Adult Cochlear Implantation: Evidence and experience

The Case for a Review of Provision

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Executive summary

Hearing loss in adulthood is linked with greater unemployment, increased risk of poor health, depression and increased risk of other conditions including dementia. However, there is little recognition of the impact of hearing loss or of the latest hearing technologies which can improve hearing. Nowhere is the failure to address the consequences of hearing loss better exemplified than in the low provision of cochlear implantation for adults.

This report reviews the current evidence on the impact of deafness in adulthood and the new evidence of the impact of cochlear implantation in adulthood since the review by NICE, and maps the provision of cochlear implantation in England in a changing health context. It also reports on new research exploring the experiences of adults who have been refused implantation. It recommends:

1. A review by NICE on its current guidance on cochlear implantation on the criteria around both unilateral and bilateral cochlear implantation.

2. Greater weight to be given to the real world impacts of hearing loss and the use of more relevant Quality of Life measures, including better models for assessing patient perception of benefit.

3. As part of the development of cost benefit analysis for cochlear implants, more account needs to be taken in judging the cost benefit ratios for cochlear implantation of the growing evidence on the links between hearing loss and the co-existence of other conditions in older people, particularly dementia.

4. The need for commissioning models used for funding to look at the wider health costs in decision making. This would prevent transferring costs onto the health and care system caused by not addressing hearing loss earlier.

5. The establishment of a lead Commissioner for Audiology so that there is a greater focus on good commissioning for Audiology services across all the Clinical Commissioning Groups as part of the new system of commissioning in England.

6. Greater education of GPs and audiologists on the potential benefits of cochlear implantation for adult and older patients.

7. More work through Public Health England on the benefits of people addressing their hearing loss and reducing the potential stigma associated with hearing loss so people are encouraged to take action.

Andrew Dunlop, GP with a cochlear implant:

"I would like to think that I was always sympathetic of patients suffering from loss of hearing but now I actually know how it feels. I am passionate about encouraging and promoting the possibilities of cochlear implantation – I think there is an "iceberg of unmet need" out there. I feel GPs need more information about the procedure, and more patients should be referred to ENT consultants and audiologists who have experience and understanding of the role that cochlear implants can have in transforming lives."
To communicate is to be part of society. Losing your hearing is not simply the absence of sound. If not addressed, hearing loss becomes the loss of our capacity to take part in social life, cutting us off from family, friends, social contact and work. Deafness in adulthood is linked to depression, increased risk of unemployment, increased risk of poor health\(^1\), reduced mental health and increased risk of other conditions, including dementia. \(^2\) This imposes not only a social burden on individuals\(^3\) and families but a huge economic burden on society that often goes unrecognised. A study from the United States suggests that not tackling the effects of hearing loss costs from \"$154 billion to $186 billion per year (2000 prices), which is equal to 2.5\% to 3\% of the Gross National Product.\" \(^4\) Similar estimates for the UK put the loss to the UK economy every year through unemployment related to hearing loss at £13 billion each year (2006 prices). \(^5\) The loss to individuals is more complex to calculate but entirely clear in principle. The Global Burden of Disease study shows that across the UK, in people over 70, age related hearing loss is the eighth most important contributor to the years of life lost through living with disability. \(^6\) The 2012 GP survey shows that 83\% of those with severe hearing impairment have an additional long term condition and 33\% have more than two additional long term conditions. Of the 300,000 people of working age with severe hearing impairment, 20\% report being unemployed (and seeking work), with an additional 10\% reporting that they cannot (seek) work due to an illness or health condition. The contribution to not working due to hearing loss is independent of other long term conditions and dramatically higher than the national average. It is also important to note that the nature of work is changing, with many more jobs dependant on people’s communication skills, which leaves those with unaddressed hearing loss more vulnerable to unemployment. \(^7\) The impact of hearing loss on the individual is compounded by the stigma attached to hearing loss by society. People fear taking action when they lose their hearing because they rightly perceive they will be treated differently. \(^8\) Perhaps as a result, there is on average a ten year delay in seeking help for hearing loss. The consequences of hearing loss are also not well enough understood and prioritised by the medical profession, or indeed by the National Health Service (NHS) generally. Evidence on health expenditure on hearing loss shows that it has remained essentially static, or at best seen a marginal increase, as a proportion of overall NHS spend, notwithstanding improvements in technology and evidence of increasing unmet need. \(^9\) Of those who do go to their GP about their hearing loss, 45\% are not referred for an audiological assessment. We know from studies that hearing aids improve adults’ health-related quality of life by reducing the psychological, social and emotional effects of hearing loss. \(^10\) For those who are severely/profoundly deaf, and for whom hearing aids offer little benefit, cochlear implants (CI) offer the chance of useful hearing. Despite the digital revolution in the NHS, in which high quality digital hearing aids are now routinely fitted to greater patient benefit, there remains a huge under utilisation of implants for adults.
A cochlear implant is made up of parts that are worn outside the body (microphone, sound processor and transmitter coil) and parts that are placed under the skin behind the ear (receiver–stimulator) and in the inner ear (electrodes) during an operation. The microphone is often worn behind the ear like a hearing aid. It picks up sounds which are turned into electrical signals by the receiver–stimulator and sent to the brain by the electrodes placed in the inner ear (cochlea). Sounds heard with a cochlear implant are not the same as those heard with the human ear. With an appropriately programmed system and support, the person with a cochlear implant becomes able to use their implant to understand speech and other sounds.

