

Acceptability, benefit and costs of early screening for hearing disability: a study of potential screening tests and models

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Executive summary

Health Technology Assessment 2007; Vol. 11: No. 42

Health Technology Assessment
NHS R&D HTA Programme
www.hta.ac.uk





Executive summary

Background

About one in five adults in the UK has a bilateral hearing problem that affects their hearing and communication. The major problems occur in listening to speech in a background of noise (e.g. in social and family settings, shops, cafés or bars, watching television), which makes communication or enjoyment very difficult. Previous estimates have suggested that at least one in ten people might benefit from amplification, but currently only one in six of those who might benefit have and fully use their amplification (hearing aids and assistive listening devices), and a further one in six are not receiving substantial benefit from their aids.

Typically, those who are referred for hearing assessment recognise that they have had a hearing problem for around 10 years or more, are aged in their mid-seventies and have a substantial hearing problem. The older that people are when they present for assessment and intervention, the more difficult they find adaptation to and care of their hearing aids. It often takes 10 years for an individual to recognise that they have a hearing problem (but a shorter time for significant others).

The impact of this degree of hearing impairment and reduced ability to communicate is substantial. Communication difficulties associated with hearing impairment cross the whole health and social care spectrum. They can lead to depression, social withdrawal and problems with employment and access to information sources. People with hearing impairment are highly likely to have other problems (there is a 40% co-morbidity) such as tinnitus and balance disorders which contribute in part as risk factors for falls and other accidental injury. Imbalance and falls in older people are frequent causes of loss of independence, avoidable illness and mortality.

Over the next 15 years hearing impairment will be an increasing population problem, because of the ageing population profile. It is likely to increase by 10–15% in population terms, without any shift in the prevalence of hearing impairment.

The Modernising Hearing Aid Services programme has recently been completed in

England, with similar programmes in Wales, Northern Ireland and Scotland. This has provided hearing aid departments with new, digital signal processing hearing aids, and with the infrastructure, patient management systems, information technology and training to provide a quality service and deliver the national patient journey from referral to follow-up. As part of this initiative there is much work concerned with meeting need in the population and meeting a demand that appears to be increasing. Skill mix, use of private sector partnerships and telemedicine all feature strongly in providing capacity to that service.

At present there are in excess of 3000 professionals working in the services, delivering about 500,000 patient journeys per year (1.5–2 million appointments and associated open access clinics) and fitting 700,000 hearing aids. This service costs in the region of £120 million per year to the NHS. However, long waits for hearing tests and the subsequent fitting of hearing aids have been a major issue across the NHS audiology departments. Diagnostic waiting times data released in July 2006 by the Department of Health estimated that around 250,000 patients are waiting for either a first assessment or a reassessment of hearing loss. The direct referral pathway for hearing assessment for adult-acquired hearing loss has not been included in the 18-week delivery programme, as that programme only covers referral to a medical specialist. However, work to underpin the development of the 18-week pathway principles and definitions identified that adult hearing services need a specific action plan to address these long-standing problems. This work has identified options to reduce significantly the unit cost of assessment and fit of digital aids through a redesigned service specification. Part of that solution may be to introduce a primary-care based service that could include a screening test element to bring better, more uniform referrals in primary care.

The degree of unmet need, the late age of presentation of most patients and the problems they have in adapting to hearing aids at an older age suggest that screening for hearing impairment in older people ought to be



investigated as a priority. New technology, such as audiometric screeners and automated otoacoustic emissions (AOAE), is highly promising as a screen. AOAE is currently used to identify newborn deafness in the Newborn Hearing Screening Programme (NHSP). It, and other more traditional methods, should be evaluated to see whether it is cost-effective in identifying adult hearing problems that could benefit from intervention in a younger population (e.g. 55–74 years) than those who present for hearing assessment (e.g. 70–90 year olds).

Objectives

The objectives of this study were to show that hearing loss has a high enough prevalence in the older population to justify screening, if effective and acceptable methods are available, and that take-up and benefit can make a measurable outcome difference in quality of life.

