Adults with hearing loss: hearing aid and implant?

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Bimodal hearing, wearing implant and hearing aid, is of increasing interest with growing evidence of benefit from implantation for those with greater residual hearing who are likely to gain benefit from a hearing aid in addition to an implantable device. Additionally, technology has developed, making the combination of hearing aid and implant more effective; maximising the benefit of both technologies requires significant changes to their joint provision.

As one audiologist commented:
"In light of advancing technology, we need to prepare for the increased potential benefit of bimodal hearing."

This report recommends:
- Greater information available about the possibility of wearing a hearing aid and implant
- Clarification of the roles and responsibilities of cochlear implant centres and audiology clinics with regard to advice about the use of bimodal hearing, and its ongoing management
- Development of agreed protocols for ongoing bimodal management by hearing aid and cochlear implant clinics
- CI and HA programming and management to be planned in the same appointment wherever possible, so bimodal technology management is seen as one rather than separate entities for holistic intervention
- Training for audiologists on the joint management of cochlear implant and hearing aid
- Clear information for hearing aid audiologists and users about the issues concerning bimodal usage
- Further in-depth research into the characteristics of good bimodal users.

"I rely less and less now on my captions at work, and I can have on the move telephone calls at work on my mobile, using neck loop or using this headset, but if I don’t have my hearing aid or I don’t have my implant, forget it, it’s not possible. So it’s a completely new world for me now!"

"I’m getting a lot of benefit from my implant and didn’t feel I needed my hearing aid, but being curious, I like to try things, that’s why I did it [...] I find use of both enables me to do more and more than just with my implant."

"Perhaps I should have been encouraged to try (the hearing aid), nobody really asked me [...] why did nobody try to persuade me? There wasn’t this kind of discussion."

This report highlights the personal and societal challenges of adult hearing loss, the impact of hearing aids, cochlear implants and other implantable devices but focuses on the experiences of users and hearing aid audiologists of bimodal hearing. There is much evidence to show that “two ears are better than one”, for listening in background noise, being able to tell where sounds come from and to follow group conversation. With most adults receiving only one implant, and interest in changes in criteria for cochlear implantation, there is increased interest in providing bimodal hearing in order to provide “hearing in two ears.” However, while there is some evidence on the benefit of bimodal hearing it seems most adults with one implant do not continue to wear a hearing aid in the other ear. This report explores some of the reasons for this and includes for the first time the views of the audiologists who manage hearing aid provision.

The report clearly shows that there is little co-ordination between hearing aid and cochlear clinics in the joint management of hearing aid and implant in England. There are huge gains in benefit to be made through co-ordination of services with better information and support for adults receiving implants about the possible benefits of also wearing a hearing aid. However, this rarely seems to happen and most adults appear to give up wearing a hearing aid in the other ear to their implant and to have little information about the possible benefits of doing so. Providing the management of an adult’s hearing aid and cochlear implant in two different clinics as is common in England at the moment, does not make sense, in terms of patient benefit or cost-effective use of NHS services.

This report’s recommendations are in line with the NHS Five Year Plan and the Action Plan on Hearing Loss (2015) which recognise that services should be co-ordinated around patients’ needs to ensure that patients’ health and wellbeing are improved. Joint management of hearing aid and implant for adults with hearing loss is one way to do so.
Hearing loss in adulthood: a major challenge for individual and society

“The cochlear implant is brilliant for hearing higher frequency sounds, brought back memories of being able to hear the birds, cat meowing, etc plus am able to identify more sounds indoors and outdoors. Combined with the hearing aid, I feel I have a balance of hearing both high and low frequency sounds, especially when communicating with my Dad.”

Adult with hearing loss

“Hearing Loss is a major public health challenge.”


Hearing is key to our ability to communicate and for our health and well being. The World Health Organisation estimates that in the UK adult hearing loss will be in the top ten disease burdens by 2030 (Mathers & Loncar, 2006). Hearing loss accounts for the most years lived with disability in both sexes over 70 in Western Europe and globally.

Particularly with an ageing population, the numbers of those with hearing loss are increasing dramatically and recognised as a global issue (WHO, 2017; Wilson et al, 2017) with a huge impact on society and the individual. Hearing loss affects communication and interaction with other people, often resulting in social isolation (Gopinath et al., 2012; Pronk et al, 2011). Hearing loss can “often lead to withdrawal from social activities... this, in turn, leads to reduced intellectual and cultural stimulation, and an increasingly passive and isolated social citizen.” (Arlinger 2003; Dalton et al., 2003).

