Chapter 24
The Role of the Audiologist in Tinnitus Practice

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Keypoints

1. Audiologists play a significant role in most models of tinnitus health care provision, including both the assessment and management of tinnitus as reported by Henry et al. (Am J Audiol 14:49–70, 2005; Am J Audiol 14:21–48, 2005).
2. Audiologists have expertise assessing auditory function; training in auditory physiology and psychology prepares them to provide tinnitus counseling; and they are able to fit hearing aids and other instruments for tinnitus therapies.
3. In some situations, the Audiologist will be part of a multidisciplinary team (e.g., in a large metropolitan hospital) that may potentially include Otologists, Neurologists, Hearing Therapists, and Psychologists.
4. In other circumstances, the Audiologist may work in comparative isolation and be responsible for the majority of tinnitus care.
5. In this chapter, the authors consider the Audiologists' perspectives of tinnitus.
6. We describe Audiologists' skills and attributes in their role in tinnitus management; present models for tinnitus practice; and introduce a Matrix framework from within which clinicians can choose strategies for patients with varying needs.

Keywords Tinnitus • Audiology • Assessment • Rehabilitation

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What is an Audiologist?

Audiologists are professionals trained in the clinical application of hearing science. Audiology exists as a health care profession in English speaking countries, the Americas, and the Pacific Rim; elsewhere similar roles are undertaken by medically qualified professions or technicians [1]. Henceforth, in this chapter, we use the name "Audiologist" to identify professionals with nonmedical University qualifications in audiology. However, much of what we discuss could equally apply to Audiological Physicians, Hearing aid Acousticians, and others who provide nonmedical assessment and management of tinnitus.

Audiologists have a broad scope of practice encompassing most aspects of hearing assessment and management. This practice includes behavioral and electrophysiological evaluations of hearing, rehabilitation of hearing loss through technology (hearing aids, cochlear implants), hearing loss prevention, and assessment and management of balance and tinnitus. Due to the strong association between hearing loss and tinnitus (see Chaps. 34 and 35), it is not surprising that most Audiological associations or registration bodies recognize that tinnitus is at the core of audiology practice.

"Audiologists are qualified to evaluate, diagnose, develop management strategies, and provide treatment and rehabilitation for tinnitus patients" [2].

Audiology began to develop as a distinct profession after World War II [3]. Shortly after this, audiological methodology (such as hearing aids) began to be applied for treating tinnitus [4, 5]. The use of sound as a treatment medium became more common with the development of ear-level maskers in the 1970s and the use of this technology in newly developed tinnitus clinics [4, 6]. The profile of audiology in tinnitus management rose

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again in the 1990s with the widespread adoption of Tinnitus Retraining Therapy (TRT, [7]). The current decade has seen the continued development and diversification of tinnitus management methods available to audiologists. Some notable additions to the audiologists' armory being Tinnitus Activities Treatment [8], Audiologic Tinnitus Management [9, 10], Neuromonics [11], and modified versions of TRT [12]. As the scale of tinnitus worldwide has become apparent, Hearing aid manufacturers and technology companies have also become more involved in improving management tools. A comprehensive survey of hearing health care practice internationally identified that audiologists are responsible for tinnitus management in most countries [1] .

Audiology Skills Applied to Tinnitus

The skills that audiologists acquire during their training and practice of "general" audiology are directly applicable to the more specialized area of tinnitus (Table 24.1). For example, audiologists need to counsel anxious hearing aid candidates and provide support to emotional parents on diagnosis of hearing loss in children. This counseling is not too dissimilar to counseling the distressed tinnitus sufferer.

Most educational programs in audiology offer limited training specific to tinnitus [10], but there are many regular opportunities for audiologists to gain further tinnitus knowledge. Scientific meetings, such as the International Tinnitus Seminars and Tinnitus Research Initiative meetings, are excellent opportunities to learn of the latest scientific developments in the field. Annual training workshops, such as one hosted annually by Iowa University as well as the European Tinnitus Course in Cambridge, build on existing knowledge to provide additional skills toward tinnitus practice. Audiologists should also have sufficient training to implement practice models described in this book and in other publications [13, 14]. Many established tinnitus clinics (including those at Addenbrooke's Hospital and The University of Auckland) are willing to share experiences and clinical protocols with clinicians new to the field.

