Tinnitus healthcare in New Zealand

Kim J Wise, Philip A Bird, Greg A O’Beirne

Tinnitus is the sensation of sound in the absence of an evoking sound stimulus and corresponding mechanical activation of the cochlea. It is usually experienced as an endogenous signal localised to one or both ears (or described as emanating within, or just outside the head), and may be described as a ringing, humming, hissing, buzzing, or a combination of these sounds. Tinnitus may be categorised as pulsatile or non-pulsatile, and may be subjective or objective (ie, the rare cases in which the tinnitus is audible to an external observer). Subjective non-pulsatile tinnitus is the larger clinical problem and is the subject of this paper.

In their article in this issue of The New Zealand Medical Journal, Wu et al present a significant study surveying the prevalence of tinnitus in New Zealand. The work is important in that it is a recent, national estimate of prevalence in the New Zealand population, involving a very large survey cohort of nearly 70,000 respondents. The authors have estimated a prevalence of 6% in persons over the age of 14 years. This study and others have shown the prevalence of tinnitus is higher in older populations, and is higher in men, but may potentially arise at any age. As highlighted by the authors, the question asked of respondents in this New Zealand study related to ‘any’ tinnitus—what this work does not show us is the proportion of people in whom tinnitus is clinically relevant, and even more importantly, where it is a significant health and quality of life issue. Their results are weighted to give representative sub-group statistics, but their study could be complemented by the gathering of further demographic data informing our understanding of how tinnitus differentially impacts the groups highlighted; especially in terms of ethnicity.

Statistics New Zealand’s most recent figures (June 2015 quarter) estimate that New Zealand’s population includes 3,742,230 people aged ≥14 years. Previous international reports indicate 1% to 4% of the overall population may encounter tinnitus as a primary health concern—experiencing its presence as unremitting and debilitating—with functional, life quality, sleep and mental health substantially, negatively affected. Comparing New Zealand population data against international estimates for chronic, incapacitating tinnitus suggests that between 37,000 and 150,000 New Zealanders in the ≥14 year age group may be severely affected by tinnitus. By 2050, it is projected the number of people aged 60 or older will grow globally by 30% or greater, which is likely to significantly increase the number of individuals with intractable tinnitus in need of treatment.

Much is still unknown about the pathophysiology of tinnitus, although valuable information has been obtained from animal models and functional MRI (fMRI) studies in humans with tinnitus, and this data is now becoming clinically relevant. To grossly simplify the theories of pathophysiology, tinnitus is usually associated with a hearing loss and therefore reduced input from the periphery, ie, the cochlea. This triggers a cascade of changes in the central auditory pathways: impaired cochlear function leads to reduced cochlear nerve activity, which may down-regulate inhibitory cortical processes and lead to hyper-excitability within central auditory structures. Abnormally high neural synchrony is observed in animal models, as well as reorganisation of tonotopic maps in the auditory cortex. The chances of tinnitus sensation reaching consciousness also heavily depend on activity in the prefrontal, parietal and
limbic brain regions, which contribute to awareness of the symptom and modulate or sustain the emotional distress caused by it. Network theories for tinnitus perception have recently emerged to account for contributions from non-auditory centres controlling attention, emotion and memory.6

Tinnitus has myriad causes, and is usually (but not always) associated with hearing loss and occasionally associated with hyperacusis or noise intolerance. It is often approached as if it were a disease rather than a symptom, and is often managed poorly or not at all. While there is often no ‘cure’ resulting in complete elimination of symptoms, it is usually possible to significantly reduce the distress caused by tinnitus with appropriate management.

Most tinnitus sufferers perceive the sound as a minor annoyance only, and while they would rather not have this symptom, they do cope with it. Generally, in terms of both loudness and degree of annoyance, initial symptoms may be readily noticeable for a few weeks to months after they first appear and fade over time. A thorough case history and full examination are crucial in determining appropriate tinnitus management. The initial consultation may include: a neck and jaw examination to account for musculoskeletal, somatosensory, arteriovenous and/or temporomandibular contributions; a review of medications and supplements to identify any potential interactions or primary causal agents; an appraisal of cardiac and metabolic function to rule out hypertension, diabetes and/or thyroid disorders; and determination of affective state, sleep pattern, functional life impact and coping ability.7 In some cases, a multi-disciplinary approach may be required.