This social isolation and loneliness can have significant effects on health (Cohen et al. 1997) and in older people there is a strong correlation between hearing loss and cognitive decline (Lin et al. 2013; Amieva, 2015), mental illness and dementia (Lin et al. 2011) and premature death (Friberg et al. 2012; Contrera et al. 2015).
Those with mild hearing loss are twice as likely to develop dementia, and those with severe hearing loss have five times the risk of developing dementia as those with normal hearing (Lin et al. 2013). Hearing loss is associated not only with the risk of the early onset of dementia, but also accelerates the rate of cognitive decline (Gurgel et al. 2014). Older people with hearing loss are two and half times more likely to experience depression than those without hearing loss (Matthews 2013) and are at increased risk of major depression and anxiety (Davis 2011; Gopinath et al. 2009).

Hearing loss has been shown to have a negative impact on overall health and is associated with an increased use of health care and a greater burden of illness in older adults even when all other relevant variables are controlled for (Genther et al., 2013). This includes the risk of more frequent falls, (Lin & Ferrucci 2012; Viljanen et al., 2009) and is associated with a number of other conditions including diabetes, (Kakarlapudi et al., 2003), stroke (Gopinath et al., 2009) and sight loss (Chia et al., 2006). Overall there is strong evidence of increased mortality associated with hearing loss (Appollonio et al., 1996).
The impact of hearing aids and cochlear implants

While the impact of hearing loss is huge, today’s hearing technologies can do much to ameliorate this.

Many studies (Perez & Edmonds 2012, HSE 2015; EHIMA, 2015) show that hearing aids are an acceptable and well used intervention for hearing loss with over 80-90% usage. People benefit from hearing aids on a number of different measures of quality of life (Ciorba et al., 2012; Swan et al, 2012; Barton et al, 2004). Kochkin & Rogin (2000) also found positive outcomes for hearing aid users having better social engagement, mental health and physical health than non-users. Wearing hearing aids also reduces the risk of dependence on social care and risk of dying early (Fisher et al., 2014; Contrera et al., 2015). Saito et al., 2010 found that hearing aids had a positive impact on depression and, it has also been shown that those with hearing aids had higher levels of employment than those without, with clear health and economic implications (for example, Kochkin, 2010).

Amieva et al (2015) found it is possible to address the potential decline in cognitive functioning through the use of hearing aids (Amieva et al, 2015). Self-reported hearing loss was associated with accelerated cognitive decline in older adults but hearing aid use reduced the decline (Amieva et al., 2015). In another study of the impact of hearing aid use it was found that cognitive declines were greatest among participants who had hearing loss but had not worn hearing aids (Deal et al., 2015).

Cochlear implants are of proven benefit for those with greater levels of hearing loss improving speech understanding, quality of life, (for example, Távora-Veira et al., 2015), “reducing symptoms associated with depression and improves global cognitive function.” (Mosnier et al., 2014). Kobosko (2015) found that wellbeing was increased and dependence on mental health services could be reduced following cochlear implantation.

The earlier cochlear implants are provided the greater the improvement in outcomes and cost effectiveness (for example, Choi, 2014).

Athalye et al., (2015) and Ng et al., (2016) found that adults perceived improvements in communication, confidence, managing social situations, and additionally positive effects on education and employment, independence and family life after implantation. As cochlear implant technology has developed so has its effectiveness. For example, Dowell (2012) reviewed the evidence supporting the effectiveness of cochlear implants in adults across several decades and found that average open-set sentence identification averaged less than 40% for sound processors in the 1990s as compared to on average 80% correct scores with modern technology, even without visual cues. Further, as cochlear implant centres have gained experience so has the performance of candidates; Govaerts (2016) noted the average results now are systematically better than 5 or 10 years ago in the implant centres he compared.

We also know that surgical techniques have significantly changed, improving the effectiveness of the procedure, helping to protect residual hearing and improve outcomes further.

Patient surveys showed that those implanted highly value the impact the CI has had on their lives in improving confidence, ability to relate to others, maintain employment and improved wellbeing. For example, Ng et al. (2016) found that patients put a high financial value on the benefit of their implant. When asked to give their implant a financial value on a monetary scale 60% chose the highest value of above £150.00 per month.
However, many also qualified this answer with statements which suggested that their implant was ‘priceless’.

*“First job application after implant that I did not have to declare deafness I interviewed for and got the job and recently doubled my initially part time hours; so from meagre benefits to full time employment. PRICELESS!”*

There is evidence of the benefits of using hearing technology in both ears; binaural amplification can improve localisation, understanding of speech in noise and at a distance, ease of listening and a more natural sound (Weinstein, 2013); binaural hearing can be provided by two hearing aids, hearing aid and implant or two implants. Bilateral implantation has been found to provide substantial benefits across the age spectrum for example Noble et al. (2009).

Buhagier and Lutman (2011) asked adults who had received a second implant what their own personal perceptions of the advantages were. The results showed the impact which is not always measured by more traditional approaches.

Participants saw a further improvement once they got the second CI which they described as follows:

**Psychological:**
- Reduced sense of isolation
- Increased happiness
- Increased energy
- More relaxed
- Reduced depression
- More confident.