Design of the research

The research was organised in four strands:

1. A population study of people aged 55–74 years, the objectives of which were:
 - to find the prevalence of reported hearing problems in the UK population and compare with other ear, nose and throat problems that people report
 - to find out the use of primary care and specialist hearing services as a function of severity of hearing problems and age
 - to assess the public's attitudes to screening and, in particular, the public's take-up of hearing screening and the hearing-impaired public's take-up of hearing aids as an intervention for hearing disability
 - to examine the extent to which the population, using a representative subset of the random sample, might benefit from amplification and the factors that influence this benefit
 - to examine what screening techniques might be best to identify those who would get benefit from amplification
 - to examine the extent to which benefit might be realised in the real world by providing a hearing aid.
2. A clinical effectiveness study using a controlled trial to examine the acceptability of benefits from candidature for and performance of differently organised screening programmes

aimed at identifying those who might benefit from intervention (and the extent of the benefit). People who were screened by questionnaire who admitted a hearing problem and those who did not were invited for assessment. Following assessment, a minimal hearing loss criterion was used to offer intervention through one of two types of hearing aid processing strategies which were assigned at random.

3. A retrospective case–control study:
 - to examine the very long-term (>10 years) compliance of patients in using their hearing aids after early identification
 - to determine the extent to which early-identified hearing-impaired people have better outcomes than equivalent people identified later.
4. Examination of the costs and cost-effectiveness of different potential screening programmes.

Setting

Strand 1, the population study, was designed as a population study in the UK, with stages 2–4 being conducted on a sample of these from Nottingham and Southampton.

Strand 2, the clinical effectiveness study, was conducted in general practices in Nottingham and Bath using a systematic or opportunistic screen.

Strand 3, the retrospective case–control study, compared a group of early-identified hearing aid users, identified at an early age in Cardiff, with control matched for age, gender and occupation in Cardiff, Glasgow and Manchester.

Participants

Strand 1 had 34,362 respondents in Great Britain, who replied to the postal questionnaire, 506 who were interviewed, 351 who were assessed for benefit from amplification and 87 who were fitted with a hearing aid.

Strand 2 received 1461 replies from the first-stage questionnaire screen, with 306 people assessed in the clinic, of whom 156 were fitted with hearing aids.

Strand 3 traced 116 previously fitted hearing aid users, who had been identified by a screen, and then conducted a case–control using 50 of these for whom complete data were available, matching with two control groups of 50 people.

Interventions

The major prospective interventions were to introduce amplification through offering people with minimal hearing impairment hearing



aid(s) in a rehabilitative setting. In strand 1 these were offered as a monaural in-the-ear (ITE) hearing aid and in strand 2 people who met the criteria were randomised to be offered two different ITE hearing aids to be fitted bilaterally. Strand 3 used unilateral and bilateral hearing aids.

Main outcome measures

The main outcomes measures were:

- prevalence of hearing problems and degree to which services meet need in 55–74-year age group
- public acceptability and individual benefits of hearing screening and intervention as a function of demographic and hearing domain-specific characteristics
- improvement in quality of life
- screening costs and cost-effectiveness as a function of proposed programmes.

Results

In Strand 1 it was found that:

- 12% of people aged 55–74 years have a hearing problem that causes moderate or severe worry, annoyance or upset
- 14% have a bilateral hearing impairment of at least 35 dB HL
- only 3% currently receive intervention, through the use of hearing aids
- these hearing problems, which mainly affect ability to hear speech in noise, have a mean reported duration of about 10 years
- over 90% of people interviewed felt that hearing screening was acceptable, especially if associated with their GP's practice.

Good amplification was shown to benefit about one in four of the population and the degree of hearing loss predicted benefit well. In a population intervention trial with a single hearing aid, less benefit was received when measured in real-world situations than in the laboratory. However, overall, there was a strong correlation between benefit from amplification and from using hearing aids.

Questionnaires and audiometric screens gave good screening operating characteristics (sensitivity, false-alarm rate, positive predictive value) while, overall, more technically advanced options such as otoacoustic emissions and speech in noise tests did not perform as well.

