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Evaluating the impact of Hearing Aids for Music (HAfM) resources on practitioners and patients

The purpose of the AHRC-funded Hearing Aids for Music project (www.musicandhearingaids.org) was to systematically investigate how hearing loss and the use of hearing aid technology affect music listening. This was guided by a panel of experts including scholars and practitioners in hearing care and hearing technologies. A key aim was to develop guidance for hearing aids users who are experiencing problems in order to help them improve their experience of music. We conducted a series of survey and interview studies with more than 1,500 people with all levels of deafness to establish frequently experienced problems. We also asked 100 audiologists about their experiences of addressing musical needs and fitting hearing aids for music in clinical appointments. In this article, we describe how we used some of our findings to develop a set of resources to improve musical experiences. This includes a patient leaflet *Music Listening with Hearing Aids* (Greasley et al., 2018) and two practitioner leaflets, *Counselling and Fitting: A Guide for Audiologists* (Crook et al., 2018a) and *Starting out with a music program: Quickstart Clinic Guide* (Crook et al., 2018b). Since their publication, we have sought feedback on our resources to ensure they remain useful and accessible for patients and practitioners. This article also summarises some of this feedback and points towards where adaptations could be made.

Key findings

For the majority of those with mild, moderate and severe hearing loss, hearing aids enable music listening, improving their ability to hear and perceive various musical elements. Our participants reported that their hearing aids enable them to hear melodies and singers and identify instruments to a greater degree than they are able to without hearing aids. Despite this, many experienced problems which reduced their enjoyment of music. A common complaint was a lack of sound quality, with music sounding 'tinny' or 'distorted'. Participants often experienced feedback whilst listening, and this was particularly the case in live settings despite recent improvements in feedback management. Participants also reported difficulties hearing lyrics in music. These findings are not entirely novel (cf. Madsen & Moore, 2014) but this project was the first worldwide to map the issues with a large number of hearing aid users (Greasley et al., 2019). Patients' reports that hearing aids help but that they can also cause problems was mirrored in audiologists' responses. 68% agreed with the statement 'sometimes HAs are useful, sometimes they are not' while less than 20% agreed that hearing aids were useful for music. Unsurprisingly, audiologists had typically not received formal training on the subject of music, and knowledge of how to improve musical experiences or fit hearing aids for music was often learned

through CPD, conference or manufacturer workshops. There was mixed confidence among audiologists, with around 50% reporting some confidence, but 25% were unsure and around 10% were reluctant to provide advice and tailor hearing aids for music. Positively, those who had received some training were more likely to report confidence. We asked about strategies employed for improving musical experiences and various technical strategies (e.g. turning off adaptive functions for speech, gain and compression changes) and counselling strategies (e.g. taking individual needs into account) were reported (see Greasley et al., 2020 for full results).

Developing the resources

Music listening with hearing aids

In response to our data from hearing aid users, we developed a patient leaflet to help hearing aid users understand how their hearing loss may affect their music listening and how hearing aids could help in different musical settings (Greasley et al., 2018). We found that whilst some patients were very knowledgeable about their hearing loss and hearing aids, some had limited understanding. The first sections explain how to read an audiogram and about the technical limitations of hearing aids for music. After this, the leaflet encourages patients to ensure that they understand how their