**Lifestyle:**
- Improvement at work
- Improved social life
- Increased independence
- Increased drive
- Better family relationships
- Have 2nd CI in case 1 fails.

However, the National Institute of Health and Clinical Excellence (NICE) guidance on cochlear implantation only recommends bilateral implantation for adults in special cases.

For patients who cannot yet benefit from bilateral implants or where they are not indicated by clinical criteria, bimodal fitting offers a viable solution to ensure that they still have the benefits of binaural sound and the real world impact this has on their quality of life.

In spite of the evidence there is a lack of awareness by the public and GPs about the huge impact personal and societal costs of hearing loss in adulthood, or of how today’s hearing technologies can help when managed effectively.
Hearing health care: The cost of NOT addressing hearing loss

If we don’t address hearing loss well, we risk not only individual difficulties but increased costs to society.

Growing evidence across Europe (Shield, 2006) and the world (WHO, 2017) is illustrating the economic impact of hearing loss and the cost effectiveness of addressing hearing loss. For example, the World Health Organisation (WHO) estimate that the cost of not addressing hearing loss is $750 billion annually, globally, (WHO, 2017) in their documents “A Sound Investment.”

A number of studies internationally have also looked specifically at the economic impact of hearing loss and deafness. Studies by, for example, Kochkin, 2007 and Stucky et al, 2010 found a negative impact on household incomes to the state in lost productivity and direct medical costs. These have led to calls in the United States for a reassessment of the impact of hearing loss (Bainbridge & Wallhagen, 2014).

For Australia, the total financial cost of hearing loss was estimated at $10.49 billion ($2,960 per person) of which productivity loss accounted for 57%. The cost for the loss of wellbeing (based on DALYs) was estimated at an overall $10.1 billion (CRC/Access Economics 2006).

People with hearing loss have higher levels of unemployment than those without. (Arrowsmith 2014, Davis 2012), costing society further. Recent estimates suggest that in 2013, the UK economy lost £24.8bn in potential economic output due to lower employment rates for those with hearing loss than across the rest of the population (ILC, 2014). Poor management of hearing loss can also result in additional care costs.

It has been estimated that at least £28 million could be saved by Social Care services in the UK if hearing loss was properly managed in people with severe dementia in the community, thus delaying their need for admission into costly residential care (AOHL, 2013).

In the UK a study explored both the additional burden of quality of life costs and costs of not adopting hearing aids and cochlear implants.

**IN THE UK**

£26 BILLION

THE ADDITIONAL BURDEN OF QUALITY OF LIFE COSTS WERE ESTIMATED AT

£4 BILLION

IN LOST EARNINGS

£76 MILLION

ADDITIONAL GP COSTS

£60 MILLION

SOCIAL SERVICES COSTS

The extent of lost earnings was estimated at £2,136 pa, with both higher unemployment rates and lower earning power in those with hearing loss. In total the study estimated that the costs associated with hearing loss were £30.13 billion per year (Archbold, Lamb, O’Neill, & Atkins, 2014).
A major review of the effectiveness of adopting hearing aids in France also found significant improvements in quality of life could be achieved while also saving money if hearing technology was more universally available and used (Kervasdoué, J. Hartmann, L. 2016). The study concluded that the target strategy of ‘all eligible people are equipped’ with hearing aids saves costs and provides an increased quality of life and that if the French Government were to offer hearing aids free of charge, there would still be a net saving and a marked increase in quality of life for millions of people.

Hearing aids are a cost effective intervention; for example (Chao & Chen 2008, Morris, 2012; Joore et al., 2003). People with hearing loss who did use hearing aids had employment rates which were almost double those who did not (Kochkin, 2010). Recent estimates suggest that in 2013, the UK economy lost £24.8bn in potential economic output due to lower employment rates for those with hearing loss than across the rest of the population (ILC, 2014).

In patients fitted with a cochlear implant one study showed that there were significant increases in median yearly income compared to pre-implantation ($42,672 vs $30,432) and the authors concluded that:

“Cochlear implantation not only improves quality of life but also translates into significant economic benefits for patients and the Canadian economy.”

Crucially they also noted that:

“These benefits appear to exceed the overall costs of cochlear implantation.” (Monteiro et al., 2012)

These studies demonstrate that addressing hearing loss through technological interventions could deliver very big savings when social and health care costs, and productivity losses and tax revenues are taken into account.
Adult cochlear implantation: current practice

Given the impact of adult hearing loss and the growing numbers affected, it is essential that the management of hearing loss is as effective as possible for the benefit of the adult with hearing loss and to society.

For adults with the greatest hearing losses this is likely to be through receiving a cochlear implant, and in the UK, cochlear implantation in one ear only (unilateral implantation) remains the standard of care for adults, as recommended by NICE guidance for clinicians and commissioners (2009), rather than two implants (bilateral implantation). This is in spite of evidence to show that hearing in two ears is of benefit for listening in noise and to localise where sounds are coming from (e.g. Weinstein, 2013).

