

Ten Top Topics That Neuro-Otologists Think General Practitioners and Family Medicine Specialists Must Know: A Multi-Center Study Using Delphi Method

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Abstract- In order to decrease medical errors and improve organized, targeted education pre- and post-graduation, we intended to detect 10 most important concepts that neuro-otologists believe family physicians and general practitioners must know. A multi-center study based on Delphi's method was designed and conducted in three stages. Of 31 topics gathered by expert panel, 10 top priorities were ranked based on 50 neuro-otologists' opinion over the country. Early diagnosis and management of sudden sensorineural hearing loss, foreign body removal from external ear canal, proper management of otitis extern, and management of emergency situations in chronic otitis media gained the highest scores among all. Also, some topics, such as managing serous and acute otitis media, differentiating peripheral vs. central vertigos, and early hearing screening at birth were among top topics, contrary to others, such as surgery in only hearing ears, or hearing losses after COM surgeries. Almost all of the top-ranked topics are among critical/organ saving, or most prevalent medical concerns in all of the world. Sudden deafness, complicated COM, and mis-diagnosing vertigo may be organ/life threatening, while foreign bodies or inflammations of external ear, acute or serous otitis media, and congenital hearing loss are among the most prevalent medical problems worldwide, with numerous malpractices in their diagnosis and management. Regarding educational and practical priorities should be considered a basic step in neurotology field, and targeted programming policies.

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Introduction

The expansile nature of medical sciences and emergence of unknown diseases reveals the importance of improving knowledge and participating continuous

medical education and complementary courses for medical practitioners (1). Graduated physicians in non-academic atmospheres who lagged participating in Continuous Medical Education programs for years will gradually lose confidence in their practice (2). Retraining,

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life-long learning and participating in continuous medical education programs are requisite parts of medical education. Parliament of Iran has passed a law for continuing medical education from 1900 to maintain and reinforce medical knowledge for post-graduate general practitioners (3). The first step to provide a proper study guide is to identify pitfalls and demands in medical education and prioritize them (4-6).

In many countries, otorhinolaryngology and head and neck surgery is a specialty of medicine, which has a course of four-to-five-year residency program. Specialists in this field can attend different fellowship subdivisions, such as rhinology, neuro-otology, head and neck surgery and so on. Neurotology and skull-base surgery is a field that includes very important diseases and conditions of ear and middle and lateral skull base, like trauma, infections, malignancies, and anomalies, that general physicians deal within their everyday practice (7).

Neuro-otology involves management of problems in a very critical anatomical field with condensed important adjacent structures. Also, some diseases of this sub-specialty, like acute otitis media, otitis extern, and hearing loss, are very common in general population and are among the most common general physician visits. On the other hand, general physicians and family medicine specialists are at the first line of encountering with these patients and are expected to possess sufficient information and skills on management of many diseases, including diseases of this field. If they could not make proper diagnosis and decision making for resolving these problems, the patients would possibly encounter more advanced, irreversible complications. Indeed, medical errors are one of the leading causes of morbidity and even mortality all over the world, organizational transfer of knowledge and insufficiencies in training, or inadequate education and also, inadequate policies are two main origins of medical errors (8). When we presume someone, including a physician, is competent, we don't believe him/her to be qualified in all aspects, but generally in a predefined set of tasks (9). Although competency is not just a list of tasks and skills but determining the "core" competencies and proficiencies in different divisions and subdivisions of medicine is the first step in both pre- and postgraduate medical education programming (10).

These facts, along with being hard to learn and educate physical examinations of the field of ear and neurotology, especially for general practitioners, made us to assess the priorities of neuro-otology topics that general physicians and family medicine specialists must know, according to a consensus between a large sample of neurotologists. This study aimed to generate a guide

plan for future schedules used both for undergraduate medical student educational programs and Continuous Medical Education programs for general practitioners and family medicine specialists. The Delphi method that is used in this study is well suited for researches needed to inform health education and health promotion campaigns, and it has proven a popular tool in information systems research for identifying and prioritizing issues for managerial decision-making (11,12).

