Telehealth tinnitus therapy during the COVID-19 outbreak in the UK: uptake and related factors

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Abstract

Objective: The Audiology Department at the Royal Surrey County Hospital usually offers face-to-face audiologist-delivered cognitive behavioural therapy (CBT) for tinnitus rehabilitation. During COVID-19 lockdown, patients were offered telehealth CBT via video using a web-based platform. This study evaluated the proportion of patients who took up the offer of telehealth sessions and factors related to this.

Design: Retrospective service evaluation.

Study sample: 113 consecutive patients whose care was interrupted by the lockdown.

Results: 80% of patients accepted telehealth. The main reasons for declining were not having access to a suitable device and the belief that telehealth appointments would not be useful. Compared to having no hearing loss in the better ear, having a mild or moderate hearing loss increased the chance of declining telehealth by factors of 3.5 ($p = 0.04$) and 14.9 ($p = 0.038$), respectively. High tinnitus annoyance as measured via the visual analogue scale increased the chance of declining telehealth appointments by a factor of 1.4 ($p = 0.019$).

Conclusions: Although CBT via telehealth was acceptable to most patients, alternatives may be necessary for the 20% who declined. These tended to have worse hearing in their better ear and more annoying tinnitus.

Keywords: Tinnitus; audiology; covid-19; video; telehealth

Introduction

A respiratory illness known as coronavirus disease 2019 (COVID-19) emerged from Wuhan, China, in late December 2019 and became a global pandemic (Bogoch et al. 2020). The first cases in the UK were diagnosed at the end of January 2020 (Moss et al. 2020). Only a few studies have evaluated the relevance of COVID-19 to audiology to date (Almufarrij, Uus, and Munro 2020; Eby, Arteaga, and Spankovich 2020; Kilic et al. 2020; De Sousa et al. 2020).

Prior to the COVID-19 pandemic, the Audiology Department at the Royal Surrey County Hospital (RSCH) offered audiologist-delivered cognitive behavioural therapy (CBT) for tinnitus rehabilitation. This involved an average of six individual face-to-face sessions, each lasting about one hour (Aazh and Moore 2018b, 2018a; Aazh, Bryant, and Moore 2019a). Audiologist-delivered CBT for tinnitus typically starts with an in-depth interview to explore tinnitus-related distress and distinguish it from the distress caused by other underlying psychological disturbances (Aazh and Moore 2017b). Patients with tinnitus-related distress usually continue with CBT focussed on tinnitus management, while patients whose distress is not directly linked to their tinnitus but is due to an anxiety or mood disorder are referred to appropriate mental health services for further evaluation and support (when needed). The remaining stages of CBT for tinnitus include: (1) formulation of tinnitus distress and psycho-education (Aazh et al. 2019b); (2) the use of behavioural experiments to test the validity of the patient's assumptions about tinnitus and its effects (Bennett-Levy et al. 2004); and (3) the use of diaries to challenge and modify irrational thoughts, emotions and avoidance behaviours (McManus, Van Doorn, and Yiend 2012). Counselling and empathic listening skills are used throughout the therapy sessions (Rogers 1965; Aazh 2016).

On 23 March 2020, the UK government introduced lockdown restrictions, like many other countries, to slow the increasing rate of COVID-19 infections and to manage the pressure on the National Health Service (NHS) (Iacobucci 2020; Peto et al. 2020). Lockdown measures in the United Kingdom prohibited leaving home without a reasonable excuse, all public gatherings were banned, and a wide range of businesses (including schools and universities) were closed (or employees/students required to work/study from home). To comply with this, most Audiology Departments in the United Kingdom actively encouraged patients to change their appointment type to telehealth to minimise physical contact, using telephone or videoconferencing. Telehealth in audiology has been widely used across screening, diagnostic and intervention services (Swanepoel and Hall 2010; Tao et al. 2018). Both asynchronous and synchronous telehealth approaches have been used in the management of people with tinnitus, with varied success (Beukes et al. 2018a; Beukes et al. 2019). Telehealth services have seen a tremendous increase across health providers as a way of minimising the risk of COVID-19 infection, especially in vulnerable populations that typically characterise audiology patients (Keesara, Jonas, and Schulman 2020; Swanepoel and Hall 2020). In fact, in light of COVID-19, a recent survey indicated that 60% of people in the United Kingdom believe telehealth physician consultations will become more popular than physical consultations (Ericsson Mobility Report 2020).

