



Outcomes from 7 years of a direct to audiology referral pathway

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Abstract

Background The direct to audiology via ENT referral pathway was designed to enhance patient access to audiology services. The pathway is recommended in the Otolaryngology Head & Neck Surgery: a model of care for Ireland report, published in 2019.

Aims This study aimed to review the outcomes of all patients that attended our institution over the last seven years.

Methods A retrospective review of the direct to audiology referral service from March 2014 to December 2021 was conducted. Outcomes were defined by the pathway each patient took following attendance at the audiology clinic. Patients were either (i) discharged, (ii) referred for hearing aid(s) or (iii) identified as candidates for further diagnostic assessments, including a follow-up at the ENT outpatient clinic.

Results During the time frame, 419 patients were triaged to the pathway. The average wait time was 13 days. The average age was 53 years (range 16–96 years, SD=6.1). Approximately 34% ($n=143$) of all patients referred were discharged back to the GP by the audiologist, but 66% ($n=276$) presented with 'red flags' and needed further investigation in the ENT clinic, with 30% ($n=73$) ultimately requiring imaging studies. Over half ($n=254$, 61%) were referred for hearing aids.

Conclusion The direct to audiology initiative has proven effective at reducing waiting times for ENT patients solely in need of audiological intervention. Approximately one-third of these referrals to the ENT service can be assessed comprehensively in the audiology clinic, thereby reducing the demand for ENT clinics, enhancing service provision and expediting onwards referral for amplification.

Keywords Audiology · Direct referral pathway · Hearing assessment · Otolaryngology · Tinnitus · Vertigo

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Introduction

Hearing impairment is highly prevalent worldwide; an estimated 1.57 billion (1 in 5) people globally live with hearing loss, 403 million (26%) of whom have moderate-to-complete hearing loss in their better ear [1]. In Ireland, the 2016 census estimated that deafness or serious hearing impairment accounted for 16.1% of self-reported disability, an increase of 12.6% from 2011 [2], with 1 in 10 individuals diagnosed by the age 77 years old and 1 in 4 by 89 years. The Irish Longitudinal Study of Ageing (TILDA) estimate that over one-third of older adults (37%) have hearing loss, and this proportion is higher in males (41%) than females (32%); the prevalence exceeds 50% in those aged 75 years and over [3].

The detrimental effects of hearing loss on speech perception [4–7], communication in complex environments [8], listening effort [9, 10], auditory processing [11, 12], neuroplasticity [13], neuro-cognition [14, 15] and falls [16] have been documented. There is a well-established association between hearing impairment and negative health and well-being [17–19]. It is well recognised that hearing impairment can impair social engagement, alter social roles and impede the formation and maintenance of relationships [20–22]. Hearing impairment is associated with higher loneliness and social isolation scores [23] and is known to be a significant risk factor for dementia [24–26].

The onset of the COVID-19 pandemic and the introduction of face coverings pose additional difficulties for those with hearing impairments [27–29] due to reduced access to facial expressions and lip-reading [27, 30]. The pandemic was also an exacerbating factor for those with tinnitus due to the disruption of support services provision [31]. The impact of age-related sensory impairment upon multisensory perception has been explored in Ireland in the context of TILDA. It is evident that clinical interventions to improve sensory function in the ageing population (bilateral cataract removal and hearing aid use) are beneficial [32].

Interventions such as hearing screening, hearing aids and auditory implants with strong healthcare provision mechanisms have the potential to ameliorate the burden of unaddressed hearing loss [1, 23]. Hearing interventions reduce daily-life fatigue and increase social activity [33]. According to the life-course model of the contribution of modifiable risk factors to dementia, hearing loss is the largest potentially modifiable risk factor [34]. Literature reviews suggest that audiological interventions could improve cognition, as well as the quality of life in people living with dementia, though further research is needed [35, 36]. TILDA reports that the use of hearing aids is low in the general Irish population, 8% of older adults use a hearing aid, and use is two-fold higher among medical card holders (27%)

compared to those without a medical card (14%) [3]. Medical card holders are eligible to free access to healthcare, medical prescriptions, eye, ear and dental checks. Eligibility criteria are determined by an individuals' income, expenses, marital status and dependants [37].

The direct to audiology via ENT referral pathway at the Mater Misericordiae University Hospital (MMUH) was designed to enhance patient access to audiology and ENT services. It expedites audiological assessment and onwards referral for hearing aid rehabilitation for patients presenting to their GP with hearing-related difficulties but no 'red flags' that indicate the need for ENT input. Such a pathway is recommended in the Otolaryngology Head and Neck Surgery model of care for Ireland (2019) [38]. It has been in use for several years in many acute hospitals in Ireland with variable, non-standardised triaging and discharge criteria.