In addition, the current NICE criteria are more restrictive than many other countries, for example, Australia, Germany, Italy and the USA where clinicians have greater freedom. They are based on audiometric thresholds of 90dBHL or above at 2 and 4 KHz and sentence testing using the Bamford, Kowal and Bench (BKB) sentences presented in quiet at 70dBSPL and are strictly enforced.

Some considerations which make changing the current NICE guidelines an issue are:

- Awareness of the impact of only testing in quiet and of using sentence tests on adults who have language
- Growing awareness that assessment should include “real-life” measures
- Greater awareness of the benefits of using a hearing aid and a cochlear implant
- Improved surgical techniques preserving residual hearing.

See Improving access to cochlear implantation: change lives and save society money, a report available on www.earfoundation.org.uk

With the knowledge of the benefits of hearing in two ears, the provision of bilateral hearing should be considered a standard of care for cochlear implant recipients (Ching et al., 2013). This can be two implants or hearing aid and implant. In some cases, with greater residual hearing in the low frequencies, then an electro-acoustic implant, combining hearing aid and implant in one device may be used. This report is concerned with exploring the potential benefits of providing useful hearing in two ears through the use of hearing aid and cochlear implant and users’ and audiologists perceptions of the services provided.
For many cochlear implant (CI) recipients, bimodal hearing through a single cochlear implant and a contra-lateral hearing aid may be the only way to benefit from binaural hearing to provide benefit in terms of listening in noise and localisation. However, there seems to be a great discrepancy in practice, with few adult users choosing to continue to wear a hearing aid in the other ear to the implant. Why not?

This report looks at what is known of current practice and reports on a new study of users and audiologists views and experiences, before making recommendations for changes in practice. With the growing interest in making cochlear implantation more widely available to those with greater levels of residual hearing (Lamb et al., 2016) who are more likely to benefit from a hearing aid, the issues to do with ongoing cochlear implant and hearing aid use and management are likely to become more pressing.

In several studies bimodal users reported clear advantages of bimodal hearing in terms of sound quality and perception as compared to those who wore a cochlear implant only. Although there was a variation in the perceived level of bimodal benefit, respondents reported advantages such as better music perception, better localisation, spatial discrimination and clarity (Stronks et al. 2017; Fielden et al. 2017; Athalye et al. 2016; Visram et al. 2012; Ching et al. 2005; Dunn et al. 2005; Kong et al. 2005; Luntz et al. 2005; Morera et al. 2005; Mok et al. 2006, Olson & Shinn, 2008). Bimodal users are also able to recognize people’s voices, perceive improved quality of environmental sounds in different situations, experience improved appreciation of music, increased confidence, and have better communication with others (e.g. Ching et al. 2007; Fielden et al. 2017; Athalye et al. 2016).

However, it appears that the majority of adult CI users do not continue wearing their hearing aid in the other ear; and this report is concerned with the reasons for this and why some do so.

Fitzpatrick et al., 2009 found that only 30% of their adult cochlear implant users with usable aidable hearing used a hearing aid in their contralateral ear, in spite of reported benefits and recommendations to wear the contralateral aid (for example, Most et al., 2011; Offeciers et al, 2005). The main reasons for not continuing to use a hearing aid in the contra lateral ear have been found to be the lack of perceived benefit and a dislike of the sound provided through the implant and hearing aid together (Athalye et al., 2016; Fielden, 2017).

With regard to decision-making for bimodal hearing, the biggest influence in making the decision to wear a hearing aid and a cochlear implant seems to be the advice of professionals, usually the audiologist at the cochlear implant centre (Athalye et al. 2016). Preservation of residual hearing in the non-implanted ear is also reported as an important motivating factor for continuing hearing aid usage. Fielden and Kitterick (2016) found some potential inconsistencies in the provision of bimodal aiding across the UK as reported by practising audiologists at cochlear implant centres.

There are many suggestions in the literature that those who have low frequency hearing were those who gained the most from binaural hearing, (Ilg et al, 2014) and also that the difficulties experienced by users in the lack of integration of the two signals from cochlear implant and hearing aid should be overcome. In spite of the long interest in the use of hearing aid and cochlear implant it appears that these technological developments are only now being addressed. However, as hearing aids and cochlear implants are commonly managed in different clinics in the UK, referred to in this report respectively as Audiology clinics and CI centres, there are difficulties in moving forward with joint management. This report shares new research into the current practice and experiences of audiologists who fit and manage hearing aids in audiology clinics and also the experiences of users. Firstly the adults themselves.
Adults with a cochlear implant and a hearing aid: their experiences

Eight adults with unilateral cochlear implants were interviewed to explore their experiences of bimodal fitting: the decision making process, the advice received and the benefits and challenges for them in daily life.

All adults had worn hearing aids prior to implantation; seven tried to continue wearing a hearing aid in the opposite ear to the implant but only three adults continue to wear a hearing aid with their implant longer term. Four had tried a hearing aid and discontinued use, and one had never tried to wear their hearing aid following cochlear implantation.