Nowhere has this failure to address the consequences of hearing loss been better exemplified than the way in which we are failing to capitalise on the potential benefits for adults in extending provision and choice for cochlear implantation.

NICE (TAG166, 2009) identified that there are approximately 613,000 people older than 16 years with severe to profound deafness in England and Wales. Davis's national study in 1995 reported that in 18–80 year olds 0.7% had a severe hearing loss (70–94 dB HL) and 0.2% a profound (>95 dB HL) (Davis, 1995). With a population of 51.4 million over 15 years of age in the UK (Office of National Statistics, 2011) there is an estimated 100,000 people with a profound loss and 360,000 with a severe loss. Although it is difficult to determine the exact number of adults who may have a clinical need for an implant, on any of the current measures of profound deafness, as Raine concluded, the current level of provision for cochlear implantation “would appear to be significantly below any predictions of need.”

Annual data shows that there has been a slow but steady growth in numbers of adults implanted per year from about 240 in 2003/2004 to about 500 in 2010/2011, with over 5,000 adults now fitted in the UK. It looks as if only around 5% of adults who might be able to benefit from an implant are currently getting one. Although this is a similar rate of underutilisation to that which is seen in the USA, compared to European counterparts the UK is only fitting half the number of implants in adults as Germany and Austria. De Raeve also found that in Belgium there was a high level of fitting for adults.

NICE (2009) has already reviewed the effectiveness of cochlear implantation and gave a positive, but restrictive, assessment on the criteria to be used for fitting of cochlear implants in adults. However since then and the NICE review of 2011, there have been significant additional research, meta-analyses and technical assessments which have strengthened the case for a widening of criteria for adults. Further, there have been significant developments in the technology which also alter our understanding of the costs and benefits of cochlear implantation. Costs of the implants themselves have reduced considerably, changing the health economics of providing cochlear implantation.

Related to this we are also getting a clearer understanding of the costs related to not taking action both for individuals and for society through lost work opportunities, increased health related conditions and the costs of addressing these issues.

The weight of this evidence points to:

- Cochlear implantation for adults being an effective intervention for a much wider group of candidates than had previously been thought
- The benefit of cochlear implantation needing reviewing in the light of reducing prices, more effective technology and more evidence about positive outcomes
- The need for a better assessment and commissioning framework to ensure equitable access for those who could benefit.
- Ensuring greater awareness of GPs, audiologists and the public about cochlear implantation
- A review of the NICE guidelines.

This report reviews the current evidence and the patients’ viewpoints in the current changing commissioning (funding) arrangements in England.
The starting point for any review of the current debate on CI must be the NICE guidance of 2009, reviewed in 2011. In that review NICE concluded that fitting cochlear implants was effective in adults, subject to the following criterion:

“The Committee concluded that unilateral cochlear implantation for adults and children with severe to profound deafness who did not derive adequate benefit from acoustic hearing aids would be a cost-effective use of NHS resources”.

Clinical Criteria

The clinical criterion for cochlear implantation set by NICE gave specific targets, which are currently used for funding decisions. With appropriate hearing aid provision, a score of less than 50% on Bamford Kowal Bench (BKB) sentence testing at 65 dB SPL in quiet, and pure tone thresholds of 90 dB or higher at 2 and 4 kHz, are the criteria for eligibility. These current clinical criteria applied by NICE have been criticised for being too restrictive. Many clinicians would argue that this standard does not reflect the ‘real’ world, and that as a minimum other tests should also be deployed. In addition, the use of sentence tests, rather than monosyllabic words, enables deafened adults to use their previous linguistic knowledge to complete the test. There is an urgent need to look at the deployment of a wider range of tests. Raine has proposed that testing in noise and assessment of performance with monosyllabic words would be more appropriate: indeed, these are for example the criteria used in Germany. Interestingly, the German approach does not specify audiological criteria, giving the clinician possibly more clinical freedom. In the study by Athalye et al, which interviewed respondents who had been refused implantation, the majority believed the decision was made on the basis of the audiological criteria: respondents spontaneously commented that the audiological assessments did not reflect the real life challenges of their hearing loss.