Materials and Methods

This study was designed to identify 10 top neuro-otologic precepts that are assumed very important for general physicians and family physicians to know from the viewpoint of neurotologists. Active Iranian neurotologists, both in academic and non-academic settings, and from different provinces of the country attended the study to define a 'top 10' list of precepts. Conditions in both emergency and elective setting were considered, and the targeted population for these precepts were general physicians and family medicine specialists.

The study was designed according to Delphi method and summed up by an "expert panel".

Stage 1: Selecting expert panel

Initially, a list of 10 most active and pioneer neuro-otologists from different first-ranked educational departments of otolaryngology and neuro-otology from different provinces of Iran were selected and the main purpose of the research explained. Of these, 7 neurotologists accepted being as the member of expert panel and completed the study course. At the beginning of the study, each of the panel members requested for library make a list of the most important otologic-neurotologic principles, proficiencies, knowledge and skills from their own viewpoints and clinical and educational expertise, those knowing and acting expected to be obligatory for all general physicians and family medicine specialists. The panelists were asked to declare one to ten or more sentence(s), each representative of a neuro-otology practical rule, in diagnosis or treatment, that they believed general practitioners and family medicine specialists must know in neurotology field. All the panelists were un-aware of the selected topics of other members.

Stage 2: Preparing the list/questionnaire

At the end of the first stage, totally 80 topics were gathered from 7 panelists. Two authors (SN. and AK.), independently reviewed the topics, and finally after

omitting similar topics and combining close-approximate topics, a list of 28 most important neurotologic topics prepared. This combined list was sent back to the panelists to be considered, trace their primary topics in that, and reconsidering and revising their first suggested topics, exclude less relevant or include some more important topics for completing their primary lists. Again the revised lists from each 7 panelists gathered and revised by the two authors (SN. and AK.), and finally, a list of 31 neuro-otologic topics prepared. These 31 topics were in different domains of neurotology, including skull base (3 topics), middle ear (8 topics), vertigo (4 topics), facial nerve (3 topics), hearing loss (5 topics), tinnitus (2 topics), CSF leakage (one topic), and external ear (5 topics).

Stage 3: Sampling and electing top 10 topics

An information sheath, including demographic information of Iranian neurotologists and a table of 31 selected topics prepared and was sent via email to all active neurotology attendings and fellowships in all over provinces of Iran. Inactive neurotologists, or who were active in other medical-paramedical and even in other ENT subspecialties, and those who had not active email addresses or had not active WhatsApp and/or Telegram cellphone applications were excluded from the study.

At this stage, all the participants were informed about purpose of the research and process of preparing the 31-topic list, and asked to give a number of one to ten, as the grade of priority, to one to ten or more topics, in which number 10 was presumed to be the most important and number one as the least important topic that's knowing would be obligatory for general practitioners and family medicine specialists from their own point of view. In the information sheath, the authors insisted that before allocating the points, read all 31 topics, and for selecting the most important topics, they should consider prevalence and sequel and complications of mismanagement of the diseases that those topics mattered. The participants were free to choose less or more than 10 topics, to define more than one sentence with the same digit, but the researchers insisted for not allocate number 10 to more than 10 topics.

After remaining the participants and giving a 2 weeks-time for completing the information sheets, the completed forms gathered. All the data entered in the SPSS version 23 software, and we used the mean and standard deviation of neurotologists' viewpoint scores in descending sorted arrangement for determining top 10 topics.

Results

The final list/questionnaire was sent to 65 neurotologists all over the country in the 3rd stage of Delphi method to prioritize 10 top neurotologic topics about which, knowledge and comprehension are absolutely necessary for general practitioners and family medicine specialists. Ultimately, 50 questionnaires (77%) received back and were analyzed.

From total of 50 neurotologists, 39 male and 11 female, 40 were attending physicians in university hospitals and 10 were non-academician. The mean experience of them as general otolaryngologist was 24.1 ± 2.2 years, and as neuro-otologists was 12.7 ± 2.8 years. Of 50 neurotologists, 35 (70%) had executive positions in their departments, and 19 (38%) had experience as members of international scientific/educational ENT-HNS associations.