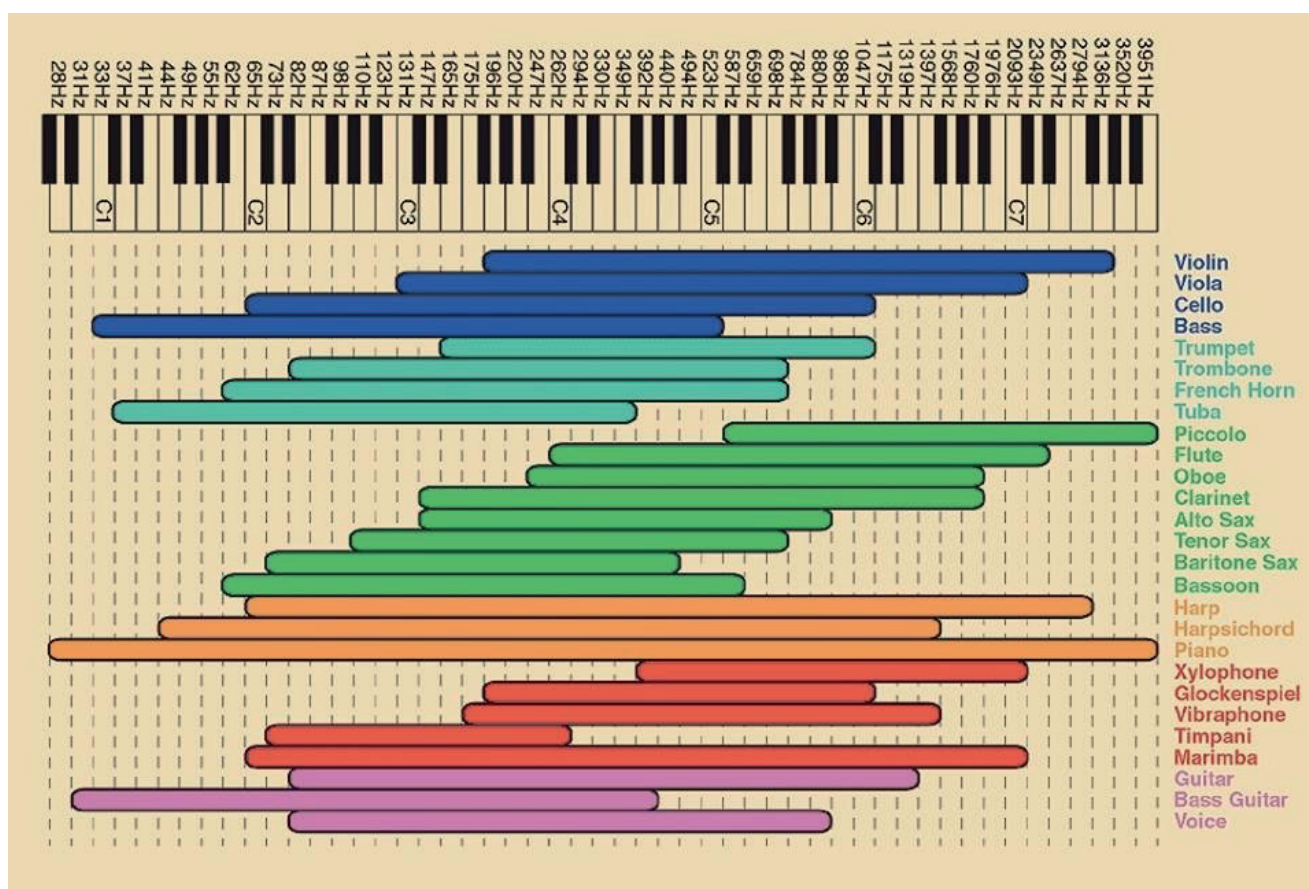


Fig. 1 Chart showing frequency ranges of different instruments (Image by Alexyo.Netcom, CC BY-SA 3.0)

hearing aids work, e.g. whether they have volume control, how to change programs and how to control their hearing aids with a phone application. We found that some patients lacked awareness of additional technologies that might help. The next section covers what Assistive Listening Devices (ALDs) are available and how they might help reflecting current technology at the time of our data collection. Patients told us about strategies they would use to help improve their musical experience, and so 'Making the best of your listening situations' describes potential adaptations to environment, such as assistive technology in the venue, or strategies such as moving in relation to the sound source. The next section, 'Persistence pays off', encourages hearing aid users to give it time to acclimatise to

listening to music through hearing aids. We found that this was key in determining positive outcomes among hearing aid users, and we suggest a variety of listening exercises to help. The final section encourages patients to keep a log of any problems experienced for discussion in appointments.

Counselling and fitting: A guide for audiologists

We developed a practitioner leaflet to raise awareness among audiologists of the problems that hearing aids can cause for music listening and to provide guidance on how to improve listening experiences (Crook et al., 2018a). We linked our guidance to our own data or evidence in the literature to provide evidence-based recommendations. Audiologists emphasised taking individual

differences into account therefore the first section 'Getting to know your patients' musical needs' encourages taking a history of what the patient listens to and/or plays/sings, and the problems they are experiencing. If they are a performer, this includes establishing how their hearing loss profile fits with the frequency range of their performance instrument and we have included a chart to help with this (see Fig.1, P5 of the leaflet). The next sections detail general hearing aid settings for music. Our research suggested better outcomes for those using volume control, and so we advise to fit a volume control with as wide a range as possible to allow for the greater dynamic range of music. This is particularly helpful for live contexts and for musicians in rehearsals. Whilst patients' reports