All patients who were receiving audiologist-delivered CBT for their tinnitus up to the lockdown and all new patients who were referred to the Audiology Department at the Royal Surrey County Hospital (RSCH) for tinnitus management after the start of the lockdown were offered the choice of receiving their therapy as telehealth or face-to-face sessions. The aim of this study was to evaluate the proportion of patients who accepted telehealth tinnitus therapy and the factors related to this.

Method

Study design and patients

The study was reviewed and approved as a service evaluation by the Patient Safety & Quality-Clinical Audit and Effectiveness Department at the RSCH, Guildford, UK, which constitutes ethical approval for the study. The survey was conducted at the Tinnitus and Hyperacusis Therapy Specialist Clinic (THTSC), RSCH. The study population comprised 113 consecutive patients whose care was interrupted during the COVID-19 pandemic lockdown between March and June 2020. These patients were at different stages in their therapy when the lockdown measures were introduced. Fifty-three per cent of the patients (60/113) were new referrals to the THTSC. Twenty-seven per cent of the patients (30/113) had attended the clinic only once prior to the lockdown. The mean number of sessions received by the remaining 20% of patients (23/113) prior to the lockdown was 4.6 (standard deviation, SD = 1.5), with a range from 3 to 8 sessions. The average age of the patients was 50 years (SD = 17 years, range 11–82 years) and approximately half (56/113) were male. Demographic data for the patients and results of their audiological investigations were imported from their records held at the Audiology department.

Procedures, equipment and material

All patients already receiving or referred for CBT for their tinnitus received an initial telephone consultation with their audiologist. During the consultation, the audiologist asked questions on how the patient was coping with their tinnitus and offered therapy and advice accordingly. The audiologist used a verbal adaptation of the Visual Analogue Scale (VAS) (Maxwell 1978) by asking the patient to rate the tinnitus loudness, annoyance and effect on life on a scale from 0 to 10. The patient was informed that they would receive more information about future care in due course. A second call was made by administrative staff in the THTSC to discuss resuming or starting the therapy. The patient was informed that the THTSC was able to offer appointments via video call to reduce the risk associated with COVID-19 and that these appointments would be undertaken using a platform called "Attend Anywhere." The patient was told that if they were unable or unwilling to have appointments via video call they would remain on the waiting list to have face-to-face appointments in the hospital and that these appointments would be undertaken by a clinician in full personal protective equipment including face mask, visor, apron, and gloves according to the hospital policy (Radonovich et al. 2019; Kowalski et al. 2020). In addition, the patient would be asked to wear a face mask for the duration of the appointment. The patient was asked whether they wished to accept or to decline the telehealth appointments. If they declined, they were asked to give their reasons for declining and their responses were recorded.

Video-conferencing for telehealth sessions

Telehealth appointments in the NHS are carried out via the "Attend Anywhere" web-based platform, which is a fully encrypted service. To use it, participants are required to have Internet access, the Google Chrome web browser on a computer (with a web camera) or an Android mobile device (Donaghy et al. 2019).

Assessment of hearing thresholds

Most patients had undergone pure tone audiometry prior to being referred to the THTSC, typically at the time of their visit to an Ear–Nose–Throat doctor. Those who were referred directly to the THTSC by their general practitioner completed pure tone audiometry before the start of their audiologist-delivered CBT. The pure tone audiogram was measured using the procedure recommended by the British Society of Audiology (BSA 2011), but with some modifications proposed by Aazh and Moore (2017a) to avoid any discomfort for patients with hyperacusis. The starting presentation level for the frequencies of 0.25, 0.5, 2, 3, 4, 6, and 8 kHz was equal to the measured audiometric threshold at the adjacent frequency (e.g. if the threshold at 1 kHz was 20 dB HL, the starting level for measuring the threshold at 2 kHz was 20 dB HL, instead of 50 dB HL as recommended by the BSA). The severity of hearing loss was categorised based on the values of the pure-tone average (PTA) across the frequencies 0.25, 0.5, 1, 2, and 4 kHz, as recommended by the BSA (BSA 2011): Mild (20–40 dB HL), Moderate (41–70 dB HL), Severe (71–95 dB HL) and Profound (over 95 dB HL).