The aims of this retrospective review were (i) to review the MMUH direct to audiology pathway access between 2014 and 2021, (ii) to review audiological outcomes of those discharged as per National Institute for Health and Care Excellence (NICE) guidelines (2018) [39], (iii) to review clinical outcomes of those in need of ENT consultation as per British Academy of Audiology (BAA) guidelines (2016) [40] and (iv) to review the outcomes of radiological investigations. Overall, the retrospective review will inform future local protocol amendments, for example, fine-tuning of our referral, inclusion and exclusion criteria.

The SQUIRE 2.0 (Standards for Quality Improvement Reporting Excellence) reporting guidelines [41] have been adopted for the purpose of this publication.

Methods

A retrospective review of all referrals that were triaged to the 'direct to audiology' pathway by the ENT team at MMUH was performed.

A pre-determined service level agreement exists between the Audiology and ENT departments for this clinical pathway, with clinical governance remaining under the ENT consultant. Briefly, the agreement entails weekly triaging of appropriate new GP referrals by the ENT consultant, to be seen directly by an audiologist. Examples of appropriate GP referrals include those that state reduced hearing, presbycusis, tinnitus and difficulty following conversations. Exclusion criteria to avail referral to the direct to audiology pathway, or 'red flags', include otalgia, otorrhoea, otitis externa, unilateral tinnitus, sudden-onset hearing loss (≤ 72 h) [40], asymmetrical hearing loss (≥ 20 dB difference between right and left thresholds at two or more adjacent frequencies 0.5–8 kHz) [42], vertigo, dizziness or other clinical features stated in the referral, based on the discretion of the ENT consultant.

Once the referral is received by audiology, an hour-long appointment is allocated. The audiologist conducts a detailed case history, otoscopy, pure tone audiometry, tympanometry and if indicated acoustic reflex thresholds, otoacoustic emissions testing and/or speech testing. If ‘red flags’ are identified during the consultation with audiology, as per the BAA guidelines (2016), the patient is re-triaged by the ENT consultant in view of the audiological findings onto the ENT waiting list. Such red flags include otalgia, fluctuating hearing loss, asymmetrical hearing (> 20 dB at two adjacent thresholds), unilateral tinnitus, hyperacusis, vertigo or any other unusual presenting features at the discretion of the audiologist.

All patients that would benefit and consent to proceed with hearing aid amplification are referred onwards to the Community Audiology HSE services with aural impressions where appropriate; or are advised on private provision of aids if they are not medical card holders. The decision for referral to amplification was made following discussion with the patient, identifying individual needs, assessing motivation and adhering to other common principles of rehabilitation such as considering their social context [43]. Transfer of appropriate referrals, appointment scheduling, results in dissemination and/or GP reports are completed electronically on the MMUH electronic patient management system (PatientCentre).

The audit time frame was March 2014, when the pathway was first initiated, to December 2021. PatientCentre was used to compile the following data fields for each referral: (i) patient medical record number, (ii) date the referral was received by audiology, (iii) date assessed by audiology, (iv) primary complaint as per GP referral, (v) primary diagnosis as per audiologist, (vi) need to see ENT, if applicable, (vii) red flags identified by audiologist indicating need for ENT opinion, (viii) need for radiological investigations, (ix) need for hearing aid(s), (x) date seen by ENT and (xi) ENT consultation outcome. All data was recorded in a Microsoft Excel spreadsheet by NS. Data was pseudo-anonymised with a coded identifier allowing re-identification if needed. Data was stored securely in secure MMUH servers. Data analysis was performed in Microsoft Excel by RK.

The Clinical Audit and Effectiveness Committee of the Mater Misericordiae University Hospital (MMUH) approved this audit (reference number CA21-092) on 04 October 2021.

Results

A total of 419 referrals were reviewed for the time period commencing 01 March 2014, which marked the first time an ENT referral was forwarded direct to audiology, to 02 December 2021. The average waiting time to access

Table 1 Most commonly used keywords chosen by GPs on their referrals to ENT

Keyword used by GP on referral	Number of referrals with keyword (out of 384)	% of total referrals (n = 384)
Hearing	232	60.4
Tinnitus	108	28.1
Deafness	13	3.4
Blockage	5	1.3
Audiology	4	1.0
Otalgia	4	1.0

audiology was 13 days (range 1–145 days, SD = 13.5), and the median was 10 days. The average age of patients referred was 53 years (range 16–96 years, SD = 6.1), and the median was 53 years. The medical card status at the time of referral could not be captured retrospectively.