In the analysis of the scores of the 31 topics, topic No. 16 (about sudden deafness and its early treatment) had the highest score (9.14 ± 1.895), and topic No. 11 (about probability of reducing hearing after surgery in some COM cases) earned the least score (3.32 ± 2.721). Top 10 topics earned from 9.14 ± 1.895 to 7.70 ± 3.209 scores (table 1) and topics No. 10, 19, 23, 25, 27 obtained borderline scores (i.e., from 7.64 ± 3.141 to 7.32 ± 3.229). Analyzing responses from the academicians independently earned the same top 10s as the total participants, but analyzing those of non-academicians contained topics No. 10 (about traumatic perforation of tympanic membrane) and No. 23 (about traumatic facial nerve palsies) in their top 10s.

Here are the top ten topics that gained the highest scores of priorities and importance, respectively.

Priority No. 1: Sudden sensory neural hearing loss is a medical emergency. Treatment initiated in 10-14 days, and preferably during the first 48 hours, significantly offer better prognosis. When a patient with abrupt hearing loss and normal otoscopy is encountered, this diagnosis should be ruled out by tuning fork tests and audiologic assessment as soon as possible."

Priority No. 2: Foreign bodies of external ear should be removed gently, by adequate-appropriate instruments and preferably, under microscopic observation. Children are recommended to be referred. Oto-microscopy is necessary for removal of foreign bodies of ear canal and impacted cerumen in children.

Priority No. 3: Otitis externa is basically treated with debridement of ear canal and administration of topical antibiotics and anti-inflammatory agents, and except in specific circumstances, there is no need for systemic antibiotics. Otomycosis cases unresponsive to topical treatment, especially in diabetic patients, are

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recommended to be referred to ENT specialist.

Priority No. 4: Known cases of COM with recent purulent discharge and concomitant vertigo and or facial nerve palsy should be admitted and receive intravenous antibiotic promptly. Para-clinical assessment is required, and they may be surgical candidates.

Priority No. 5: Ear and temporal bone are parts of skull base. All types of otitis media and some other diseases of ear may be accompanied and complicated by serious intracranial problems. Family physician should be familiar with these complications and emergently refer the patients.

Priority No. 6: General physicians and family medicine specialists should have the full competency and expertise of precisely examine tympanic membrane and be familiar with its landmarks.

Priority No. 7: Family and general physicians must be capable of differentiating acute and chronic otitis media in children. Serous otitis media may cause hearing loss and delay speech which requires close follow-up and proper intervention. In acute and serous otitis media in

children 6 to 23 months with unilateral disease, and 24 months and older with unilateral or bilateral AOM, who does not suffer from severe pain and fever, it is possible to monitor the patient without administration of antibiotics, during the first 48 hours.

Priority No. 8: Unilateral serous otitis media in an adult, especially in an elder patient may be suggestive of nasopharyngeal carcinoma. In any adult patient with a complaint of ear fullness with earache and hearing loss, precise examination of tympanic membrane, neck, nose and pharynx is necessary.

Priority No. 9: In patients with peripheral vertigo, loss of consciousness, focal neurologic deficits and gait disturbances do not occur. General and family physicians are supposed to detect emergency vertigo/dizziness cases of central origin after thorough history taking and neurologic physical exam.

Priority No. 10: In order to detect hearing loss and intervene most properly, all newborns must undergo hearing screening at the first weeks/month after birth.

Table 1. Top 10 neurotological topics and 5 borderline- and other low-ranked topics that neurotologists think family medicine specialists and general physicians must know.