Diagnosis and Assessment

Given that patients with hearing and balance issues are internationally being referred directly to an audiologist, care should be taken to ensure effective and efficient diagnosis. This will usually involve four themes:

Table 24.1 Consideration of audiological skills in general use and as applied to tinnitus. American Speech and Hearing Association audiology scope of practice guidelines [56] were used to formulate the categories of audiology practice

General audiology	Tinnitus audiology
Hearing loss prevention and promotion	Tinnitus prevention and promotion
Identification of auditory and balance disorders	Identification of tinnitus and tinnitus related pathology
Behavioral and electrophysiological assessment of auditory function	Behavioral and electrophysiological assessment of tinnitus
Intraoperative monitoring of audiology function	Intraoperative monitoring of audiology function during tinnitus-related neurosurgery
Assessment and management of Auditory Processing Disorders	Evaluation and intervention of tinnitus (and Hyperacusis) in recovery from head and neck trauma
Otoscopy and middle ear function tests examining for the obstruction of external auditory meatus and middle ear pathology	Evaluation of potential contribution of external and middle ears to tinnitus symptoms.
Assessing the "Hearing needs" of patients	Tinnitus needs assessment
Referral and consultation with other professionals	Referral and consultation with other professionals
Development of intervention and rehabilitation plans	Tinnitus management plan
Select and fit hearing aids and/or assistive devices to improve hearing	Select and fit hearing aids and/or sound generating devices for tinnitus management
Assessment and management of severe-profound hearing loss with Cochlear Implants	Assessment and management of tinnitus accompanying severe-profound hearing loss with Cochlear Implants
Use counseling to address psychosocial aspects of hearing loss and provide communication skills	Tinnitus counseling
Assessment of hearing intervention outcomes	Tinnitus outcomes measurement

- Identification of treatable otological pathology
- Assessment of hearing and tinnitus testing
- Assessment of tinnitus handicap
- Identification of treatable psychological symptoms, such as anxiety and depression

Each of these themes are now discussed in turn. Given appropriate teaching and support, there is no reason why an audiologist should not diagnose otological pathology. A protocol approach is advocated, wherein investigations and onward referral are indicated by the presence of certain symptoms or test findings. An example is in centers located in the UK (Cambridge and Liverpool for example) where patients with unilateral tinnitus and/or asymmetric hearing thresholds are referred for Magnetic Resonance Scanning by the audiologist leading the Tinnitus Clinic. Similarly, when an autoimmune hearing loss is suspected, appropriate serological tests can be requested. When abnormalities are found an otological opinion is then necessary. This extension to the traditional audiologist scope of practice allows a direct-access model of service provision that is both efficient and cost effective.

Audiometric testing is clearly an essential element of the assessment of the tinnitus patient, and in many patients tympanometry will also be routinely undertaken. The issue of testing for loudness tolerance in the tinnitus population, many of whom may have hyperacusis, is somewhat controversial and discussed in Chap. 3. There are well-established audiometric methods of tinnitus pitch and intensity matching (see Chap. 24). The clinical utility of such measures is not high, however. Electrophysiological measures of tinnitus are being developed and opportunities may exist for audiologists to implement these in clinical practice.

The assessment of tinnitus handicap is another essential element in patient management. Many questionnaire instruments are available to determine the impact of tinnitus. These questionnaires typically inquire as to the effects of tinnitus on work or leisure activities, sleep emotion, and in some cases hearing [15, 16]. The clinician must choose one or two questionnaires that are reliable, sensitive to change with treatment, and are of low impact to the patient. The need for a universal outcome measure for tinnitus treatments has been recognized [17]. Whether clinicians are willing to move from existing questionnaires to a standard index will be tested in the next few years.