Assessment of tinnitus using the visual analogue scale

A verbal adaptation of the Visual Analogue Scale (VAS) (Maxwell 1978) of tinnitus loudness, annoyance and effect on life was used to rate the severity of tinnitus, via a telephone consultation during lock down. This measure was chosen as it is very brief and easy to use during a telephone conversation. VAS scores are ratings on a scale from 0 to 10. The VAS score for the loudness of tinnitus was assessed by asking the patient to rate the loudness of tinnitus during their waking hours over the last months (It was explained that 0 corresponds to no tinnitus being heard and 10 is the loudest sound that they can imagine). The VAS score for annoyance induced by the tinnitus was assessed by asking the patient to rate their subjective perception of annoyance on average during the last month (it was explained that 0 corresponds to no annoyance and 10 is the most annoying thing that can possibly happen). The VAS score for the impact of tinnitus on their life was assessed by asking the patient to rate the effect of tinnitus on their life during the last month (it was explained that 0 corresponds to no effect and 10 is an extreme effect).

VAS scores for tinnitus loudness and annoyance have good test-retest reliability (over 0.8) and scores correlate well with those for tinnitus questionnaires (Figueiredo, de Azevedo, and de Mello Oliveira 2009; Adamchic et al. 2012).

Data analysis

The data were anonymised prior to statistical analysis. Descriptive statistics (means and SDs) for the characteristics of the patients, hearing thresholds and the scores for the VAS for tinnitus loudness, annoyance and effect on life were calculated. Pearson correlation was used to assess the relationship between VAS scores, age and hearing thresholds. Non-matched samples *t*-tests and chi-square tests were used to compare the means of VAS scores, hearing thresholds and gender distribution for patients grouped according to whether or not they accepted or declined the offer of telehealth sessions. Variables that were significantly different between patients who accepted and declined the telehealth appointments were included in two multinomial logistic regression models that assessed the relative risk ratio (RR) of declining the telehealth appointments (dependent variable) based on hearing in the better ear and VAS scores for tinnitus annoyance (independent variables). The values of the

RR and their 95% confidence intervals (CI) were calculated both unadjusted and adjusted for age and gender.

The *p*-value required for statistical significance was set at $p < 0.05$. The Stata program (version 13) (StataCorp 2013) was used for statistical analyses. Audiograms were not available for all of the patients. The analyses were restricted to patients for whom there were complete data on all variables required for a particular analysis. The number of patients included in each analysis (*N*) is reported.

Results

Characteristics of the patients

The mean hearing thresholds of the study patients are presented in Table 1. The mean PTA across ears was 19 dB HL (SD = 14 dB). There was a significant correlation between the mean PTA across ears and age ($r = 0.37$, $p = 0.0003$). Based on the PTA for the better ear, 73% of patients (67 out of 92 with audiograms) had no hearing loss, 24% (22/92) had mild hearing loss, and 3% (3/92) had moderate hearing loss. Based on the PTA for the worse ear, 57% of patients (52 out of 92) had no hearing loss, 30% (28/92) had mild hearing loss, 10% (9/92) had moderate hearing loss, 2% (2/92) had severe hearing loss and 1% (1/92) had profound hearing loss.

Table 1. Means (SDs) of the audiometric thresholds in dB HL.

	0.25 kHz	0.5 kHz	1 kHz	2 kHz	3 kHz	4 kHz	6 kHz	8 kHz
Audiometric threshold right ear	14 (14)	15 (15)	16 (16)	17 (18)	23 (19)	26 (20)	35 (23)	34 (27)
	N = 92	*N* = 92	*N* = 92	*N* = 92	*N* = 84	*N* = 92	*N* = 84	*N* = 92
Audiometric threshold left ear	16 (19)	17 (19)	16 (17)	20 (19)	25 (20)	31 (23)	37 (23)	38 (28)
	N = 92	*N* = 92	*N* = 92	*N* = 92	*N* = 84	*N* = 92	*N* = 84	*N* = 92

The number of patients is indicated by *N*.

The mean VAS score was 5.9 (SD = 2.2) for tinnitus loudness, 6.0 (SD = 2.0) for tinnitus annoyance, and 4.7 (SD = 2.5) for the effect of tinnitus on life. There were significant correlations between the mean PTA across ears and the VAS scores for tinnitus annoyance ($r = 0.31$, $p = 0.0023$) and the effect of tinnitus on life ($r = 0.23$, $p = 0.03$). The correlation between the mean PTA across ears and the VAS score for tinnitus loudness was not significant ($r = 0.13$, $p = 0.23$). Age was not significantly correlated with VAS scores for tinnitus loudness ($r = 0.09$, $p = 0.36$), tinnitus annoyance ($r = 0.17$, $p = 0.07$) or effect of tinnitus on life ($r = 0.11$, $p = 0.24$).