Priority	Concept	Mean score	SD
Top 10 Topics			
1	Q16: Sudden sensory neural hearing loss is a medical emergency	9.14	1.895
2	Q28: Foreign bodies of external ear should be removed gently, preferably, under microscopic observation	8.66	1.996
3	Q29: Otitis externa is basically treated with debridement of ear canal and administration of topical agents	8.32	2.343
4	Q8: Severe headache, true vertigo, or facial nerve palsy in an activated COM (i.e., complicated COM) should be managed as soon as possible in an in-patient setting	8.28	3.051
5	Q1: ear and temporal bone are constituents of posterior and middle skull base and its diseases may be complicated by intracranial problem due to adjacency	8.20	2.900
6	Q4: all physicians should be familiar with TM landmarks	8.06	2.795
7	Q5: various types of otitis media should be diagnosed and managed properly in children. Not all cases of acute and/or serous otitis media need antibiotics	7.98	2.551
8	Q3: unilateral serous otitis in an adult could be representative of nasopharyngeal tumor	7.84	2.902
9	Q12: physicians should be capable of differentiating vertigo of peripheral or central origins, based on history and physical examination	7.82	2.670
10	Q20: hearing screening is crucial in all newborns	7.70	3.209
Borderline Priorities			
11	Q23: In dealing with facial nerve paralysis, physicians should know that Bell's palsy can be diagnosed only after excluding other causes of facial nerve paralysis and, in post-traumatic facial palsy, nerve decompression may be indicated based on the timing (gradual vs. sudden) and severity of weakness	7.64	3.141
12	Q27: recommendations are against routine ear canal washing, especially in diabetic or immunosuppressed and perforated TM cases.	7.54	2.815
13	Q2: in every patient with an asymmetric/ unilateral non-pulsatile tinnitus or sensory-neural hearing loss, retro cochlear etiologies should be ruled out by means of proper imaging studies	7.52	2.451
14	Q10: in blunt traumatic perforation of TM, water protection is generally all is needed	7.50	3.118
15	Q19: cochlear implant in an earlier age results in better outcomes, (preferred to be performed before 12 months). Missed cases must be referred as soon as possible, especially before 2-4 years-old.	7.32	3.229
Low-Ranked Topics			
16	Q7: simple COM and cholesteatoma are diagnosed clinically, and although managed medically during acute exacerbations, basically are surgically treated diseases and must be referred.	6.80	3.064
30	Q9: surgery should be avoided in only hearing ear, if feasible	4.16	3.478
31	Q11: hearing threshold may be falsely good in a deeply involved COM ears and hearing may reduce after surgery in some COM cases	3.32	2.721

• The topics are summarized in the table

• SD: Standard deviation COM: Chronic otitis media TM: tympanic membrane

Discussion

Several studies have demonstrated that evaluation and conclusion of must-learn and priorities due to recommendations of university attendants and conducting educational and refreshing courses based on the concluded consensus results in better surveillance of patients, proper management of diseases, referral at required time-frame and improves enthusiasm among physicians (12-15). As presented in the results of current study some of the top topics are related to the diseases that might be life-threatening and may interrupt quality of life due to permanent complications (e.g., neurologic deficit) or even lead to death. For example, it has been revealed that delayed management of MOE, often result from inappropriate antibiotic prescriptions (16). Sequentially, delayed treatment directly influences patient prognosis. On the other hand, some top topics are related to the most common conditions or diseases in the mentioned field of medical practice that worth being reminded in yearly educational programs. Also, we think these studies would improve medical education, both in undergraduate and post-graduate levels, then improve medical care by decreasing medical errors and lowering more advanced complications and irreversible sequela. Within otology, there are many specific high-risk areas, in which medical errors may cause serious complications, even if deviation from the standard of medical care is minimal (17,18).

The results of present study emphasized the importance of following concepts in the field of neuro-otology that should be considered and included in educational programs of general practitioners and family medicine specialists. Albeit we categorized 5 further topics as "borderline priorities", such as traumatic facial palsy, Bell's palsy, ear canal washing in elderly or immunocompromised cases, traumatic tympanic membrane perforation, and cochlear implants. These 5 topics gained borderline scores in our study, and independent analyzing priorities of non-academician neurotologists brought two of these in 10 top topics (i.e., topic No. 10, about traumatic perforation of tympanic membrane and No. 23 about traumatic facial nerve palsies). This sub-category of our sample included only 10 neurotologists, which seemed being merely small size, and perhaps performing this study in a larger sample size or in other countries would bring some of these topics in the top 10 neurotology list.