The assessment of anxiety and depression is also strongly indicated in tinnitus patient management. *The Beck Depression Inventory* [18] and *State-Trait Anxiety Inventory* [19] are the gold standard in this regard, but the questionnaires may alarm some individuals, promoting greater distress. The Hospital Anxiety and Depression Scale [20] is in widespread use in tinnitus clinics in the UK, and is a low impact screen for these symptoms. As psychologists developed the scale, it is credible to that community which helps onward referral.

Management

Audiology-based methods of tinnitus intervention demonstrate their benefits across psychological and audiological/neurophysiological domains, including but not limited to attention, habituation, and learning [21]. Most strategies used by audiologists incorporate the use of sound making devices along with counseling [22] (see Chap. 74). Although it has been argued that the used of sound stimulation has limited benefit over counseling [23] and even that it is counterproductive [24], there is increasing evidence that placed in an appropriate counseling framework sound does provide additional assistance [11, 25]. How sound should be used and with what counseling approach is most appropriate has been a source of considerable debate [26, 27]. Although treatment strategies used by audiologists differ, fundamentally they are actually very similar – sound therapy and counseling. The most appropriate intervention used by audiologists should be governed by the needs of the individual seeking help. At a bare minimum, an audiologist should be able to offer positive advice and refer to other clinicians involved in tinnitus management. The major elements of tinnitus management from an audiology perspective are described below.

Tinnitus Needs Assessment

A key stage in preparing an audiological management plan is determining the needs of the individual. This tinnitus needs assessment attempts to identify

how the tinnitus affects an individual. Using tinnitus questionnaires can help identify general emotional and lifestyle needs of patients. The Client-Orientated Scale of Improvement (COSI, [28]) is a widely used needs assessment tool in hearing aid selection. The COSI-Tinnitus [29] can be used to identify an individual's specific needs and goals for tinnitus management. Through dialog and acknowledgment of the tinnitus sufferer's complaints the groundwork for counseling can be laid. The patient's needs can be addressed through variations of counseling and sound therapy.

Audiological Interventions

Specific counseling (see Chap. 70), masking (see Chap. 74), and habituation (see Chap. 75) based treatments are mentioned elsewhere in the book. We describe them briefly here considering the role of Audiologists.

Counseling

To help patients understand tinnitus and facilitate their coping with the condition, clinical approaches to the management of tinnitus include the use of counseling (see Chap. 70). In this context, audiology counseling interventions can range from simply providing advice, to bibliotherapy [30], directive counseling [31], and psychoeducation [32]. In some cases, referral for formal psychological assessment and treatment will be indicated, e.g., CBT [33] (see Chap. 54), though some patients may be resistant to that [34]. Audiologists should be able to address patient concerns and misplaced beliefs due to broad knowledge of auditory physiology, psychology, and aural rehabilitation. Counseling accompanying the fitting of sound devices would be very similar to the counseling of an audiologist should provide individuals with hearing aids in a comprehensive aural rehabilitation program. Some audiologists use CBT-based techniques, which address a patient's reaction to tinnitus, and provide relaxation training and cognitive restructuring as part of their scope of practice (e.g., [36]).

Masking

Tinnitus masking uses sound to cover tinnitus to some degree and should be used with counseling [6]. Masking could be considered the core audiological-based treatment for tinnitus [37]. During the 1990s, masking became somewhat maligned as a treatment method, but the principles and clinical application still remains a useful tool for audiologists. Masking is commonly associated with the use of ear-level devices produced by hearing aid manufacturers with whom audiologists should have strong working relationships. Audiologists familiar with tonal masking in audiometry should understand that tinnitus masking does not obey normal peripheral masking rules [38, 39]. Tinnitus masking is likely due to central processing mechanisms, similar perhaps to informational masking [40]. Complex sounds may be more useful in this treatment than constant broadband noise commonly in use [41].

Habituation

Habituation is the decline in responses to a signal that is not important [42]. The most well-known clinical models of tinnitus habituation are the model of Hallam et al. [43] and Tinnitus Retraining Therapy [7]. Audiologists have tended to gravitate toward the TRT model due to familiarity with; the auditory system as expressed in the underlying model [44]; directive counseling and the use of instruments for sound therapy [45]. TRT has been simplified to suit different clinical settings [12] and other published management protocols exploit the aspects of habituation [8].