Bilateral implantation

“The Committee considered the evidence for the clinical effectiveness of bilateral (2) cochlear implants. The Committee considered that the additional benefits of bilateral cochlear implantation were less certain than the benefits of unilateral cochlear implantation. This was because of the limitations of the evidence base owing to the small number of studies and the small numbers of participants. However, the Committee considered that the studies had shown additional benefits to having a second cochlear implant in relation to speech perception in noisy situations and directional perception of sound. The Committee heard from patient experts that they considered that there were other benefits from bilateral cochlear implantation. These benefits included easier, less exhausting communication (for example, determining the direction of the sound in group conversations without unnecessary head movement). The Committee concluded that there were additional benefits of bilateral cochlear implants that had not been adequately evaluated in the published studies, although these may vary among individuals.”

The technical report prepared for NICE was also clear in concluding that:

“Probabilistic threshold analyses suggest that, when measured on a lifetime horizon, and compared with either non-technological support or acoustic hearing aids, unilateral cochlear implants are highly likely to be cost-effective for adults and children at willingness to pay thresholds of £20,000 or £30,000 per QALY. There are likely to be overall additional benefits from bilateral implantation, enabling children and adults to hold conversations more easily in social situations.”
However it was less positive about the cost benefit equation for fitting bilateral cochlear implants, given the current willingness to pay thresholds at that time:

“overall, in both adults and children, our model and the highly uncertain utility gain estimates contained within it suggest that both simultaneous and sequential bilateral implantation would be unlikely to be judged as cost-effective as unilateral implantation (given currently accepted levels of willingness to pay for a QALY in the UK NHS).”

In response to the 2009 guidance, 13 CI centres in the UK formed a consortium and created a multicentre audit program to collect outcomes data on children receiving simultaneous and sequential bilateral CI. They are also doing further work on the cost effectiveness of adult implantation in the light of the report.

New evidence

Since the NICE review there has been a very substantial change in the overall level of knowledge about the effectiveness of cochlear implantation following a number of additional studies and meta-analyses. There has also been a reduction to the cost of implants while the technology has dramatically improved. These changes are reviewed below and strongly argue for the urgent need to review the NICE guidance on cochlear implantation.

If we look at the key issues around the developing evidence on cochlear implantation in adults they fall into the following areas.

The evidence for the impact on older people

Before the NICE review there was substantial evidence that cochlear implantation in older adults produced positive results. However since then this has been added to significantly with positive outcomes being reported in a number of recent studies showing that for patients between 60, 65 and 79 years good outcomes are achieved.

Further the results for older patients compare well with younger patients, with some studies showing equivalent gains as for those with younger adults. Thus Noble found that similar outcomes for older and younger adults though younger bilateral subjects were better on localisation. Olze also saw positive results including QoL and tinnitus measures, and Poissant found gains on speech understanding and QoL measures. Even where performance has not been as good the outcomes have still been very positive. A drop off in gains was found by Williamson but with only slightly poorer performance in subjects over 80 years of age. Lenarz also found that patients over 70 showed a similar learning curve as younger adults and found no difference between average performance of the older patients and younger adults in a range of standard speech tests. Park also found that speech recognition improved in all age groups (<50, 50-65, >65) and quality of life all improved markedly and in all age groups to a similar extent. The effect was not dependant on prior use of a hearing aid. While Budenz did find subjects who were older benefited less this was primarily due to a correlation with the duration of the hearing loss not the age of the subject per se. Berrettini also found a drop off in benefit in a systematic review for fitting post 70 but also concluded that there was “improvement of the quality of life and perceptive abilities after CI,” and that “advanced age is not a contraindication for the CI procedure.” It is also the case that adults born deaf have been seen to have substantial gains from cochlear implantation; this was previously not thought to be the case. For example, patients with a mean age of 36 (range 21-55) were implanted and showed significant improvement for Consonant/Vowel/Consonant word and phoneme score, equally significant improvement on a number of quality of life measures and to have improved speech production.

Surgical experiences

Concerns about the surgical risks of implantation in older patients have been addressed. Several recent papers have reported generally low rates of surgical complications in elderly CI recipients including Eshraghi (2009), Chehlo (2009) and Migirov (2009). Carlson compared surgical complications between younger and older CI recipients and found that while anaesthetic related problems are slightly more common in older patients post-op and medical complications were not. It was also shown that the operation has only minimal anaesthetic risk.
Cost effectiveness of unilateral cochlear implantation

As noted NICE concluded in 2009 that the cost benefit analysis for unilateral cochlear implants in adults have remained positive. Since then this has been further supported by a meta-analysis by Turchetti et al who found that:

> “that monolateral cochlear implantation is generally a cost-effective intervention…. Overall Cost/QALY estimates indicate that monolateral cochlear implantation is also a cost-effective intervention for elderly patients” 45

These more recent findings support Bond’s technology appraisal for NICE 45 cited above.