Even those who discontinued described a range of other benefits including:

Benefits to speech perception

“I find use of both aids enables me to do more and more than just with my implant e.g. telephone conversations.”

“I rely less and less now on my captions at work, and I can have on the move telephone calls at work on my mobile, using neck loop or using this headset, but if I don’t have my hearing aid or I don’t have my implant, forget it, it’s not possible. So it’s a completely new world for me now!”

Improved experience of sound

“Having both of these ears, even though they weren’t very good, individually they weren’t nearly as good as the sum of the two, I mean like two hands are much more useful than one hand... what you actually get even though it’s very small, together is much greater.”

“I would like to call it 4D sound, because the implant was basically giving me the high frequency and the hearing aid amplifying low giving me that (4D sound)[...] I had the full range of hearing.”

“If I forget to put the HA on [...] then I can’t really define it but it’s not quite as good.”

“I think it gives a slightly different resonance to things even though I don’t have very much hearing left on the (HA) ear.”

“I’m getting a lot of benefit from my implant and didn’t feel I needed my hearing aid, but being curious, I like to try things, that’s why I did it [...] I find use of both enables me to do more and more than just with my implant.”

Improved experience of music

“Musically definitely the HA contributes (and to) general experience of sound.”

“Without my hearing aid, the music was empty. So this is where I would say is the benefit of having the hearing and implant, then you get the full spectrum.”
Other reasons

Three CI users continued to use bimodal technologies even when they described little or no benefit from their HA; for two the reasons for this seemed to be to keep the ear stimulated or in case the CI fails. The other adult continued to use the HA out of habit or comfort; perhaps also indicating that they prefer the sound even when they report they get no benefit from it:

“I get very little from it but I don’t want the ear to forget what it is for in case the CI fails and I need a CI in the other ear.”

“It was just a little bit out of comfort, a little bit that I’d been wearing them (HAs) for 25 years.”

“I prefer to keep on using that even though it gives me virtually nothing at all.”

Directionality and localisation are sometimes cited as benefits of bimodal hearing; however these were not noted in this sample of bimodal users, with two commenting:

“I’d like to say it helps with the location of sounds, but on the whole, I don’t think it does.”

“I hope it might give me some sort of sense of direction... I don’t think it does really.”

It may be that what is important to users about using bimodal hearing, is not always what is considered important in the clinic. As one commented:

“The cochlear implant is brilliant for hearing higher frequency sounds, brought back memories of being able to hear the birds, cat meowing, etc plus am able to identify more sounds indoors and outdoors. Combined with the hearing aid, I feel I have a balance of hearing both high and low frequency sounds, especially when communicating with my Dad.”

Challenges of bimodal hearing

Bimodal users also commented on the experience of adapting to bimodal hearing and the difficulties they still encountered.

“It took a long time to get used to... quite exhausting in the early weeks. For me it took maybe 6 months to get used to, partly because my ear had got lazy, there were a lot of things that I had to learn.”

Users’ experience of decision-making

None of the adult CI users reported any pre-implant discussion with professionals about using a contra-lateral HA. All except one had a personal expectation that they would continue to wear their HA post-CI; this adult had been told that a HA would not be an option due to her lack of residual hearing.

“Both ears are completely dead [...] the other ear has been deaf for too long time, (I was not encouraged to try a HA) because I already had no hearing left. Perhaps I should have been encouraged to try?”

Mixed advice from professionals

Although these seven (out of eight) adults chose to wear their contra-lateral HA post-CI; five reported no specific advice from audiologists to support this decision. Comments included:

“You’ve got some hearing in that ear so why don’t you just try and keep the HA in case.”

“It was just expected that I would (continue with HA).”

“I will say what people in the hospital said, just try it and see if it will work for you.”

“I can’t remember that discussion taking place [with audiology] but I can remember saying that I wanted to carry on wearing the HA.”

“Nobody ever said wear it as well or not to wear it [R: They just left it up to you?] Yeh yeh.”

“I think it was whatever you felt comfortable with, if you felt that you needed it (HA), then try it.”

“Nobody really asked me.”

“I don’t think anything was ever mentioned about that. I think I probably just carried on wearing this HA because between operation and switch on, that was all I had however little it was, so I imagine I just carried on wearing it.”
Only two reported specific guidance on when and how to introduce it.

Introducing the HA immediately post-CI:
“When I first got the implant, the person fitting me said ‘you don’t need to bother with a HA... we want to break you in not using the HA on the other side [...] they more or less said you can throw that HA away now.”

“They ask me to try, to see if I could get used to a hearing aid in one side and the cochlear implant in the other.”

Introducing the HA once CI use is established:
“We want you to get used to the implant so you know, try and alternate between the two or just get used to the implant a bit more, because it’s a very different information [...] so I think it was kind of try not to wear it and you’ll get used to the implant quicker, but equally if you’re not comfortable then wear the HA.”