The GP referral document was available on the electronic patient management system for 384 patients (92% of the referrals). The six most commonly chosen keywords by GPs in their referrals to ENT are listed in Table 1. Other keywords that comprised less than 1% of the total include an audiogram, audiometry, balance, buzzing, deaf, dizziness, effusion, fullness, hallucinations, hyperacusis, hypoacusia and pressure.

Of the 419 patients assessed by audiology, 143 (34.1%) were discharged back to the GP without the need to be assessed by ENT. Figure 1 outlines the number of patients discharged per year. The discharge rate ranged from a minimum of 16.2% (n = 11 of 68 referrals) in 2018 to a maximum 42.9% (n = 21 of 49 referrals) in 2017.

Of all patients assessed, 60.6% (n = 254) were deemed good candidates for hearing aid amplification, of which 209

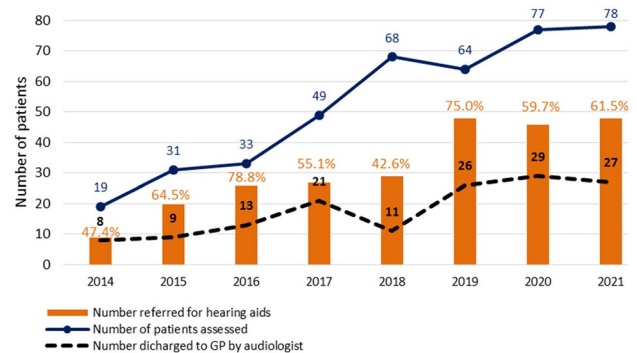


Fig. 1 The dark blue line represents the number of patients referred and seen on the direct to audiology pathway per year (2014–2021). The dotted black line represents the number discharged back to their GP without the need for an ENT assessment. The orange bar charts represent the number of patients referred for hearing aids per year. The percentage of the total number referred for hearing aids per year is noted above each bar chart

(82.3%) were medical card holders and were referred to Community Audiology HSE services for fitting (Fig. 1). The majority ($n=117$, 46%) needed a custom earmould fitting, and 92 (36.2%) were suitable candidates for open fit aids. Custom ear moulds are generally required for those with moderate or worse hearing thresholds, and open fit fits can be prescribed if the degree of loss is mild to moderate. The rest ($n=47$, 18.5%) were non-medical card holders, therefore not eligible for HSE hearing aids, and were therefore provided with information on how to approach an Irish Society of Hearing Aid Audiologists (ISHAA) registered hearing aid dispenser for a hearing aid trial in the private sector.

Of those discharged back to their GP ($n=143$), an average of 34% ($n=49$) had audiograms indicating hearing thresholds were within normal limits (≤ 20 dB HL) as per BSA guidelines [42], of whom 44 had tinnitus and one reported a 'blockage' sensation. Approximately half ($n=70$, 49%) were diagnosed with symmetrical mild-to-moderate (21–70 dB HL) sensorineural hearing loss, and 11% ($n=16$) with symmetrical moderate-to-severe (41–95 dB HL) sensorineural hearing loss, or bilateral profound (≥ 95 dB HL) loss ($n=4$, 3%). Four (3%) patients had previously investigated asymmetrical hearing loss and could therefore be discharged back to the GP. Figure 2 displays a summary of the audiometric profiles. The mean age of those discharged was 54 years, the median of 55 years (range 17–93 years).

A total of 245 (58.5%) patients fitted the BAA guidelines (2016) [33] red flag criteria for assessment by ENT (Fig. 3). The commonest reason for ENT referral was

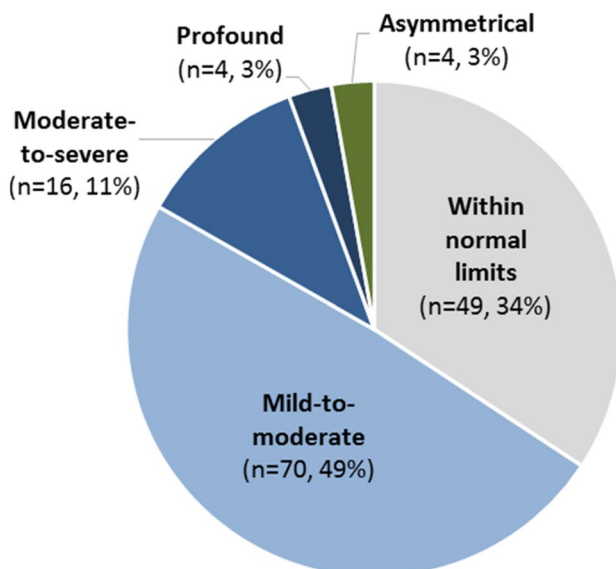


Fig. 2 Audiometric profiles of patients discharged back to the GP by the audiologist. Within normal limits: ≤ 20 dB HL, mild to moderate: 21–70 dB HL, moderate to severe: 41–95 dB HL, profound: ≥ 95 dB HL, asymmetrical: ≥ 20 dB difference between right and left thresholds at two or more adjacent frequencies 0.5–8 kHz