In strand 2, one- and two-stage screening programmes were examined in systematic and opportunistic screening programmes. The

systematic screening programme was more acceptable and gave a better response. The offer of two hearing aids was accepted by about 70% of those who were offered an aid. This increased to 95% for those with 35 dB HL or poorer. There were substantial worthwhile benefits (+1 SD) in terms of domain-specific outcomes such as hearing in noise performance and hearing aid benefit outcome inventories, and moderate benefits measured in health utility [Health Utilities Index (HUI) and Short Form 6 Dimensions (SF-6D)] from amplification for this target group (35+ dB HL). Generalisability of uptake will be affected by a number of factors (service setting, research participation incentives) that will need to be explored in translating the research into service.

In strand 3, the retrospective case control study showed that long-term hearing aid use was low, unless hearing impairment was quite high (e.g. 35 dB HL). Those identified early had greater benefit through additional years of use/better adaptation to use than those of the same age and hearing impairment who were fitted with hearing aids later.

In strand 4, the different screen programmes were modelled and judged in terms of d' , cost and cost per quality-adjusted life-year (QALY) against different gold standards. The 35 dB HL better ear average hearing impairment level was found to be a good, robust and justifiable target group for screening. In identifying this target group, the most efficient and practicable method was to use two questions in primary care concerning hearing problems and a hearing screen using a pure tone at 3 kHz 35 dB HL (that was used in the hearing aid clinic, but could be used in primary care if costs per device were appropriate). The average cost of the screening programme was £13 per person screened or about £100 if treatment costs were included.

The benefits and costs were examined using the HUI and the SF-6D. Making the conservative assumption that identification gives 9 additional years using hearing aids (average gain if identified earlier, i.e. 63 rather than 72 years of age), the 9-year costs of screening and intervention were in the range of £800–1000 per QALY when using the HUI and about £2500 using the SF-6D metric. Sensitivity analysis showed that at the lower confidence interval using the HUI outcome metric the current costs of providing hearing aid services would have to increase by about an order of magnitude for the usual criterion of £20,000 per QALY to be exceeded.

Conclusions

Hearing impairment of moderate degree in adults is a highly prevalent major public health problem with a large impact on people's lives, which is left too late before access to services is achieved. One in ten people aged 55–74 years is substantially impaired and would benefit from referral. Lack of intervention impacts on activity and causes substantial participation restriction (handicap) in older people. Amplification gives substantial benefit to these people and this benefit can be realised by provision of good-quality hearing aids to people with this high degree of need.

A simple systematic screen, using an audiometric screening instrument, has been shown to be acceptable to people in the age range 55–74 years, is likely to provide substantial benefit and may be cost-effective to those in that target group. Hearing screening appears to meet the National Screening Committee's criteria in most respects, provided screening is targeted at those with at least 35 dB HL better ear average. Based on the research carried out here there is sufficient evidence to support a larger and more definitive study of hearing screening.

In addition, if screening is targeted on the younger age range, it will identify more people who are currently not likely to self-refer, where the additional benefits (e.g. from 10 years earlier identification) are more likely to be found. However, it should be noted that its benefit is not solely restricted to this group at present (as older people who would greatly benefit have not had any screening and have not self-referred).

Recommendations for research

The following are recommended for future research:

- A prospective randomised controlled trial of one- and two-stage hearing screen is needed to identify bilateral 35 dB HL or worse hearing impairment in 60–70-year-old people and intervene in a primary care trust setting using current NHS hearing aids (behind the ear)
- A prospective pilot of hearing screen triage is needed to identify people who should be referred for and benefit from audiological assessment and provision of hearing aid in a primary care trust setting.
- A simple, low-cost, audiometric screening device could be developed and trialled
- A trial is needed of a Hearing Direct, telemedicine alternative to questionnaires, combined with a low-cost audiometric screen device.
- A workforce review should be conducted to estimate the impact of introducing the screen on the audiological workforce in general and to look at the workforce requirements for different levels of staff to assist patients through the patient journey.
- Modelling of different screening programmes and their cost and financial impact should be carried out.

Publication

Davis A, Smith P, Ferguson M, Stephens D, Gianopoulos I. Acceptability, benefit and costs of early screening for hearing disability: a study of potential screening tests and models. *Health Technol Assess* 2007;**11**(42).

NIHR Health Technology Assessment Programme

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ISSN 1366-5278

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Published by Gray Publishing, Tunbridge Wells, Kent, on behalf of NCCHTA.

Printed on acid-free paper in the UK by St Edmundsbury Press Ltd, Bury St Edmunds, Suffolk.