Preference for telehealth compared to face-to-face therapy and related factors

Of 113 patients who were offered telehealth appointments, 90 (80%) accepted and 23 (20%) only wanted face-to-face appointments. The main reasons expressed for declining the telehealth sessions comprised: not having access to a suitable device for video calls (8/23), belief that telehealth appointments would not be useful (8/23), hearing loss (2/23), and anxiety concerning video calls (2/23). Miscellaneous other reasons were expressed by 3/23.

Patients who declined the telehealth sessions tended to be older, but the effect of age was not significant ($p = 0.12$; Table 2). Forty-nine per cent of patients who accepted the telehealth sessions were male and 52% of patients who declined were male. The difference in gender

distribution between those who accepted and declined telehealth sessions was not statistically significant ($p = 0.78$).

Table 2. Comparison of the means and SDs for age, pure-tone average (PTA) hearing loss in the better and worse ears, the number of therapy session patients received prior to the lockdown, Visual Analogue Scale (VAS) scores for tinnitus loudness, tinnitus annoyance and effect of tinnitus on life, for patients who accepted therapy via internet video and those who declined.

	Accepted Mean (SD) (*N*)	Declined Mean (SD) (*N*)	*p* Value
Age, years	49 (17) (*N* = 90)	55 (14) (*N* = 23)	0.12
Number of appointments	2 (1.6) (*N* = 90)	1.9 (1.2) (*N* = 23)	0.65
PTA of better ear (dB HL)	13 (10) (*N* = 74)	22 (14) (*N* = 18)	**0.004**
PTA of worse ear (dB HL)	21 (18) (*N* = 74)	30 (18) (*N* = 18)	0.064
VAS for tinnitus loudness	5.7 (2.2) (*N* = 90)	6.7 (2.4) (*N* = 23)	0.057
VAS for tinnitus annoyance	5.8 (1.9) (*N* = 90)	7.0 (2.0) (*N* = 23)	**0.01**
VAS for effect of tinnitus on life	4.5 (2.2) (*N* = 90)	5.6 (3.3) (*N* = 23)	0.057

The number of patients is indicated by *N*. Significant *p* values are indicated by bold font.

As shown in Table 2, there were no significant difference between those who accepted and those who declined the telehealth sessions in the number of appointments received prior to the lockdown, VAS scores for tinnitus loudness, VAS scores for effect of tinnitus on life, and PTA of the worse ears. However, patients who declined the telehealth appointments had significantly higher PTAs in their better ears and rated their tinnitus as significantly more annoying than those who accepted (Table 2).

The first multinomial logistic regression model estimated the RR of declining the offer of telehealth sessions (dependent variable) based on hearing loss category for the better ear (independent variable). Unadjusted results as well as results adjusted for age and gender are presented in Table 3. The adjusted model outcomes indicated that, compared to having no hearing loss in the better ear (i.e. a PTA $\leq$ 20 dB HL), having a mild or moderate hearing loss increased the RR of declining telehealth appointments by factors of 3.5 ($p = 0.04$) and 14.9 ($p = 0.038$), respectively.

Table 3. Outcomes of a multinomial logistic regression model assessing the relative risk ratio (RR) of declining video appointments based on the PTA for the better ear.

	Unadjusted RR (95% CI)	*p* Value	Adjusted RR (95% CI)	*p* Value
Hearing of the better ear				
No hearing loss	1		1	
Mild hearing loss	4.2 (1.34–13.2)	**0.013**	3.5 (1.06–11.4)	**0.04**
Moderate hearing loss	14.75 (1.2–181.8)	**0.036**	14.9 (1.2–191.3)	**0.038**

The table shows both the unadjusted RR values and the RR values adjusted for age and gender, together with 95% confidence intervals (CI). Significant *p* values are indicated in bold font (*N* = 92).

The second multinomial logistic regression model estimated the RR of declining the offer of telehealth appointments (dependent variable) based on VAS scores for tinnitus annoyance (independent variable). Unadjusted results as well as results adjusted for age and gender are presented in Table 4. The adjusted model outcomes, indicated that every 1-point increase in VAS score for tinnitus annoyance increased the RR of declining telehealth appointments by a factor of 1.4 ($p = 0.019$).

Table 4. Outcomes of a multinomial logistic regression model assessing the RR of declining the video appointment based on VAS scores for tinnitus annoyance.

Unadjusted RR (95% CI)	*p* Value	Adjusted RR (95% CI)	*p* Value
1.4 (1.1–1.8)	**0.013**	1.4 (1.05–1.8)	**0.019**

The table shows both the unadjusted RR value and the RR value adjusted for age and gender, together with 95% confidence intervals (CI). Significant *p* values are indicated in bold font ($N = 113$). The value of 1.4 means that the RR increases by a factor of 1.4 for each 1-point increase in VAS score.