Lack of perceived benefit from the HA

Despite the benefits of bimodal hearing perceived by some users, for others the CI provides such useful hearing that they didn’t feel the need to persevere with their HA or the HA detracts from the sound provided by their CI.

“Once you go for CI, CI is such a powerful tool that it takes over so much [...]and you just want to concentrate on the better one.”

“It amplified, but didn’t clarify. And because it amplified a muffled version [...] it’s like throwing diluted mud into clear water.”

“The aid provided no benefit and confused the sounds through CI.”

“I think it also depends on how successful your implant is...it seems that those who have done as well as I have with their implant usually tend to forget about their HA and we just go for the best but those who haven’t quite so well with the CI especially with speech, they tend to boost themselves up in the second ear with a HA because they feel it helps them.”

Audiologists had also seen this clinically:
“In my experience, once a HA user had an implant; they tend to not use their contra lateral aid as it doesn’t sound the same. Patients have a preference to their implant.”

“A lot of people give up on the HA because the CI is enough for them.”

Lack of awareness or advice

“And most people [...] weren’t wearing the hearing aid, they were just wearing the implant so I think I thought, well it’s not just me can’t be bothered, it was other people as well.”

“Perhaps I should have been encouraged to try, nobody really asked me [...] why did nobody try to persuade me? There wasn’t this kind of discussion.”

“I’ve never felt that we had the chance of sitting and discussing all the different options between audiology departments, there is no chance or time [...] how can she or he know what is right for you.”

Effort

“It (using both HA and CI) was just making me even more confused and tiring me.”

“I think people can be too familiar in their own comfort zone with the HA and may not challenge themselves [...] without the HA made it much more challenging and therefore more rewarding.”

“(HA) gives you that bit more of a comfort, which means you might not push yourself very much with the implant.”

Cosmetic and comfort issues

“It’s a waste of time, because HAs go in your ear and make your ears sweat...with this [CI] I haven’t got a thing in my ear so it’s not making my ears sweat.”

“It was distracting, not enough, not helping me at all, uncomfortable on the eardrums, feels like hurting sometimes.”

“I didn’t like the visibility of the hearing aid in my ear [...] I think because of the lack of hearing I could hear out of it, it did bother me having that visibility.”
Current challenges: communication between hearing aid clinic and cochlear implant clinic

Communication between audiologists managing the hearing aid and those managing the cochlear implant; the user views:

Comments from the adult users indicated a lack of communication between the audiology centre where their hearing aid was fitted and the CI centre. For example:

“They don’t seem to talk to each other.”

All of those who tried bimodal hearing, except one, report that their HA and CI were managed separately even when the service is provided in the same location:

“I think they were managed quite separately [...] I only went back to Audiology when I thought the HA wasn’t working.”

“If I want them to check out the HA, I have to make two appointments on the day I go up there.”

“I think mostly it was with the implant on and the HA off, but then at the end they were like you can put the HA on just to make sure it feels comfortable with the HA, just to check and see how it feels, but it was never a main factor in the whole programming.”

“You need to ask [...] if you want your HA to be checked out.”

Only one participant had an integrated service for CI and HA management:

“The whole thing is combined...they’re truly excellent. Sometimes they test the ears together or alone.”
Recommendations from users

Listening to the experiences of adults provides an invaluable insight into the decision-making process, the challenges of continuing bimodal hearing and how it could be improved.

The adult CI users would encourage potential bimodal users to consider the following issues:

- Understand that sound from the CI will be different from that experienced with the HA
- The experience of bimodal hearing may be different for each individual
- Be prepared to work at developing listening skills
- Consider trying bimodal technology even if there is little residual hearing as there may be benefits
- Give it time; persevere with the HA
  “You should try and see what works, don’t just reject it because you don’t think you need it anymore, take it out there in the world and try it. Try the world without it in your ear, see if it works better. Don’t throw the hearing aid away. Learn where one’s good and where one’s not good.”
- Use available support
  “I have a very strong supportive network [...] and I think that does help; a support network or mentor.”
  “A forum would be good for CI users to share their experiences.”
  “It would have been nice to talk to someone...I didn’t know enough to ask the real questions.”
  “Peer support is important, we see things that you might not see as important, but actually is.”

These CI users also suggested recommendations for audiologists working in this area:

- Work together with the user
  “To see us as a partner in getting the best outcome rather than just seeing us as someone who receives technology.”
- Routinely provide information about the potential benefits of bimodal hearing and the bimodal technology options.
  “We are not always given the best technology in hearing aids; perhaps if those were combined together as well you would see the difference in how people want to use their hearing aids.”
  “I think it is important to look at what hearing aid technology you can give when you talk about bimodal because if people were given better options, they could probably continue with the hearing aid.”
- Consistent advice and guidance about how and when to introduce a contra-lateral HA
Hearing aid audiologists’ views of current practice in bimodal fitting

An on-line survey was conducted to explore the views and experiences of hearing aid audiologists in assessing and managing bimodal technology in their hearing aid clinics.