on the efficacy of music programs is mixed, both in our research and elsewhere (e.g. Madsen & Moore, 2014, Looi et al., 2019; Vaisberg et al., 2019), we suggest applying a music program and tailoring it with reference to strategies audiologists reported. This included disabling feedback manager to prevent pure tone musical stimuli (e.g. organ, flute) being mistakenly analysed as feedback and being suppressed and disabling noise reduction to prevent hearing aids interpreting musical stimuli as unwanted sounds. We also include considerations such as checks for audibility and occlusion for singers/players. If occlusion is a problem, strategies such as venting (or increasing vent size), reducing low frequency gain and/or trying a longer ear mould depth can be used. Finally, we included a ‘counselling after fitting’ section which details exercises that can be adopted to help patients acclimatise to listening

to music through hearing aids, based on our data from our patient study.

Starting out with a music program: Quickstart clinic guide

In recognition that appointments can be time pressured, we developed a ‘quick start guide’ to fitting hearing aids for music (Crook et al., 2018b). This is a shorter resource, with colour-coded pages, to help audiologists refer quickly to suggested settings. The section ‘General hearing aid settings’ includes mould selection, giving a volume control and mute buttons, verifying fitting with REM as accurately as possible to target and implementing a music program. ‘Settings in a music program’ then details strategies that practitioners report using. This includes disabling the automatic features for speech, increasing MPO if possible (though with checks for loudness comfort),

keeping compression ratios as low as possible, and selecting slow-acting compression. Research has shown that patients prefer linear processing for music (Marchand, 2019; Vaisberg, 2019) which is why we suggest keeping compression ratios low. A further two sections cover audibility and occlusion checks.

Feedback from audiologists

We conducted a resource evaluation study which asked practitioners about the impact of the practitioner leaflets on their clinical practice using survey and interview methods. We surveyed 19 audiologists who were geographically dispersed in England, UK (North East, North West, Yorkshire, London, South West, South East) and who had been practising for a varied number of years. Only 7 had received any training on the subject of music, and this had typically been delivered at a conference or CPD training/