Discussion

The use of videoconferencing for telehealth was part of NHS long-term planning before the outbreak of COVID-19 (NHS. 2019). Recent research studies exploring the views of patients and clinicians reported that video telehealth appointments would be particularly useful for the management of mental health problems and chronic illness (Donaghy et al. 2019). Telehealth was rapidly adopted in a wide range of outpatient activities as well as primary health care and mental health care during the COVID-19 pandemic (DiGiovanni et al. 2020; Keesara, Jonas, and Schulman 2020; Wosik et al. 2020; Zhou et al. 2020). Although we are not aware of any study reporting the use of telehealth for tinnitus management during the COVID-19 pandemic, there has been widespread availability of telehealth services for audiology (Swanepoel and Hall 2010; Tao et al. 2018), and this increased during the lockdown (Huang, Imam, and Nguyen 2020; Ratanjee-Vanmali, Swanepoel, and Laplante-Lévesque 2020). Even prior to the lockdown, several authors suggested the use of therapy for tinnitus via telephone, Internet or hard copy educational materials (Molini-Avejonas et al. 2015; Aazh, Moore, and Roberts 2009; Beukes et al. 2018b; Dang et al. 2018; Henry et al. 2019).

Our study showed that 80% of patients were willing to continue or commence their audiologist-delivered CBT for tinnitus via telehealth video consultations. For the remainder, lack of familiarity with the technology and lack of access to suitable equipment were among the key barriers cited by the patients. This finding is consistent with previous reports pointing out that offering telehealth sessions to all can lead to inequality in accessing health care for patients who are unfamiliar with digital technology (Iacobucci 2018; O'Dowd 2018).

Our study showed that the risk of declining telehealth sessions significantly increased for those with worse hearing in their better ear. This probably happened because hearing loss can lead to considerable difficulty in understanding speech over the Internet. The quality of Internet-based audio is often poor, because of the bit-rate reduction systems that are used (Rix et al. 2001), the occurrence of drop outs, artefacts caused by echo-cancellation systems, and the poor quality of the loudspeakers incorporated in many computers, especially laptops. People with normal hearing can usually just understand Internet-based audio despite its poor quality (Bolot, Crepin, and Garcia 1995) because of the inherent redundancy of speech signals (Fletcher 1953), but the perceptual deficits associated with hearing loss (Moore 2007) can make it almost impossible to understand Internet-based audio. Some of the patients in our sample who declined telehealth sessions may have experienced Internet-based audio and knew that they would have great difficulty in understanding speech. One way of addressing this problem would be to have automatic closed-captioning (sub-titles) such as that provided by some videoconferencing platforms (HLAA, 2020). The use of complementary Internet-based programmes which include educational videos or other visual aids could also help to motivate patients with tinnitus in taking telehealth options (Beukes et al. 2018a, 2019).

Our study also showed that the risk of declining telehealth sessions was higher for those with worse VAS scores for tinnitus annoyance. This may partly reflect the fact that greater tinnitus annoyance is associated with higher PTAs (Aazh and Salvi 2018; Mahafza et al. 2020). Future studies should use validated questionnaires to further explore reasons for declining telehealth appointments.

The finding that patients with poor hearing in their better ear and/or a high degree of annoyance with their tinnitus are more likely to decline telehealth sessions means that special care is needed to ensure that such patients receive appropriate care, either following the easing of lockdown, or during lockdown via face-to-face clinics with the use of appropriate personal protective equipment.

Study limitations

This was a service-evaluation survey assessing the proportion of patients who accepted telehealth tinnitus therapy and the factors related to this. The study was limited to the clinical data available. We did not use a questionnaire to examine the reasons for declining telehealth sessions and our analysis was limited to the data that were documented in patients' audiological records. Therefore, our results need to be interpreted with caution. This study did not assess satisfaction with telehealth sessions. Hence, there is a need for future studies to compare patient satisfaction for telehealth and face-to-face tinnitus sessions.

Conclusions

Although CBT telehealth therapy was selected by four out of five patients during COVID-19 lockdown, one in five patients selected face-to-face appointments, mainly because they did not have suitable equipment or because they thought that telehealth sessions would not be effective. Patients who declined the telehealth option tended to have worse hearing in their better ear and worse VAS scores for tinnitus annoyance. As the use of telehealth becomes more popular and widely used in audiology settings, it is important to ensure that patients who decline telehealth receive appropriate care, either by resuming face-to-face service or by application of additional technological assistive solutions.

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