The questionnaire recorded demographic information and contained both open and close ended questions. Forty responses were received in total and came from throughout England, including those in a range of roles.

All considered that there may be benefits of bimodal usage:

“Binaural hearing helps with the detection of direction and is beneficial in background noise [...] the hearing aid may provide a different quality to the sound perception, possibly more preferable for music appreciation.”

“I only have experience of a few patients with cochlear implants but they all use an aid in the contra-lateral ear successfully.”

Some (n=7) also acknowledged that there ‘may’ be a benefit and pointed out that there could be variation in the benefit.

“Some patients seem to do very well with CI in one ear alone, some are better with bilateral CIs and some do well with CI and hearing aid not all patients will benefit from the same technologies.”

Deciding to use bimodal hearing

Up to 62% of the audiologists reported that they would recommend a hearing aid on the contralateral side to new or to established CI users with consideration of the following factors:

- Level of residual hearing
- Perceived benefit
- Advice from CI centre
- Patient motivation
- No other contraindications

When asked about how the decision is made in their respective clinics, patient request was the most common method followed by trial to assess benefit.

However, advice and information appears to be inconsistent particularly with regard to when and how to introduce the contra-lateral HA post-CI.

- 47% believed that it should be patients choice (n=9)
- 58% would recommend that the CI and HA should be used together from the start (n=11)
- 37% said that the HA should be fit some time after the CI is activated (n=7)

Of the range of support provided when considering the option of using bimodal hearing (n=24), discussion/verbal advice (88%) was the most common support offered by HA clinics, followed by counselling (58%), online resources (46%), leaflets/information resources (33%) and opportunity to meet/talk to other bimodal users (33%). However, audiologists also reported that their limited experience of managing bimodal hearing presented a challenge and they would require training and support to advise those considering using bimodal hearing.

None of the adult participants reported receiving advice or information about bimodal hearing from their hearing aid clinic.
Although 75% (n=30) of the total respondents reported that they see bimodal patients in their clinic; the majority of this group (n=16) currently see less than five bimodal patients per year and only one reported seeing more than twenty five patients per year. Half of the audiologists who answered the question (12/24) reported that their clinic had no standard protocol or fitting parameters for bimodal fitting.

Management of CI and HA

The majority of respondents (63%) believed that programming the CI and HA together is the most ideal way to manage bimodal technology; only six (6/19) felt that they can be effectively managed independently of each other.

However, 79% of the respondents (n=19) report that post CI the hearing aid clinic is responsible only for the management of the HA and its technical issues. The majority of clinics (62%) report that locally, adults receive the management of their CI and HA in different clinics and at different appointments; however only five clinics manage both the CI and HA in the same appointment.

When asked about who takes responsibility for the fitting of the hearing aid and issues with the hearing aid, 67% of those with experience wanted the fitting to be the responsibility of the hearing aid clinic and 25% the cochlear implant clinic: others were not sure. All respondents wanted the responsibility for the management of the cochlear implant to be with the cochlear implant centre.

However, there were some comments reflecting on practice; for example:

“I would assume that it would be sensible to maintain the CI and hearing aid as complete systems – as you would a pair of hearing aids.”

Only one respondent commented on accessory provision:

“Liaising with the implant centre i.e. when upgrading a HA to ensure that the aid is compatible with the CI ie the assistive listening/streaming devices to ensure maximum benefit.”

Audiologists in HA clinics identified advice from the CI centre as one of key important factors in the decision-making process; however there was variation across clinics with regards to communication between the CI and HA centres.

“Have good links with several implant centres to be able to discuss issues etc. We have had training from implant companies and have attended relevant training days. We also have in-house presentations from implant centre staff.”

On the other hand there were several comments such as this:

“We do not fit the implant and have no data on how the implant has been fitted.”

“We only deal with the hearing aid and for help with the cochlear implant they (the patient) will have to contact the cochlear implant department.”

“It would be better if CI and HA are going to be used together more often to have the CI team provide and care for both with the exception of general maintenance of the hearing aid which should be undertaken locally e.g. impressions, ‘re-tubes, etc.” (Audiologist)
In summary, the research showed:

- The majority of both the users and the hearing aid audiologists agreed that there may be benefits to trying a hearing aid contra-lateral to a cochlear implant. Even those adults who did not use both, felt there could be benefits to trying the HA.

- Benefits acknowledged by both users of bimodal hearing (regardless of level of residual hearing) and professionals (regardless of level of experience with bimodal hearing) include better speech and music perception. In addition, users also described improvement in quality of sound describing it as ‘full spectrum’, ‘4D’, ‘added resonance’.

- Hearing preservation in the contra lateral ear was important to some CI users.