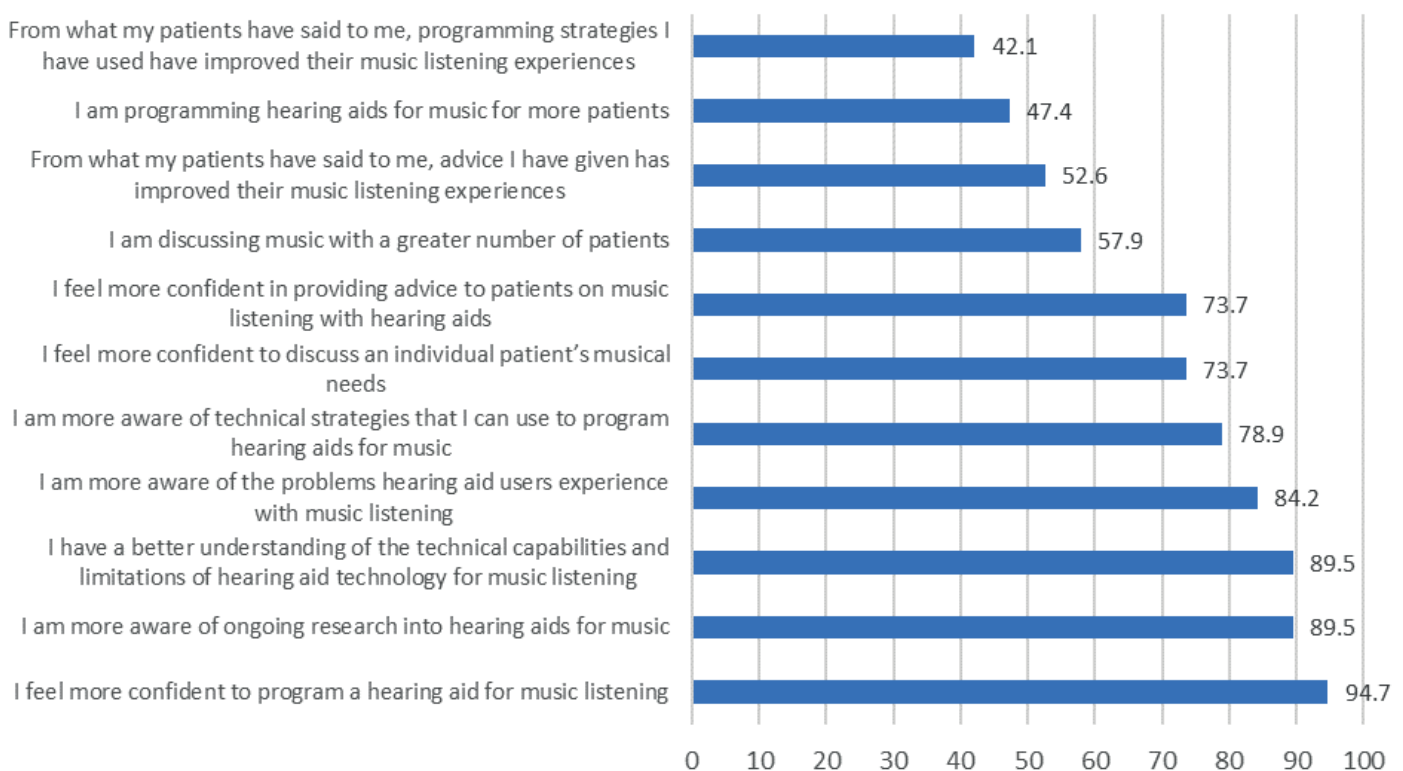


Fig. 2 Percentage of agreement (i.e. ‘agree’ or ‘strongly agree’) for each of the statements about the impact of the HAFM resources (N=19)