Bilateral cochlear implantation in adults

The NICE review and the TAG/NICE report did find the evidence to support the effectiveness of bilateral cochlear implants but due to the limited evidence of additional patient benefit and the assessment of cost effectiveness of the second implant concluded that they could not recommend bilateral implants at that time.47 Since then there have been a number of studies and technology assessments which have been positive. A technology assessment by Raman et al, 48 found that unilateral cochlear implantation had been effective in improving speech perception and health related quality of life in adults with profound hearing loss. Further that bilateral cochlear implantation provides added improvements in speech perception in noisy environments over unilateral implantation and better sound localisation. Van Schoonhaven 49 in a meta-analysis found that while there continued to be difficulties in comparing studies that all studies reported “a significant bilateral benefit in localization over unilateral implantation.” Bilateral implants were also beneficial for speech perception in noise and for some self-reported measures. They concluded that “The current review provides additional evidence in favour of bilateral cochlear implantation, even in complex listening situations.” Similar findings were also found in a separate meta-analysis by Gaylor 50 which concluded that “Results from studies assessing bilateral implantation showed improvement in communication-related outcomes compared with unilateral implantation and additional improvements in sound localization compared with unilateral device use or implantation only.” In another systematic review Crathorne 51 also found the same problems in study comparison and heterogeneity of studies but again noted that all studies reported improvements in bilateral cochlear implantation for improved hearing and speech perception and that quality of life is improved in the absence of worsening tinnitus. However on the basis of limited cost-effectiveness evidence they concluded that it was probably only cost effective at a willingness to pay threshold above £62,000 per quality life adjusted year. These results are also true when users of bilateral implants are directly compared with those using one cochlear implant. 52

However the cost equation is still difficult in terms of the current willingness to pay threshold. The argument on this is complex. There are a number of well known factors including discount factors and how benefit is measured that can dramatically alter the potential calculations. The systematic review authors conducted global sensitivity analyses at the study level (Lammers et al.) 53 concluded:

> “The incremental cost-effectiveness ratios for bilateral cochlear implantation vary widely and appear to depend on the gain in QALY due to the second implant. The results of this review confirm that more empirical data are required to estimate the cost-effectiveness of bilateral implantation.”

Moreover ratios are developed on the gain between the first and second fitting without analysis of the difference as to whether the first or second implant was in the best ear and without reference to more real world benefits. The costing ratios also do not take into account our growing understanding of the links between hearing loss and dementia which might affect the overall assessment of the cost benefit threshold even under current measures of benefit.

Many of the studies also do not show how auditory test scores might translate to hearing-related function in real-life situations. Some authors have estimated that in normal-hearing individuals, bilateral squelch contributes 2 dB improvement to (reduction in) the signal-to-noise ratio required for listening to speech or another signal in the context of background noise and that the head shadow effect contributes about 3 dB improvement in the
required signal-to-noise ratio in noisy situations.\textsuperscript{55} Thus, the reported improvements of 0.53 to 11 dB for speech perception in noise in these studies, with most improvements ≥ 2 dB, suggests that bilateral cochlear implantation produces clinically relevant improvements in speech perception in noise.\textsuperscript{56}

Studies which also look at self-reported benefits from patients also show that patient perception is that bilateral implants make a significant difference. For example Noble et al. also found on a review of self-reported benefits that “it remains evident that bilateral implantation offers substantial benefits across the age spectrum.”\textsuperscript{57} This has been further borne out in a pioneering study\textsuperscript{58} on adults who have been implanted sequentially who were then asked what their own personal perceptions of the advantages of having a second implant. 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

As illustrated, the case for bilateral cochlear implantation in adults has strengthened. It is proven not only to be clinically effective in measurements in laboratory conditions, but adults report significant benefits not just in their ability to hear better but in improvements in psychological impacts related to their hearing loss. Measurement, as with the Buhagiar and Lutman study, should focus much more on the assessment of real world effects and the psychology of hearing loss. For example, many patients start with binaural hearing and then lose it. The starting point for measuring change should not be the additional gain between the first cochlear implant and the second, but from the potential benefit of both and what would be lost by losing one, as is the case with unilateral implantation. Certainly in psychological terms, and therefore real life effects and benefits, we know that people generally invest more value in the loss of something they already have than in risking something for further potential gains.\textsuperscript{59} Therefore measurement should start from the assumption of full hearing rather than the marginal utility of difference between the first and second implant. This would measure the level of loss and how far this has been addressed by the device. This has been referred to as measuring the revealed disability that someone is facing.\textsuperscript{60}

This was reflected in one of the interviewee’s comment who said that:

“I still feel it’s worth trying, like I said, if I had £30,000 I would put on the table right now.”(P1)

Given both the strong clinical evidence and patient experience, which has not been so sensitively captured until now, it is important that future assessments of suitability for implantation take these fully into account in the development of any future guidance.
Changes in Technology

It is also the case that since the NICE review the technological advances in the quality and performance of implants led to further improvements. NICE’s evidence on UK adult studies, including bilateral data, was collected on patients that were predominantly wearing technology from the late 90’s, due to time lag inevitably involved in studies with substantial data sets. Certainly for studies in the UK, and possibly wider, these devices are likely to have been analogue processors with no input processing.