These are top 10 neurotology topics that this study

showed their learning and acting as absolute necessity for general physicians and family medicine specialists from viewpoint of Iranian Neurotologists:

1. Sudden sensory neural hearing loss is a medical emergency

Sudden sensorineural hearing loss (SSNHL) is defined by an abrupt hearing loss of sensorineural type that occurs within a 72-hour period. Although some known etiologies e.g., neoplasm, autoimmune, metabolic and vascular are proposed in some instances, most cases are idiopathic. The disease is termed idiopathic only after sufficient diagnostic work-up and excluding specific causes. The prognosis of hearing recovery depends on multiple factors, two of the most important of them are the severity of disease at presentation and beginning early treatment. An initial hearing level greater than 80 dB correlates with a poor prognosis (19-21). Prompt assessment and management of sudden sensorineural hearing loss may offer the opportunity to reverse the hearing loss. For all patients with SSNHL glucocorticoids are recommended (systemic, intratympanic or combined therapy), within 2 weeks of onset. Hyperbaric oxygen is an option only when combined to corticosteroid. Due to clinical trials and updates of treatment algorithm, antioxidants are recommended against in routine clinical practice (22). There is currently no evidence to support the use of antiviral drugs in the treatment of ISSHL (23).

2. Foreign bodies of external ear should be removed gently, preferably, under microscopic observation

The external auditory canal (EAC) comprises a medial bony portion and the lateral cartilaginous portion. The skin that lines the bony part is thin and lacks hair, glands and subcutaneous tissue. The bony-cartilaginous junction is the narrowest part of EAC (21). Ear canal foreign bodies are about 26% of ENT foreign bodies in children. Immobility of the patient, sufficient illumination and appropriate instruments are crucial for extraction of aural foreign bodies (24-26). Due to high risk of iatrogenic trauma to external ear canal or tympanic membrane, it is advised to refer patient to a specialist in case of doubt in performing the procedure successfully.

3. Otitis externa is basically treated with debridement of ear canal and administration of topical agents

The infection or inflammation of EAC, range from mild inflammation to osteomyelitis of temporal bone that is part of skull-base is a common disease. This process

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may be acute or chronic (24). Topical therapy is the treatment of choice for acute otitis externa, and systemic antibiotics are prescribed only in special circumstances e.g., severe disease or immunocompromised host. Cleansing and thorough debridement of the external canal is the most important first step in treatment process of otitis extern. The removal of cerumen, skin scale, and purulent discharge greatly facilitates healing and improves penetration of topical agent into the inflamed skin. There are no randomized trials directly comparing topical and oral antibiotic therapies. However, it seems that combined therapy of an oral and topical antibiotic does not enhance the response in uncomplicated external otitis (27).

4. Severe headache, true vertigo, or facial nerve palsy in an activated COM (i.e., complicated COM) should be managed as soon as possible in an in-patient setting

Chronic Otitis Media (COM) is characterized by prolonged inflammatory process or infection of middle ear and mastoid. COM may be with or without cholesteatoma, both types are progressive diseases and sometimes they may become complicated toward intratemporal or intracranial complications, some of them may be life threatening.

One of the risk factors for recurrent bacterial meningitis is defects of inner ear and also, otomastoiditis may develop toward meningitis. (28) Hearing loss, labyrinthine fistula, facial nerve paralysis, and intracranial infections are emergency states that may occur due to COM. Children with intracranial complications due to complicated COM are more likely to present with headache, nausea, and vomiting, whereas adults are more likely to present with decreased level of consciousness. Neurosurgical collaboration should be urgently sought when an intradural process is identified. Although declining in incidence, the complications of temporal bone infections continue to carry the potential for extensive morbidity and mortality due to intracranial and extracranial complications, and risk of neurovascular involvement. (27) Brain abscess and meningitis are the most commonly reported intracranial complications. Various intracranial complications may occur simultaneously (29,30).