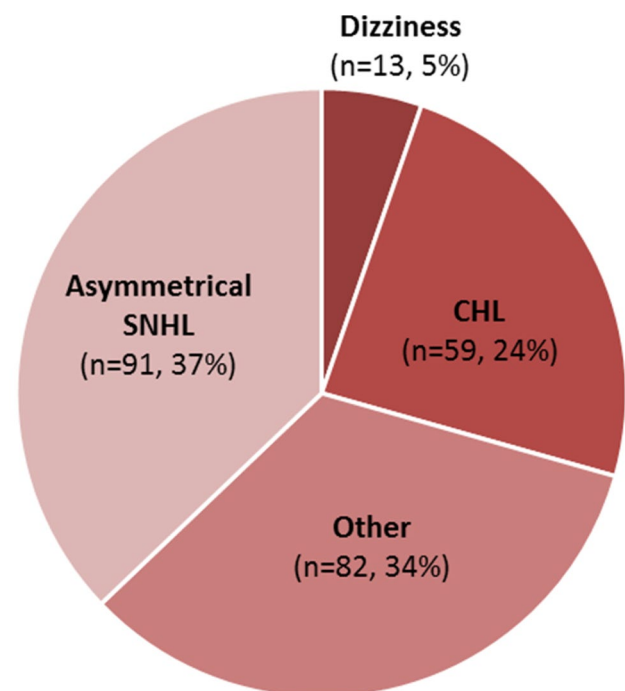


Fig. 3 Primary reasons for the need for ENT assessment identified by audiology. CHL: conductive hearing loss, SNHL: sensorineural hearing loss. The 'other' category incorporated early onset hearing loss, abnormal tympanograms or case history findings (otalgia, highly intrusive tinnitus, hyperacusis)

asymmetric sensorineural hearing loss (SNHL) ($n=91$, 37%). One quarter ($n=59$, 24%) had a conductive element on audiometry, and 13 (5%) complained of dizziness or vertigo. Approximately one-third ($n=82$, 34%) could not be discharged by the audiologist due to early onset hearing loss (<50 years old), case history findings including otalgia, highly intrusive tinnitus, hyperacusis and complex family history or case history (e.g., syndromic causes). The mean age of those who required an ENT opinion was 52 years, with a median of 52 years (range 16–96 years, SD=11.6). For 30 (7.2%) patients, there was inadequate clinical data available with regard to the need for ENT assessment, and they were therefore excluded from the analysis.

The average waiting time to see ENT after the audiology assessment was 166.6 days (23.7 weeks), ranging from 2 days wait to 812 days (116 weeks). Of the patients subsequently attending the ENT outpatients' clinic, radiological investigations were ordered for 73 (29.8%). Investigations included magnetic resonance imaging (MRI) and/or computed tomography (CT). The primary reason for imaging was to investigate asymmetrical hearing loss ($n=55$, 75.3%) and for unilateral tinnitus ($n=18$, 24.7%).

The radiology results were available for 41 (56.2%) patients, for which 39 were normal (no vestibular schwannoma) and one was diagnosed with a vestibular

schwannoma. An abnormal CT scan was reported in only two cases (out of 41), which indicated mastoiditis and cholesteatoma. The rest (43.8%) were on a waiting list for radiology.

Discussion

The aims of this retrospective study were to review the audiological outcomes, the ENT clinical outcomes and the outcomes of radiological investigations of patients who accessed the direct to audiology via the ENT pathway at MMUH since its inception in 2014.

In those patients who had abnormal audiograms, the majority (49%) had a mild-to-moderate degree of loss, followed by moderate-to-severe hearing loss (11%), which is in keeping with prevalence studies [44, 45], with only a minority (3%) diagnosed with profound loss. An advantage of this pathway is that patients' hearing loss and/or tinnitus were addressed efficiently by either referring them for hearing aid amplification or discussing management options [43]. Of those who had hearing thresholds within normal limits (34%), the majority complained of tinnitus. Tinnitus severity or intrusiveness is not currently investigated systematically on this pathway; perhaps a future review of the pathway could incorporate the BSA tinnitus in adults guideline for assessment and management [46]. We noted an increase in the number of hearing aid referrals in 2019–2021, which could be attributable to the introduction of face coverings which have a detrimental effect on speech intelligibility and non-verbal communication cues [27–30]. Secondary to a local service level agreement with the HSE community audiology services, medical card holders in need of amplification get fast-tracked for hearing aid fittings following their assessment at our centre.