Sound Therapy Technology

Audiology has a strong technology focus; this is also the case in its tinnitus role.

Although tinnitus patients often crave silence, this silence can "feed" the tinnitus by increasing the tinnitus signal relative to background noise. With little competition the auditory system will naturally divert attention resources to the remaining signal – tinnitus [48]. While avoiding silence is simple advice, it does

help patients who fail to make the connection between tinnitus perception and background noise levels. Desktop sound generating devices produce a variety of different sounds (for example, ocean waves, rain, and running water), and these have been found useful to reduce tinnitus effects at night [49]. Nighttime is often when tinnitus sufferers experience heightened tinnitus awareness due to low sound levels and absence of other competing sensory input. Desktop devices are available through hearing aid distributors or electronics retailers.

The value of digital music players (e.g., MP3 players) as tinnitus aids have been recognized by both patients and audiologists [9]. Sounds can be produced by computer programs in the clinic or downloaded from the Internet. Use of prerecorded sounds is an easy way of obtaining treatment sounds that patients find comfortable and easy to listen too. Music can be used in an informal way to promote positive emotional effects to reduce tinnitus [50]. The Neuromonics treatment [11] uses music in a customized form as part of its audiology-focused treatment protocol. Although each year the size of digital players decreases and their battery capacity increases, they are still less convenient to wear on a regular basis than hearing aid style sound generators [52]. Personal music players also do not address any accompanying hearing handicap the way hearing aids or combination devices do.

Hearing aid style in-the-ear and behind-the-ear sound generators produce noise stimuli of variable intensity and frequency. The selection and manufacture of these devices is much the same as for hearing aids, but without the sophistication of signal processing necessary for amplification. Hearing aids themselves are often an underrated tinnitus management technology. Detailed protocols for the fitting of hearing aids in tinnitus treatment are available [29] (Chap. 74). The development of more advanced signal processing appears to have increased success rates [29, 53]. Audiologists are intimately familiar with hearing aids, including their selection, electroacoustic, and subjective evaluation of performance. Hearing aids have the benefit of addressing hearing as well as tinnitus needs. Combination instruments combine a hearing aid with a built-in tinnitus masker. They are available from a limited number of hearing aid manufacturers, but they attempt to combine the benefits of amplification with generated sound [54]. The technology, in these devices, has in the past lagged behind that of the best hearing aids. However, this technology gap appears to being addressed by some manufacturers. A potential advantage of combination devices is their independence from environmental sound levels for effect. In persons with severe to profound hearing loss, cochlear implants become a management option [55].

Matrix Approach to Therapy Selection

Several authors have suggested a progressive management approach based on tinnitus severity and how it manifests itself [14, 56]. One approach to therapy selection is to use a Matrix model in which the audiologist selects intervention depending on the needs of the individual. Selecting the most appropriate elements from both psychological and technological axes can target individual needs assessed during an interview. The key to successfully implementing such an approach is to understand the problems the patient reports and their reaction to each treatment element. Individuals with high emotional needs are provided with more in depth counseling. Those with greater complexity of auditory injury may require more complex technological solutions. The potential strengths of audiologists in this management role are their ability to work across both technology and counseling strategies (Fig. 24.1).

Referring on

Within the context of an audiologist led Tinnitus Service, there will be patients who need to access professionals of other disciplines when issues arise that are beyond the scope of the audiologist's practice. The majority of these will be referrals to Otology and Psychology services, but there may also be occasions when referral to disciplines, such as Hearing Therapy (for addition counseling), Neurology (e.g., Head injury), Maxillofacial surgery (e.g., temperomandibular joint assessment), or Physiotherapy (for one-to-one instruction in relaxation techniques) may be indicated. Building relationships with professionals of such disciplines is an essential part of developing a Tinnitus Clinic. The ease with which these relationships are formed will vary with context and may be most straightforward in a University Acute Hospital