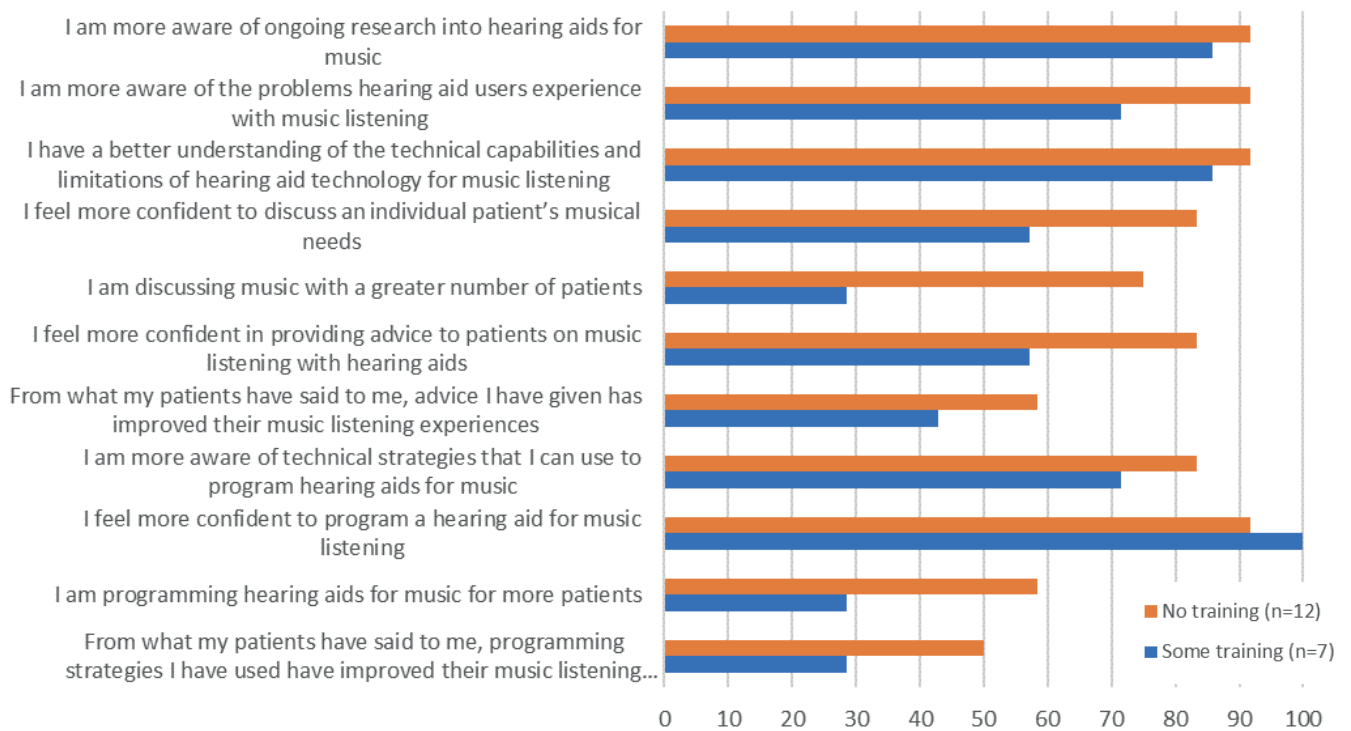


Fig 3. Average rated agreement for each statement for those who had received prior training on music (N=7) and those who had not received any training on music (N=12)

event. We asked audiologists to rate agreement with a series of statements such as whether they felt more knowledgeable about the problems hearing aid users can experience, or felt more confident in providing advice or fitting hearing aids for music, as a result of engaging with our resources.

85% reported that greater awareness of problems hearing aid users experience and 90% agreed that they had a better understanding of the limitations of hearing aids for music (see Figure 2). 95% reported that they felt more confident in programming a hearing aid for music listening, however this was not immediately translating into increased fitting as only 48% were programming hearing aids for music for more patients as a result. 74% agreed that they felt more confident in discussing an individual patients' musical needs and 74% agreed that they felt more confident to provide advice about

music listening with hearing aids.

Results showed that the impact of the resources was greater for those who had not previously had any training on the subject of music (n=12) and those who had (n=7)

(see Figure 3). 83% of those without prior training were more confident in providing advice to patients (compared to 57% who had received some training) and 58% reported that they were programming hearing aids for a greater number of patients (compared with 29%). Furthermore, those without training reported that they were more likely to discuss music with patients and felt more confident in their ability to do so. This underlines how even a small amount of guidance can go a long way to raising awareness and understanding of potential difficulties or strategies when addressing musical needs in clinic.

We asked an open-ended survey question "In what ways have the counselling tips and/or programming strategies in the HAFM resources changed your practice?" Only one audiologist reported that the resources had not impacted on their practice. Many reported increased awareness and confidence, whilst others noted significant change in their practice:

"Before I would just set the automatic music program up if it was requested but following the guidance on the leaflet I am much more proactive in discussing music with my patients, and following that doing much more fine tuning of the music settings to tailor it to their specific requirements. Those that I have done so with have all been very happy with their hearing aids and while it can't all be put down to the music settings I believe that it has led to an increase in overall user satisfaction."

Interview data provided further insights. For some, the leaflets confirmed what they already knew through experience or minimal amounts of training (e.g. conference, product training, own research) though this reaffirmation of all the information in one place was helpful.

“The things I have been saying for a while, it was brilliant to see them confirmed in writing, ‘cause sometimes you go on some instincts and things that you’ve read but to, to have it validated like this gave me even more confidence of what I would say to people when they were still trying their best to enjoy music rather than giving up on it completely.”

Others felt they had learnt something new. All of the audiologists we spoke to agreed that the leaflets were useful and were ‘pitched at the right level’ in accessible language, with right sort of content. There was agreement that the leaflets were already changing their practice (e.g. trying technological adjustments, ensuring topics were covered in appointment).

“It’s already changed how I operate just from reading through ... if I have someone with problems in a music issue then I will read through the leaflet and I will say ‘have I looked at this, have I looked at this, have I looked at this’, and it basically helps me cover everything you know in the one resource to make sure I’ve done the best for that client who is struggling with that music issue.”
[Audiologist]

One audiologist noted that their practice had added a question about the importance of music to all routine appointments. Whilst this was generally viewed positively,

others emphasised time pressures in clinical appointments affecting how much could be covered. The way in which we developed our resources to enable audiologists to locate information quickly (e.g. ‘top ten’ tips, Quickstart guide) was commented on and appreciated.

“The quick reference stuff is really helpful so just as a baseline if audiologists have only got five minutes and think well this person plays music and I’m not sure what to do, then it’s a really nice quick reference for them to have.”
[Head of NHS Audiology Department]

All of the audiologists wanted to be sent more printed resources and emphasised how important printed materials are for (elderly) patients and community practice (i.e. therapy).