A significant proportion of patients (37%) presented with asymmetrical hearing loss, which requires cross-sectional imaging to out-rule cerebellopontine angle tumours. These patients were allocated a follow-up outpatient appointment at the ENT clinic for clinical ENT assessment and radiological investigations as necessary. In our cohort of 41 available radiology results, one (2.4%) vestibular schwannoma was identified, which is comparable to available data [47]. The BAA service quality committee have developed guidance on non-medical referral for MRI for suspected vestibular schwannoma [48]. The use of non-medical referrers for radiological investigations is an increasingly accepted approach to the delivery of innovative service provision within the NHS, with one service in Southend University Hospital NHS Foundation Trust making cost savings of £164 850 when assessing 1126 patients [47]. Redesigning our local service could prove mutually beneficial to patients and the organisation.

The patients' subjective experience of accessing a healthcare professional-led pathway instead of an ENT pathway has not been captured. While the direct to audiology pathway improves timely access to audiology services, one limitation of our study is that it does not capture the patients' or the referring GPs' perspective on a pathway where they may be discharged without seeing an ENT surgeon. However, a Speech and Language Therapy (SLT)-led pathway delivered at Tallaght University Hospital for voice and/or swallowing difficulties collected patient experiences [49] and identified no criticism for their SLT-led service delivery. A recommendation for a future project would be to obtain tailored stakeholder feedback for the audiology pathway and utilise it to develop and standardise national protocols and guidelines.

Future evolution of the direct to audiology pathway might incorporate the provision of services for those with distressing tinnitus, for which pathways have already been proposed in the clinical setting [46, 50]. Expansion of the pathway to those with vestibular or balance problems, which has been successfully implemented in the NHS and the Australian healthcare settings, can potentially improve access, efficacy and cost-effectiveness [51–53].

The direct to audiology via ENT initiative has proven effective at reducing waiting times for ENT patients solely in need of audiological assessment and intervention. No disadvantages or adverse outcomes have been identified. A considerable proportion of these referrals to the ENT service can be assessed comprehensively in the audiology clinic, thereby reducing the demand for ENT clinics, enhancing service provision and onwards referral for amplification.

Abbreviations BAA: British Academy of Audiology; CHL: Conductive hearing loss; COVID: Coronavirus disease; CT: Computed tomography; ENT: Ear, nose and throat; GP: General practitioner; IOS: Irish Otorhinolaryngology, Head & Neck Surgery Society; ISHAA: Irish Society of Hearing Aid Audiologists; MMUH: Mater Misericordiae University Hospital; MRI: Magnetic resonance imaging; NHS: National Health Service; NICE: National Institute for Health and Care Excellence; SD: Standard deviation; SLT: Speech and language therapy; SNHL: Sensorineural hearing loss; SQUIRE: Standards for Quality Improvement Reporting Excellence; TILDA: The Irish Longitudinal Study of Ageing

Author contribution Study conceptualisation: RK, NS. Data curation: RK, NS, AN, EF. Formal analysis and data interpretation: RK, NS, AN, EF. Methodology: RK, NS, BL, BOD. Project administration: RK. Original draft preparation: RK, EF, NS. Review and editing of the final draft: RK, NS, AN, EF, LMcL, BL, BOD, SK. Final approval of the published manuscript: RK, NS, AN, EF, LMcL, BL, BOD, SK. Funding acquisition: not applicable. Study supervision: RK, SK. All authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. Thank you to Ian Cahill, Audiologist, MMUH, for proof-reading the final version of the manuscript.

Declarations

Ethics approval This retrospective chart review study involving human participants was in accordance with the ethical standards of the institutional and national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. The Clinical Audit and Effectiveness Committee of the Mater Misericordiae University Hospital approved this study (reference number CA21-092) on 04 October 2021.

Consent to participate Not applicable. This is a retrospective review. All patient data was pseudo-anonymised; a coded identifier was allocated, allowing re-identification (if needed).

Consent for publication Preliminary data from this project was presented by AN at the 62nd Annual Meeting of the Irish Otorhinolaryngology, Head & Neck Surgery Society (IOS), Royal College of Surgeons in Ireland, Dublin, Ireland.

Conflict of interest The authors declare no competing interests.

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