5 of 19 (26.3%) patients seen in ER 1 of 56 (1.8%) patients seen in primary care 2 of 76 (2.6%) patients seen in otolaryngology 0 of 2 patients seen in otolaryngology/audiology Recommended for 2 patients (2.6%) at current otolaryngology visit and potential/future planned for 1 patient (1.3%). 	The results suggest high (97.4%) guideline compliance in otolaryngology practices based on the current visit or future option (98.7%). In terms of other first visit providers, compliance is as follows: 73.7% in Emergency Room; 70.0% in Urgent Care; and 98.2% in Primary Care.
The remaining statements are specific to the ISSNHL patients (n=142).		
STATEMENT 4 (Recommendation). AUDIOMETRIC CONFIRMATION OF ISSNHL	<ul style="list-style-type: none"> Otolaryngologists at participating sites were not asked to indicate their diagnosis (primarily to facilitate study collection solely through the research coordinator). In a statistical analysis of the dataset using the audiometric data and the underlying condition question (as defined in the guideline), of the 173 patients in the final data set, 142 (82.1%) had idiopathic sudden sensorineural hearing loss with a 30 dB hearing loss at three consecutive frequencies and absence of potentially contributing factors (ie, neoplasm, autoimmune disorder, diabetes, neurological disorder). 	Per the AAO-HNSF's guideline citing Rauch [1], "Up to 90% of SSNHL, however, is idiopathic at presentation and is presumptively attributed to vascular, viral, or multiple etiologies."
STATEMENT 5 (Strong Recommendation Against). LABORATORY TESTING	<ul style="list-style-type: none"> 5 (3.5%) patients indicated they had laboratory testing (RPR, ESR, ANA, and/or CBC) prior to their current visit with the otolaryngologist. At the current visit with the otolaryngologist, 12 (8.5%) patients had laboratory testing recommended. Three (25%) of these patients had indicated they had received laboratory testing prior. Laboratory work was indicated as a future/potential treatment for 5 (3.5%) patients. 	The results suggest reasonable (91.5%) guideline compliance in otolaryngology practices.
STATEMENT 6 (Recommendation). RETROCOCHLEAR PATHOLOGY	<ul style="list-style-type: none"> Information was not collected on ABR. MRI was recommended at a prior visit to other providers as follows: <ul style="list-style-type: none"> 6 (37.5%) patients seen in urgent care (n=16); 6 (35.3%) patients seen in the ER (n=17); 11 (19.6%) patients seen in primary care (n=56). When excluding patients who indicated they had received MRI prior, at the current otolaryngology visit MRI was recommend to: 	The results suggest high (100%) guideline compliance in otolaryngology as all patients received audiometric testing and MRI was also recommended for some patients.

Statement	Results	Compliance Assessment
	– 33 (31.0%) patients and indicated as a future option for an additional 42 (38.0%) patients.	
STATEMENT 7. (Strong Recommendation) PATIENT EDUCATION	<ul style="list-style-type: none"> At their current visit with the otolaryngologist, 92.3% of ISSNHL patients indicated they were provided educational information about their condition and 89.4% indicated they were provided a description of treatment options. In other settings these percentages, respectively, are: <ul style="list-style-type: none"> – 42.1% and 36.8% (ER); – 40.0% and 35.0% (urgent care); – 25.0% and 28.6% (primary care). 	While the degree of education and discussion is not known, the results suggest compliance in the range of 89.4–92.3% in otolaryngology practices. This is drastically reduced when seen in other settings.
STATEMENT 8 (Option). INITIAL CORTICOSTEROIDS	<ul style="list-style-type: none"> When patients who indicated they had received oral steroids prior were removed, 65 (86.7%) patients were recommended oral steroids at the current visit with the otolaryngologist. At the “first provider seen” level, the percent of patients recommended oral steroids at other provider types was: <ul style="list-style-type: none"> – 10 (62.5%) patients seen in the Emergency Room; – 10 (58.8%) patients seen in Urgent Care; – 29 (51.8%) patients seen in Primary Care. 	Oral steroids are being utilized as an option as indicated in the guideline.
STATEMENT 9 (Option). HYPERBARIC OXYGEN THERAPY	<ul style="list-style-type: none"> One patient indicated they had been treated with hyperbaric oxygen therapy prior to their current visit with otolaryngology (this patient’s first visit was to Primary Care). At the current visit with the otolaryngologist, two patients (1.4%) were recommended for hyperbaric oxygen therapy (both within an academic site). 	There is low utilization of hyperbaric oxygen therapy as an option as indicated in the guideline.
STATEMENT 10 (Recommendation Against). OTHER PHARMACOLOGIC THERAPY	<ul style="list-style-type: none"> 8 (5.6%) patients indicated they had been treated with other pharmacologic therapy (7 with antivirals and 1 with thrombolytics; 0 with antioxidants and vasodilators) prior to the current visit. The antivirals were recommended treatment for patients seen in Emergency Room (n=2); Urgent Care (n=1); and Primary Care (n=4). The thrombolytics were recommended at a prior otolaryngologist visit (n=1). At the current visit with the otolaryngologist, 7 (4.9%) patients were recommended antivirals and 2 (1.4%) patients were recommended antioxidants; no thrombolytics or vasodilators were recommended. 	The results suggest high (93.7%) guideline compliance in otolaryngology practices and other provider types (92.1%).
STATEMENT 11 (Recommendation). SALVAGE THERAPY This statement requires knowledge of the clinical judgement of the otolaryngologist which was not captured due to the design of the study. In the data collected, treatment with IT steroids was categorized as recommended treatment or as salvage therapy. The results of both are provided.	<p><i>IT as salvage therapy:</i></p> <ul style="list-style-type: none"> 7 (4.9%) patients had been treated with IT as salvage therapy prior to the current visit (3 seen in Emergency Room; 2 in Urgent Care; and 2 in Primary Care). At the current visit with the otolaryngologist, 11 patients (7.7%) were recommended for IT as salvage therapy and 14 patients were categorized as potentially having this therapy recommended at a future visit. <p><i>IT as recommended treatment:</i></p> <ul style="list-style-type: none"> 14 (9.9%) patients had been treated with IT steroids prior to the current visit. 	The results suggest that IT steroids are being offered both as initial and salvage treatment.

Statement	Results	Compliance Assessment
	<ul style="list-style-type: none"> At the current visit with the otolaryngologist, 53 (37.3%) patients had recommended treatment of IT steroids and additionally 27 patients (19.0%) had IT steroids for potential future treatment. 	
STATEMENT 12 (Recommendation). OUTCOMES ASSESSMENT	Results: This statement cannot be assessment based on the cross-sectional design.	N/A
STATEMENT 13 (Strong Recommendation). REHABILITATION	<ul style="list-style-type: none"> 3 (2.1%) patients indicated they had been treated prior with counseling or rehabilitative services (1 seen in Emergency Room; 1 in Urgent Care; and 1 during a prior visit to otolaryngologist). At the current visit with the otolaryngologist, five (3.5%) patients were recommended counseling and rehabilitative services with future potential for 11 (7.7%) patients. 	The results suggest low guideline compliance in otolaryngology practices and other provider types.