There have been a significant number of changes to the technology since the NICE review including:

- Up until 2004/2005 the sound processors were analogue: after that digital processing was introduced. Essentially this change was the same as the process of ‘hearing aid modernisation’ that took place in the NHS with the analogue to digital hearing aid upgrade;
- At the same time dual microphones have been introduced for improved directional hearing particularly in background noise; 61
- Input (pre-) processing of the sound signal for improved hearing in background noise and in quiet conditions has been introduced.

Comparing studies of the benefits of cochlear implantation relying on these studies would be the same as judging the performance of digital hearing aids on the basis of old analogue aids; they are essentially different devices in terms of how the technology works and the benefits experienced by patients.

In addition, costs have also come down significantly during this period with industry estimates of a reduction of around 10-15% in the devices and significant discounting also available from the list prices. 62 This would substantially alter the QALY ratios even on the current ways of measuring benefit and would also alter some of the presumptions of other studies which have looked at these issues.

Recommendation

1. NICE should review its current guidance on cochlear implantation, and in particular on the criteria for both unilateral and bilateral cochlear implantation.
SECTION 3: Patients’ views

Qualitative research methods are now increasingly recognised as capturing issues which quantitative or laboratory based methods may not. In the study by Athalye et al (submitted) 63, which interviewed adults who had been refused cochlear implantation, the majority had been refused implantation on the grounds of the current audiological criteria. Athalye showed that patients were clear about the the impact of deafness on their work situation.

Comments included:

“They used to run a bet on how long it would take me before I would be crashed out. It’s insulting really isn’t it? I was the real butt of jokes. Deaf and dumb, you know.” P7

“I find it very frustrating when my hearing goes down and I can’t communicate with students, I cannot participate properly in management decisions.” P1

“The HR manager who would simply say ‘I don’t know if you are up to this job any more. You can’t hear what people are saying to you, how can you do your job? I am going to have you assessed if you are fit to do the job’ basically. That was actually quite frightening. I was possibly going so deaf that I wouldn’t be able to work properly.” P4

“I was less functioning. I was taking on more and more work and gradually at the end of the day I was falling asleep in the car. I thought one of these days I am going to wipe out a family because I am going to crash on the other side. It is a mental exhaustion.” P7

“They also spontaneously raised the lack of real world criteria in the testing situation:

“I think the assessment should incorporate background noise, if it incorporated the fact that most people don’t speak the Queen’s English, it doesn’t take into account the dialect – like with your dialect I would find that very difficult to understand with no lip patterns, I feel that it was a very easy exercise and it really peed me off to be perfectly honest, and I didn’t feel it was any reflection on real life, unless you count sitting in a lounge having a conversation with someone real life, it’s not at all.” P2

“I didn’t feel that it was a real life procedure and I thought if all the sound had come from this direction and realised that there was sound coming from here – it sounded like a massive wall paintbrush for a very profound thing.” P2

“The conditions they did the testing in were ideal. It was perfect but they made no allowance for the difficulties you get if somebody is talking from the side, or if there is any background noise. They were absolutely perfect conditions and of course under those circumstances you do very well and it makes no allowances for problems you run into in real life from ideal conditions.” P3
The criteria established by NICE include speech perception tests using sentence testing: for those deafened as adults, previous linguistic knowledge helps them to understand the sentences, and may compensate for hearing that is in fact poorer than the tester suspects. The interviews of the adults reflected their understanding that they may have to wait until they have very little hearing at all to be provided with an implant. For example:

“At times I have acute problems that render me most incapable of undertaking any teaching or administrative duties because I cannot understand people. Given that I am in a very highly productive part of my life I think it would be a risk worth while taking and I would try to get it to work if the auditory nerve was functional, there should be no reason why I could not eventually train myself to use the implant and though it might be significantly different to my right ear,…I think it would add a lot of functionality. At present the situation I face is that I have to wait until I become completely bloody deaf on my right ear before they are going to do anything.”

