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ISBN 1-904196-10-1

Public Health Institute of Scotland

NHS SCOTLAND

Needs Assessment Report on

NHS Audiology Services in Scotland

January 2003

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ACKNOWLEDGEMENTS

The working group would like to thank Dr Karen Ritchie, who contributed greatly to this group until July 2002, when she moved to the Health Technology Board for Scotland. We are very grateful to Hilary Davison (Clinical Standards Board for Scotland, now part of NHS Quality Improvement Scotland) and to Liz Ann O'Hare (Social Work Department, Renfrew) for their valuable contributions to the group, to Carol Silvester (MRC Institute of Hearing Research, Scottish Section) for her help with the analysis of data and to Frazer McCulloch (Clinical Directorate Finance Manager, North Glasgow University Hospitals NHS Trust) for his help in calculating the financial implications of the recommendations.

This needs assessment has involved a number of consultations with key stakeholders for audiology services. The group would like to express their appreciation to all of those who participated in this process, those who allowed us access to unpublished reports and those who gathered information, or distributed surveys on behalf of the working group. We are also grateful to the many people who completed questionnaires as part of the surveys of service users.

MAIN REPORT

APPENDICES

The Appendices to this report have been published as a separate volume. These contain detailed information on the evidence on which the report has been based. They can be obtained from the PHIS website (www.phis.org.uk) or a printed version can be obtained from the Public Health Institute of Scotland (PHIS). Please contact the Public Health Institute of Scotland (PHIS), Clifton House, Clifton Place, Glasgow, G3 7LS, telephone 0141 300 1018, or e-mail info@phis.org.uk.

EXECUTIVE SUMMARY

Audiology services comprise a range of clinical and technical services that include:

- Assessment and management of adults and children with hearing problems, tinnitus (ringing in the ears) and balance disorders;
- Assessment of people with middle ear problems for whom surgery offers a potential clinical management.

Currently, the public perception is that audiology services in Scotland are failing, use inferior procedures and technology, and that waiting times have reached unacceptable levels. Consequently, the Scottish Executive commissioned a review of services provided by NHS Audiology Departments to determine their current status, and to identify options for development and priorities for the future. The multi-disciplinary review, conducted under the auspices of the Public Health Institute of Scotland, had input from audiology and other NHS professionals (e.g. public health medicine), education, social work services, and voluntary bodies.

The review includes:

- Identification of the evidence-base for audiology services;
- Audit of departments;
- Surveys of service users;
- Comparison with good practice standards and recommendations;
- Comparative data from other services to derive an assessment of the current situation;
- Recommendations for a framework for audiology services in the future to ensure compliance with modern standards.

Permanent hearing impairment in children has a population prevalence of 13 per 10,000 live births. Though the overall prevalence is low, if hearing loss is not detected and managed early in life it will lead to an irreversible communication deficit. The scheduled introduction of universal newborn hearing screening (UNHS) will increase the demand for diagnostic audiology and place a premium on services and skills for effective fitting and supporting hearing aids in the very young. Middle ear problems in children will continue to result in significant service workloads, as ongoing audiological assessment and monitoring are required to identify the sub-set of persistent cases for whom surgery is appropriate.

Hearing loss in adults is predominantly sensorineural (inner ear) in origin and population prevalence in the United Kingdom (UK) increases exponentially with age. Epidemiology shows that 730,000 adults in Scotland have a hearing loss with a consequent communication deficit, of whom 533,000 would benefit from NHS hearing services as they currently exist. Only one third of potential beneficiaries currently access these services. Nevertheless, approaching 90% of all hearing aids in Scotland are delivered by the NHS – over 50,000 aids in 2001.

Hearing deficits impact directly on communication ability, constrain development in children, lead to limitations in everyday activities and restrict personal and social participation. They have demonstrable effects on health-related quality of life, though they rarely register as priorities with health planners and policy makers. Hearing services are a low-cost, high-volume intervention, whose cost-utility compares very favourably with other healthcare interventions.

Audiology services suffer from a number of structural and organisational handicaps. In common with other conditions in large numbers of older people, causing high morbidity but no mortality, they have not benefited from the development opportunities afforded to other services within the NHS in recent years. There is a historic under-investment in facilities, equipment, staff and the development of skills in existing staff. Over-concentration on hearing aids as technical devices, at the expense of their rehabilitative context, has restricted the development of audiology services' wider role. Audiology services are often adjuncts to ENT surgery, but now need to develop along more autonomous lines.

Audiology services are inherently multi-disciplinary in nature, both within the NHS and with external agencies. Audiology services for adults and children are effective only when functioning links with child health, speech and language therapy, ENT surgery and other medical specialties are in place. Moreover, education and social work services are responsible for crucial aspects of interventions, and hence systems which ensure effective inter-agency co-ordination and information flow are required.