- The main reasons that emerged for not using the hearing aid were lack of perceived benefit, the greater usefulness of the hearing from the cochlear implant and a lack of consistent advice or discussion in decision-making.

- The majority of audiologists saw less than five patients using bimodal technology a year; they were primarily involved in the assessment of hearing aid candidacy only.

- The majority of audiologists considered programming the CI and hearing aid together as the ideal way to manage bimodal technology. However, only one adult user had experienced this service.

- Hearing aid and CI services are largely separate entities with different processes.

- Examples of limited communication between hearing aid audiology services and cochlear implant centres were reported by both audiologist and users.

- There was variability in when audiologists thought that a contra-lateral hearing aid should be introduced to a new cochlear implant user; about half would recommend introducing a contra-lateral HA to new CI users and the other half would recommend introducing a hearing aid when CI use is established. Adult CI users experienced a variety of advice from audiologists regarding using a contra-lateral HA post-implant.

- Half the audiologists had no protocol for managing bimodal hearing in their clinics; four were unsure if the clinic had a protocol.

- Audiologists largely felt they had the knowledge and skills to manage bimodal technology, but would value more training.

- In considering the use of bimodal hearing, discussion/verbal advice was the most common support offered by clinics followed by counselling, online resources, and leaflets. The opportunity to meet/talk to other bimodal users was also considered important, but the least common to be offered.
With the current interest in increasing access to cochlear implantation for adults with greater levels of residual hearing this issue is a growing one. Research has shown the potential benefits of cochlear implant and hearing aid, and today’s technology, with wireless links able to stream audio signals and link HA and CI can make the combination more effective.

However, in practice it appears that most adults give up using their hearing aid. Their comments indicate they feel that this wasn’t the necessary outcome.

“I think it is important to look at what hearing aid technology you can give when you talk about bimodal because if people were given better options, they could probably continue with the hearing aid.”

Although the audiologist respondents recognise the potential benefits of bimodal hearing, most of them had limited experience of managing these patients and do not seem to discuss bimodal hearing with patients pre-referral to CI centres. They all considered that joint management of hearing aid and cochlear implant to be the ideal; however, this continues to be an uncommon practice, and only one adult user experienced this service. Most clinics still consider that the CI is the responsibility of the CI centre and the HA clinic is responsible for the HA. This discrepancy in perceived responsibilities needs consideration in order to facilitate holistic care; the development of wireless bimodal options further highlights this need (Advanced Bionics 2016).

There continues to be uncertainty and variation not only about the advice to give regarding the introduction and use of bimodal hearing, but about roles and responsibilities of the hearing aid clinic and the cochlear implant clinic; lack of communication appeared to play a part in this. Audiologists were keen to have further training in bimodal hearing management; this would also improve communication and knowledge. Inconsistent advice and information also means that users often make the decision about bimodal hearing using trial and error, rather than with consistent guidance or support.

Although a small group, the users represented a wide range of experience including those who had never tried their hearing aid, those who had tried and discontinued use and those who continued use of both hearing aid and cochlear implant. The reason for not trying a contra lateral HA seemed to be lack of advice or opportunity to do so; the reasons for discontinuing HA use were largely because the cochlear implant was so useful by comparison that there seemed no point in continuing with the hearing aid or that the HA affected the perception of benefit from the CI. Joint management and better communication would perhaps improve this situation; from the one user who had experienced joint management, this approach is highly valued. Other reasons for not continuing were discomfort with the hearing aid, which needs addressing.

Given these findings and those from research of the potential value of bimodal hearing; it is surprising that the wearing of a hearing aid and cochlear implant is not more commonly used when we are looking to maximize the benefits from today’s hearing technologies.

“We are not always given the best technology in hearing aids; perhaps if those were combined together as well you would see the difference in how people want to use their hearing aids.”
Imagine if for your glasses prescription you went to one optician for one lens of a certain power but then had to go to another for the separate lens of different power, or that one dentist did your fillings, a separate one your crowns, a third your check up before referring you to either.

This is similar to the situation we now have in respect of bimodal hearing for adults with an implant and a hearing aid in the UK. Two ears may be better than one but those ears presently get treated in different places by different teams with little or no co-ordination; this is not the situation across Europe, where joined up clinics are more common. We have shown the huge and growing impact of hearing loss in adults and how today’s hearing technology can help.

For those with a hearing aid and an implant, there is an urgent need to review the way bimodal services are commissioned and delivered and adults supported to ensure the most effective outcomes for them and the most effective use of public services.

The one person who had experienced joined up services was delighted:

“The whole thing is combined...they’re truly excellent. Sometimes they test the ears together or alone.”
References

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Acknowledgements

Full report, Choosing and using bimodal hearing: the experiences of adults with a cochlear implant and audiologists working in hearing aid clinics. Available at: www.earfoundation.org.uk/research/research-across-the-lifespan/adults-26-years

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