5. Ear and temporal bone are constituents of posterior and middle skull base, and its diseases may be complicated by intracranial problem due to adjacency

Petrous and squamous portions of temporal bone are parts of intracranial surface of middle cranial fossa (MCF). The posterosuperior edge of the petrous part, is

the posterior end of MCF (24).

6. All physicians should be familiar with TM landmarks

Normal TM is pearly, translucent, and concave. The most prominent landmark is manubrium (handle of malleus), with the umbo in the center of TM. (24) Only for diagnosing some of most prevalent diseases in human being, like acute or serous otitis media and sensorineural hearing loss, a general physician or family medicine specialist must be familiar with TM landmarks and diagnose normal and abnormal TM.

7. Various types of otitis media should be diagnosed and managed properly in children. Not all cases of acute and/or serous otitis media need antibiotics

Otitis media (OM) is among the most common disease in young children (24). Acute otitis media is an acute infection with bulging of tympanic membrane due to increased pressure of middle ear that is often accompanied by rapid signs and symptoms that may include fever, otalgia, and TM erythema. On the other hand, in otitis media with effusion these symptoms of inflammation may be absent, and hearing loss due to middle ear effusion is the most prominent symptom. The mainstay of the management in acute otitis media is systemic antibiotic, however due to recent guidelines in non-severe cases watchful waiting is possible. Close observation for 48 hours may be considered in 6-23 months patients with unilateral non-severe disease and 24 months or older children with uni/bilateral non-severe infection (31).

8. Unilateral serous otitis in an adult could be representative of nasopharyngeal tumor

Nasopharyngeal carcinoma, the most common malignancy of nasopharynx, may cause serous otitis media in about one-third of patients, which is believed to be secondary to eustachian tube dysfunction. Nasopharyngeal carcinoma frequently originates from the fossa of Rosenmüller, that's why patients may remain asymptomatic for a prolonged period (32). Hence, serous otitis media in adults, necessitates endoscopic and/or radiologic assessment of nasopharynx.

9. Physicians should be capable of differentiating vertigo of peripheral or central origins, based on history and physical examination

Vertigo is an illusion of motion, either the patient feels movement internally, or the objects in the surrounding are moving. The clinical history is the key to determining the

cause of imbalance. From the history, the clinician will have a general idea of whether the symptoms are attributable to a vestibular disorder and whether this disorder is central or peripheral in origin (18).

10. Hearing screening is crucial in all newborns

Newborn hearing loss is very common and even certain populations (e.g., with a family history of hearing loss, history of NICU admission) are at greater risk. Therefore, all neonates must undergo hearing screening prior to 1 months of age. Surveillance of hearing and speech and language status is essential for all children, whether the infant passed universal newborn hearing screening or not. Earlier detection of hearing loss leads to earlier intervention, in turn improving patient outcomes. Cochlear implantation should be adopted into a well-coordinated early detection and intervention program if indicated. 1,3, 6, vs. 1,2, 3 rules of thumb in universal newborn hearing screening (UNHS). In general, improved language comprehension, and expressive development are associated with earlier CI. Infants who fail hearing screening test require additional audiologic evaluation by three months of age (24).

It seems not considering the above-mentioned topics by general physicians may cause important and irreversible complications and sequels, such as irreversible SNHL, deterioration of intracranial complications, improperly prescription of systemic antibiotics, and even mortality. Also, there are many important "borderline" topics, about facial nerve palsy, traumatic tympanic membrane perforation, and etc. If this study would be performed with a larger sample size or in an international scale, the order of some of these topics would be changed.

Medical education should be targeted on selecting the most efficacious material to train physicians who are proficient and possess knowledge on must-learn issues in medicine, especially in critical areas of medicine including neuro-otology in which miss-management may result in disastrous complications for patient.

Limitations

The results of this study are based on a consensus among Iranian neuro-otologists that may be influenced by the referral system and medical policies in this particular country. Conducting international research may contribute to more generalized results. On the other hand, future researches considering the feedback received from general practitioners and family physicians party would be valuable.

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