Reassurance and an explanation of the nature of the condition (‘informational counselling’) are important, initial steps. The Tinnitus Research Initiative (TRI)—a foundation comprised of tinnitus researchers worldwide—has emphasised counselling as a principal treatment consideration, either delivered alone or as an adjunct to other therapeutic options, depending on the case.7 Of the various counselling approaches used in tinnitus management, cognitive behavioural therapy (CBT) received support in a 2010 Cochrane Review for having a beneficial effect on tinnitus.8 However, the approach can be lengthy and there is currently little data to support CBT’s superiority to other counselling options, including clinical information provision. Some form of counselling is often included as part of current tinnitus treatment modes, potentially managing pre-existing or later-developing psychological distress, or persisting negative attitudes sustaining tinnitus perception.

In addition to a full examination, audiometry is an essential part of management, as up to 90% of individuals presenting with tinnitus as their main concern demonstrate measureable hearing loss.9 Unfortunately, a small group of individuals go on to have tinnitus, which in terms of loudness and annoyance is a major issue affecting their quality of life. In some cases, this may be at least partially mitigated by assuring them of the quality and variety of current support and treatment options.

Often, correction of underlying hearing loss via a trial of amplification (hearing aids, for example) is an initial management consideration for the majority of cases involving comorbid hearing loss and tinnitus. Although professional tinnitus working groups emphasise the importance of counselling,7 one study found that those with co-occurring hearing loss and tinnitus who experienced counselling but subsequently proceeded to a hearing aid trial, had significantly reduced tinnitus handicap.10 A recent (2014) Cochrane Review comparing hearing aids and sound generators showed both treatment approaches were beneficial—ie, no significant difference was observed between the methods investigated.11 This highlights the importance of case-based individualised approaches and an appropriate diagnostic review of hearing profile, as those with measured hearing loss and associated tinnitus pitch match(es) that are not well-supported by the bandwidth of modern hearing aids, may find other forms of sound therapy preferable. The application of therapeutic sound may also be employed via a desensitisation approach in cases of hyperacusis or marked sensitivity to certain everyday ambient sound(s), to promote normal sound tolerance over time. The above treatment methods, as well as other case-dependent tinnitus control options, can
be broadly organised into seven categories, shown in Table 1.

Awareness of the theories of tinnitus causation is now leading to individualised management of troublesome tinnitus in specialised facilities. New Zealand is home to world-class tinnitus treatment centres and a network of support through local Hearing Associations, dedicated audiology clinics, otolaryngology, and University laboratories. Basic science, translational and clinical approaches continue to be pursued by internationally-recognised researchers across New Zealand. With this important paper by Wu et al, we now have the benefit of current prevalence data to help drive tinnitus healthcare initiatives and focus our efforts for the future—accommodating the growing proportion of our population projected to be significantly affected by tinnitus.

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<th>Category</th>
<th>Details</th>
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<tr>
<td>I. Counselling</td>
<td>This is a recommended treatment consideration,’ either alone or as an adjunct to other treatment options, and may include cognitive behavioural therapy (CBT), guided therapy, masking therapy, neurofeedback, and/or acceptance and commitment therapy (ACT).</td>
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<td>II. Amplification or sound provision</td>
<td>Amplification not only treats the hearing loss, but also increases the level of speech, background and environmental sounds which may interact with tinnitus perception, rendering it less intrusive. Some devices also include therapeutic sound generators to supplement or promote this aim. Ear-level and/or stand-alone sound generators, music, nature sounds, and emerging smartphone apps fall in this category.</td>
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<td>III. Customised or methodological sound provision</td>
<td>Treatments such as Neumonics, Tinnitus Retraining Therapy (TRT), or other approaches using tailored sounds, involve specially-trained clinicians and generally require more time for benefits to be realised (6 to 12 months or longer), but have received extensive peer review.</td>
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<td>IV. Pharmacological</td>
<td>The provision of antidepressants, anxiolytics, or tranquillisers may improve or exacerbate tinnitus depending on the case, but current investigations include drug trials and animal prototypes targeting ion channels, or counteracting acute glutamate excitotoxicity.</td>
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<td>V. Non-invasive neurological treatments</td>
<td>Treatments such as transcranial magnetic or direct current stimulation tend to be provided in research settings or dedicated facilities and currently appear to offer short-term relief. Research continues into effective montages and high-definition modes.</td>
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<td>VI. Medical management or surgery</td>
<td>These treatments apply to pathologies such as superior semicircular canal dehiscence (SSCD), glomus tumour, and vestibular Schwannoma, and require specialist otolaryngology referral/intervention.</td>
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<td>VII. Perceptual training</td>
<td>Treatments involve auditory attention-based or auditory scene analysis perceptual training, sound discrimination and/or categorisation, to theoretically promote training related neuroplastic change and thereby diminish the tinnitus signal. Treatment has tended to occur via research settings or dedicated facilities, but take-home versions have been developed.</td>
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EDITORIAL

Competing interests:
Kim Wise reports a patent, Interactive Gaming System US 20140171195 A1, issued to Pending.

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