It was also noted for these candidates hearing aids were not able to address the issues they were experiencing; after refusal for implant, they were left with the same major challenges, particularly at work. As the survey noted, the participants’ unaddressed hearing loss:

“had a massive negative impact on their study/work life work (whether current or in the past). The participants were a mix of different professions including university lecturers, students, teachers, defence personnel, managers and hence had a range of communication needs at work. All the participants reported to have severely struggled at some point in their work lives while facing moderate difficulties on a day to day basis. One participant had to medically retire because of his hearing loss while another felt that his performance was extremely compromised owing to his hearing difficulty. Another also reported having taken early retirement.”

If not addressed, these experiences of people using hearing aids were likely to lead to them becoming less productive, and in extreme cases, giving up work.

### Quality of Life Measurement

Accurate Quality of Life (QoL) measurement depends on ensuring that the instruments which we are using are attuned enough to weigh correctly all the issues that the adult experiences. As Loeffler concluded after reviewing some of the established QoL instruments “QoL instruments are an essential addition to speech perception tests to quantify the outcome of cochlear implants. Compared to speech perception tests QoL scores allow a more comprehensive insight into patients’ daily life and activities.” However, it is important to ensure that these instruments are sensitive to the life experiences of users. For example, the authors of the 2011 AHRQ report (Raman et al., 2011) demonstrated a significant effect on disease-specific functional and QOL scales for unilateral cochlear implantation in adults, but no effect according to generic scales (Gaylor et al., 2013). This effect has also been apparent in a number of other studies. Essentially, when more disease specific measures are used a significant impact of quality of life is shown for CI users in most studies. The Nijmegen Cochlear Implantation Questionnaire (NCIQ) is more reliable and sensitive to clinical changes than generic tests such as SF36 and Health Utilities Index. Even so, it is not clear that all the potential benefits are currently considered by such tests and we need to look at how these can be refined further.

### Recommendation

2. Greater weight needs to be given to the real world impacts of hearing loss and the use of more relevant Quality of Life measures, including better models for assessing patient perception of benefit.
Economic benefits of cochlear implantation

“I feel that so much of my previous life and true self has been restored, regaining my pride and ability to contribute actively in society on an equal basis.”

We do have much better evaluation of the impact of hearing aids on employment prospects and therefore, by extension, it would be reasonable for working age adults to assume at least a similar level of impact of implantation. Hearing aids have been found to mitigate the effect for those with moderate to severe hearing loss by 65–77% and that those with severe hearing loss who did not use hearing aids had unemployment rates nearly double those who did use amplification (15.6% versus 8.3%). This suggests, along with what we know about the problems that deaf people have in maintaining successful employment when they suffer profound deafness, that the use of cochlear implantation could have a profound impact on the ability of deaf people to maintain their employment status or gain employment and therefore stay more productive.

If the impact on employment was addressed there would be large economic benefits. A Canadian study concluded that “Cochlear implantation not only improves quality of life but also translates into significant economic benefits for patients and the Canadian economy. These benefits appear to exceed the overall costs of cochlear implantation.” Those having implants saw a significant increase in median yearly income compared to pre-implantation of $42,672 vs. $30,432. A similar, though considerably smaller, effect was also found by Harris et al. who identified a mean increase of $1249 in yearly income 3 years after cochlear implantation.

Though, as Sorkin has noted, there is scope for further studies aimed at assessing the social and economic aspects of cochlear implantation and she concluded that “For adults, there have been no comprehensive studies on the impact of CI on the employment and advancement of working age adults. There are also no studies documenting the general benefits to society of providing hearing to those who have lost it or who were born deaf. Having such data would provide additional impetus for timely referrals for people of all ages.”

There is an urgent need to conduct more studies on the long term economic impact of implants in adults but there can be little doubt from what we already know about the impact of hearing loss on employment prospects that the overall benefit of greater availability of implants for those who are experiencing significant hearing loss would be significant.
Impact on Social Care Issues

As Lin has shown “The magnitude of the reduction in cognitive performance associated with hearing loss is clinically significant with the reduction associated with a 25 dB hearing loss being equivalent to an age difference of 7 years.” This is consistent with other studies that have looked at the relationship between declining social networks, which is a common consequence for older people with progressive hearing loss, and the onset of dementia or cognitive decline. It is also the case that when those in the older age group use hearing aids there has been a measured improvement in cognitive ability. Further we know that the risk of death within a year for a socially isolated older person is typically 26% greater than the risk for a person of the same age who does not report being socially isolated. While it is clear that much more work still needs to be done in this area to establish the causative mechanisms for the association between hearing loss and cognitive decline, the fact that cognitive decline can, to some extent, be mitigated by the use of hearing devices means that we should take far more seriously both the potential health impacts and the consequential costs of not doing so in any costing models for making commissioning decisions.