“I think patients feel more empowered when they have leaflets and they can go away and do their own reading and just consolidate what we’ve talked about in the appointments”
[Senior Audiologist]

Several emphasised getting the information/message out through different channels (e.g. printed material, audio-visual, blogposts, social media) and suggested methods we could employ to maximise our impact (e.g. workshops, teaming up with regional and national organisations, podcasts, videos). It was acknowledged that while some colleagues may have musical backgrounds (i.e. musical training, performance experience), many lacked prior knowledge affecting their confidence in treating musicians specifically. The idea of ‘audiology champions’ who could be contacted for advice on music was proffered.

Feedback from patients

We conducted a resource evaluation study with patients to get their feedback on the Music listening with hearing aids leaflet using a survey (n=29, mean age 71yrs, all had moderate or severe hearing loss) and a series of four focus groups (n=17). We asked which sections they found most useful and what might be improved, to rate how accessible, relevant and practical the information was, and whether engaging with the leaflet had changed their behaviour in any way. We then explored these topics in more detail in the focus groups.

Patients reported that the most useful sections were explanations of why the perception of music through hearing aids was challenging (66% selected this section) and ‘top tips’ which included advice for reproduced and live music settings (also 66%). This was supported in open-ended responses which noted the helpfulness of understanding the limitations of hearing aids that are optimised for the speech signal. The next most helpful section was ‘How can I make the best of the environment?’ (55% selected this section). Several patients reported that they had successfully tried our tip of turning down the volume and letting the hearing aid amplify the sound, or changing the position of speakers in home settings.

Whilst some reported that finding out about assistive technologies (e.g. remote microphone, direct audio functions) was helpful, 50% felt that the section on ALDs needed improving. Technology has moved on since the publication of these leaflets and revisions need to reflect this, including connectivity

with smartphones and phone applications through which to control parameters of the hearing aid (e.g. volume, equalisation). It is worth noting that those patients who had this capability reported improved outcomes for their music listening. A section that provoked mixed responses was 'Making the most of your audiologist'. Whilst 48% regarded this as one of the most helpful sections, 40% felt this section could be improved. Some patients felt this was a critical section and had initiated conversations with their audiologist about music as a direct result of engaging with the leaflet.

Overall, patients gave high ratings for the relevance of information (90% agreement), appropriateness of section headings (80%) and language level (83%), and clarity of visual layout (86%), though slightly lower ratings for appropriateness of images (79%) and quotations (71%). Language use was felt to be appropriate though several noted the audience was literate adults and versions could be made that were inclusive of age (e.g. young people, children) and cultural background (e.g. translation into different languages). Several also commented that the information could be presented in different formats such as audio or podcasts or video tutorials of different durations which could be directed at different audiences (e.g. school children, adults with learning disabilities, carers). Finally, there was a general consensus that whilst the leaflet was helpful for music listening, there is a need for a leaflet specifically for musicians which should cover some of the common problems experienced by different vocalists/instrumentalists and which provides tailored advice.

Summary

The HAFM project developed a series of resources to help improve access to music for people with hearing loss. These can be freely accessed and downloaded on our website (www.musicandhearingaids.org/resources). Our evaluation studies have shown that the patient and practitioner leaflets are positively changing behaviour and practice. Hearing aid users are encouraged to try new strategies and technologies, and to discuss music with their audiologists. Audiologists report increased confidence in discussing music with patients and programming hearing aids for music. This is especially important since our findings show that very few discussions about music are taking place in clinic (Greasley et al., 2020).

Revisions are now needed to all our resources. This includes reviewing and describing new technologies and their impact on listening experiences, and

any recent technical or signal processing strategies that have been found to be useful for improving musical experiences. Revisions also need to take into account advancements in telecare and the possibilities of remote adjustments, which were not widely used at the time we developed the resources. Whilst having paper copies was valued by all, both patient and practitioners felt that we should explore alternative formats for presenting the information, such as short tutorials for staff meetings or audio podcasts for different audiences. Finally, drawing on some of our more nuanced findings from our qualitative results, developing a leaflet specifically for performers is an important next step. We are hugely grateful to the patients and practitioners who gave up their time to reflect so constructively, and look forward to sharing revised resources with the community in due course.

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