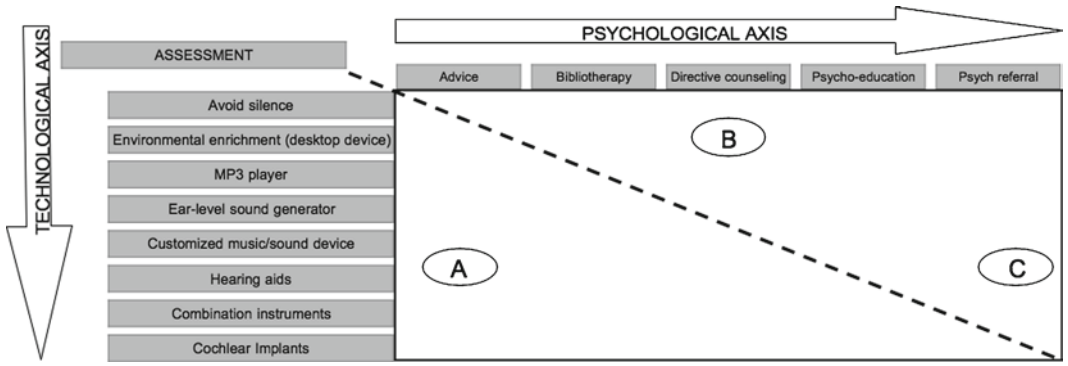

Fig. 24.1 Matrix of audiological management combining the psychological and technical aspects of audiology practice: (**a**) an individual with low psychological impact of tinnitus, but a hearing loss may simply require good advice and a hearing aid fitting. (**b**) A person with normal hearing though fear of tinnitus may not require a technological solution, but the individual may need to understand the cause and neurophysiological basis of tinnitus – directive counseling is one way of providing this. (**c**) Patients with significant anxiety, depression, and hearing loss are likely to be best served by hearing aids (or combination instruments) along with referral to psychology or psychiatry services

Fig. 24.2 Hub and spoke model of key relationships from an audiologist led service

Table 24.2 Audiology counseling scope of practice and referral guidelines, based on Flasher and Fogle

Within scope of practice	Referral
Interviewing the patient/family	Chemical dependence
Presenting the diagnosis	Child or elder abuse
Providing information about the diagnosis	Chronic depression
Discussing interventions for the diagnosis	Legal conflicts
Dealing with the patient's reaction to the diagnosis	Marital problems
Supporting the strengths of the person and their efforts to regain function	Personality disorders
Supporting the strengths of the family to help them interact optimally with the patient	Sexual abuse and sexual problems
Creating supportive empowerment for the patient and family to develop the ability to manage their own problems and be independent of the clinician	Suicidal ideation

setting. Outside the hospital setting, audiologists need to seek out professionals to network within a useful way (Fig. 24.2).

A clear framework for which issues lie within, and without, the boundaries of clinical practice for an audiologist has been developed by Flasher and Fogle 54. The areas that are considered to lie within and outside boundaries are detailed in Table 24.2. This framework deserves some reflection. The issues said to be within boundaries are wide ranging and may be challenging for those who see audiology as primarily a technical profession. The issues beyond boundaries are specific and some of those listed may well arise in a tinnitus context – legal conflicts and marital problems potentially being the most common. Stating that these issues are beyond boundaries does not mean that the audiologist should ignore them. Rather, it indicates that the issue should be acknowledged, as should the fact that it is outside the scope of an audiologist, and additional help and support sought from appropriate practitioners.

Summary and conclusions

Audiologists should feel that they have the skills to implement many of the tinnitus treatments in this book. Useful protocols for managing tinnitus have also been published elsewhere [32]. Increasingly, audiologists are adopting evidence-based practice models [55]. Tinnitus practice models should also reflect current evidence and audiologists should adapt their methods based on the evidence available. Audiologists should have the training and flexibility to incorporate changes in the understanding of physiology, psychology, assessment, and management technologies as they occur. In many respects, audiology practice is one of human-technology interaction. Rapid advancement in sound technology applications and hearing instruments should see audiologists among those at the forefront of tinnitus treatment innovation for the foreseeable future.

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