While the Government is rightly concerned about the cost of adult social care the impact of hearing loss on this, including the growing association between hearing loss and dementia, is underplayed. Debates about social care costs and social care legislation would suggest both more focus and a bolder approach. The government’s end of life care strategy could provide more specific recommendations about communication support and end of life care including the effectiveness of cochlear implantation in preventing earlier admission and greater dependence in elderly patients. Arguments about particular social benefits (and associated cost savings) in elderly recipients of cochlear implants or other interventions will go a long way to addressing any concerns about the (self evidently) fewer remaining expected life years to which QoL measures can be applied.

Recommendations

3. As part of the development of cost benefit analysis for cochlear implants, more account needs to be taken in judging the cost benefit ratios for cochlear implantation of the growing evidence on the links between hearing loss and the co-existence of other conditions in older people, particularly dementia.

4. The commissioning models used for decision making on adult implantation (particularly for older adults) need to look at the wider health and social care costs implicit in not proceeding to intervention alongside the (obvious) potential costs of the intervention itself. The possibility that not addressing hearing loss in a timely fashion could transfer substantial additional costs onto the health and social care system later should be explicitly acknowledged.
Why is commissioning and use of adult cochlear implantation so low?

With the acknowledged benefits of cochlear implantation in adults, why are the implantation rates so low? A review into health technology assessment in general concluded:

“…. innovations can significantly improve clinical practice, but the rapid growth of medical technology, and the increasing volume of new knowledge from basic and applied clinical research, have made it virtually impossible for care providers to keep pace with treatment advancements.” ~74

While this may be true as an explanation of why practice does not keep up with the technology it is vital that we address the lag between the promise of cochlear implantation for a wide variety (and large number) of adults and what is actually being achieved on the ground. We have demonstrated that the impact of hearing loss is under recognised, that adults affected by hearing loss do not seek help early, and that when adults do seek help they are not routinely referred for assessment. Access to cochlear implantation is part of this issue, and as we have shown, current audiological criteria are considered by many to be too restrictive. In addition, the criteria do not recognise the real life challenges of hearing loss, which require other assessments to be taken into consideration.

Professional and Public Awareness: impact on provision and commissioning

The adults in the study by Athalye also commented on the lack of information (and the inconsistency of the information that is available) about cochlear implants for adults, and the lack of information not only for GP’s but also in audiology clinics. One interviewee commented:

“Should be a lot more pro-active in the NHS, people at certain level of hearing should automatically advised it’s available—we only got this because we were private. May be eligible doesn’t feel it is recommended, there should be basic process at individual hospital level. Unfortunately you need to go to ENT-Audiology-GP—the route needs to be simplified.” ~P11

There is a major issue about GPs’ awareness of the impact of deafness in general ~75 and their lack of knowledge of the benefits of cochlear implantation in particular. As previously observed, we know that GPs are currently reluctant or not aware enough to refer patients with hearing loss for audiology assessment: 45% of patients presenting with hearing loss are not being referred to Audiology Departments for assessment. ~76 Patients also complain about their GPs’ general lack of audiological awareness. ~77 Further there is already some anecdotal but worrying evidence that the new commissioning arrangements in England are likely to lead to more, not fewer, restrictions in agreeing funding for cochlear implantation or other major interventions for hearing loss. ~78 There is however growing recognition of both the benefits of cochlear implantation for adults and the need for GPs to take a more proactive role in the referral and management of patients who would benefit from cochlear implants. ~79 We know the number of adults currently implanted is low compared
to the number who could benefit, and we also know that the cost of not addressing deafness in the community is great in terms of other costs to society in terms of increased depression, links to dementia and morbidity.

With the development of GP commissioning and the Any Qualified Provider (AQP) commissioning framework, access to implantation is going to become even more dependent on good knowledge at the level of GP practitioners. In this context it is also crucial that the public is fully informed about their hearing options and can make informed choices. Audiologists in turn need to be aware of the benefits of cochlear implantation to the wider group of adults now having them successfully fitted so that timely referral for implant assessment in a cochlear implant centre is made.

There is also serious concern about more specialised commissioning that cochlear implant centres depend on in England. There is no lead clinical specialist for Audiology in the new commissioning arrangements to ensure the development of good practice around commissioning of cochlear implants and to guide the commissioning strategy for Clinical Commissioning Groups (CCGs) in the way which exists for many other specialist clinical areas.

**Personal awareness**

There continue to be major barriers in the public’s mind about initially taking action on hearing loss and then taking further action if interventions have ceased to provide hearing benefit. As noted, earlier studies have shown that this is directly related to perceptions of the stigmatising of those with hearing loss and the concerns of wearing hearing devices. A Mori poll in 2005 showed that almost a quarter of respondents are worried that people would think they are getting old if they wore a hearing aid and would also be seen as being less capable. While these attitudes are common in most countries, the UK is in a good position to challenge them if it can ensure that Audiology services are offering state of the art technology and health policy is looking to integrate support and services for older people through better commissioning. The government’s NHS Mandate includes an ambition to be among the best in Europe at supporting people with on-going health problems to live healthily and independently.

Action on hearing loss fits squarely with domain 2 of the government’s health outcomes framework of the Mandate: “Enhancing quality of life for people with long-term conditions.”

**Recommendations**

5. A lead Commissioner for Audiology should be established so that there is a greater focus on good commissioning for Audiology services across all the Clinical Commissioning Groups as part of the new system of commissioning in England

6. Greater education of GPs and audiologists on the potential benefits of cochlear implantation for adult and older patients is required as a matter of urgency.

7. More work should be carried out through Public Health England on the benefits of people addressing their hearing loss and steps should be taken to reduce the potential stigma associated with hearing loss so people are encouraged to take action.
Cochlear implantation for children is now acknowledged as having a dramatic positive impact on children’s capacity to communicate, and consequently on their subsequent social and educational outcomes.

However, the health system in England is still massively underutilising the potential of implant technology to transform older people’s lives through a combination of outdated guidance to commissioners, failure to invest in capacity and a lack of awareness amongst both health professionals and the general public.

We need a number of substantial changes in both the understanding of the benefits of cochlear implantation and how this knowledge is then communicated to health professionals across the system; we will then need improvements in how cochlear implantation is commissioned and provided. The consequence of not doing so is increasing costs to other parts of the health and social care system, greater dependence in a working population which is being required to work for longer, and loss of wellbeing and increased ill health into older age.

We need a national conversation with health communities and across Government that will support concerted action to address the low value put on addressing hearing loss. The Department of Health should produce an action plan to focus health providers on how they should be implementing the NHS Mandate in respect of deafness and hearing loss. The debate must become one about quality of life issues and how good communication is fundamental to a good life. Understanding that health and well being are fundamentally impacted by hearing loss and deafness must become central to health providers’ thinking.

Hearing technology has made huge strides in the last decade and we now need to see a revolution in the provision of cochlear implantation for adults which matches the introduction of digital hearing aids.

The late Lord Ashley was known to call his cochlear implant a “miracle” for the way it allowed him to function as a successful MP and then as a Peer. It is time that everyone who needs a cochlear implant had access to their own “miracle”.

Conclusion

SECTION 6:
Conclusion
References


7. Ruben (2000) notes that by the end of the twentieth century “62% of (the) labour force made their livelihood using skills based on their communication abilities.”

8. For example “14% of members feel that they have been the victim of physical or verbal assault because of their deafness or hearing loss. This figure conceals large variations between different groups. For instance, while 11% of hard of hearing respondents feel that they have been the victim of such an assault, 49% of BSL and SSE users, respectively, feel that they experienced this type of assault.” Action on Hearing Loss Members Survey (2006).

9. See for example Methods for the estimation of the NICE cost effectiveness threshold - Karl Claxton, Steve Martin, Marta Soares, Nigel Rice, Eldon Spackman, Sebastian Hinde, Nancy Devlin, Peter C Smith and Mark Sculpher. CHE Research Paper 2013. Who show that between 2004 and 2008, when digital hearing aids were being introduced on the NHS the overall proportion of expenditure did not go up at 0.5% of the health budget while the Department of Health's figures for 2003-2011 show a rise from 0.30 of the budget to 0.45. 2003-04 to 2010-11 programme budgeting data. Department of Health August 2012.


24. The Guidance was updated in 2011.


44 Op CIt Coelho, DH, et el (2009).
See for example Kahneman D. Thinking Fast Thinking. Slow. 2011 Chap 26-28, which demonstrates that we have an inbuilt bias towards subjectively making decisions which prioritise not risking loss of what we have already gained. This would be relevant in determining scales of measuring potential psychological benefit in looking at what the potential loss was by not having the optimum hearing possibly restored than the incremental gain between having some hearing restored and slightly better hearing still especially if this was combined with greater real world hearing assessment. See also Thaler, R.; Sunstein, C. Nudge. Improving Decisions about Health, Wealth and Happiness. Yale University Press. 2008. P33.

For a discussion on a broader approach to this issue see Drummond M, Tarricone R, Torbica A. Assessing the added value of health technologies: reconciling different perspectives. Value Health. 2013 Jan-Feb;16 (1 Suppl):S7-13.


NICE 2011 has these at the following “For sequential bilateral implantation, the discounts ranged from 0 to 40% for the second implant. For simultaneous bilateral implantation the range was 0–50% for the second implant.”

Athalye, S OPcit (2013).


See for example Ramen et el (2011) who recommended more sophisticated QoL measures for assessing profound deafness.


See for example Shield, B. (2006).


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