Surveys of the services themselves, and of adults, children and their families who have accessed current services, identify a number of general themes when compared to established good-practice standards. These are listed below.

- Inadequate facilities at base hospital, peripheral clinic and community sites.
- Shortages in qualified staff and staff skills leading to compromised service access and quality.
- Financial pressures compromising service quality, with an undue emphasis on activity at the expense of outcome.
- Poor or non-functioning inter-agency links.
- Large variations in services across NHS Boards.
- Inferior service quality and outcome in comparison to elsewhere in the UK and overseas.
- Recommendations and guidance from the NHS (particularly the Good Practice Guidance on Adult Hearing Aid Fittings), professional groups and voluntary organisations regarding service standards have not been implemented, despite the demonstration of their efficacy and effectiveness in other contexts.
- Good working practices are often not in place. Developments in audiology services elsewhere in the UK are largely absent in Scotland.

A sustained programme of investment will be required to develop the service and reverse its decline. Action is required as a matter of urgency to:

- Reverse the current deficits;
- Meet increasing demands on hearing aid services;
- Enable implementation of universal newborn hearing screening.

Given the pervasive nature of service shortfalls and deficits, specific recommendations in the main report are numerous, have a range of resource implications and implementation timelines, and will apply to differing extents across NHS Boards. They can be configured in a number of categories.

- The development of programmes to train and put in place audiology staff in adequate numbers with appropriate clinical, scientific, technical, rehabilitative and administrative capabilities. Development programmes for existing staff are also required.
- The development of organisational and management structures for audiology which enable effective planning, control and delivery of services, taking account of the differing requirements of adults and children, and the transitional arrangements between the two.
- The provision of facilities, accommodation and equipment in base-hospital and local sites at standards which do not compromise the clinical utility of measures and procedures. The networks of base and local sites require review.
- Improvement in service models, referral mechanisms, clinic facilities and communication skills to improve service access and responsiveness.
- The development of good working practices to ensure that liaison is effective between NHS professionals.
- The implementation of service standards, particularly the Good Practice Guidance for Hearing Aid Fittings.
- The development of inter-agency arrangements for education and social work, and for voluntary bodies.
- The development of specialist services (e.g. for tinnitus, balance problems, bone-anchored hearing aids). Protocols for referral to, and interaction with, these new services and existing specialist cochlear implant services are required.
- The development of liaison, advisory and monitoring functions with wide input at local and national level to inform policy and service development.

The recommendations in this report should help to ensure that the NHS in Scotland can implement a phased development of infrastructure and technical improvements to audiology services. This report is not an end in itself, but the first stage in a process which can result in the modernisation and improvement of the services provided by audiology departments. Implementation of the recommendations, and ongoing modernisation of services will require central as well as local planning and monitoring.

RECOMMENDATIONS

Although the recommendations are developed individually in each appropriate section of the report, this section collects together each of the recommendations and is accompanied by two forms of prioritisation, via a system of star ratings. The star ratings form a consensus from the Audiology Needs Assessment Group regarding the eventual impact on the quality of services that would result from effective implementation, and also the time required for effective implementation to occur. The higher the star rating the greater the overall impact and the greater the immediacy of implementation. Further details about this can be found in Section 10 of this report.

The recommendations are grouped together under three headings: Audiology Services for Children; NHS Hospital Audiology Services; and Structures and Organisations. They have not been set out in order of priority or phasing.

AUDIOLOGY SERVICES FOR CHILDREN

Recommendation 1 **Overall Impact ***** **Implementation Time ***
NHS Boards should ensure that for each paediatric audiology service there is an established multidisciplinary team with an identified clinical leader. There will be written protocols for the diagnosis and management of hearing impairment in children. Local circumstances will determine from which discipline the clinical leader is drawn.

Recommendation 2 **Overall Impact ***** **Implementation Time ****
NHS Boards should ensure that all children's audiology services have properly functioning links with education, social work, child health and speech & language therapy services, and ensure that all are equal partners with families in decision making regarding the ongoing management of the child. There should be complete transfer of diagnostic, management and progress information between families, health, education and social care at identification and throughout the pre-school and school years.

Recommendation 3 **Overall Impact **** **Implementation Time *****
Breaking the news to parents of a newly diagnosed deaf child should be done by a professional with experience and knowledge of child development and the support and education options for deaf children, with sufficient time and in privacy. The appropriate support personnel (e.g. education, speech and language therapy etc) should either be introduced at that time or informed promptly to ensure immediate and ongoing support and information sharing as desired by parents.

Recommendation 4 **Overall Impact **** **Implementation Time *****
Paediatric audiology services should put in place a system to ensure that every diagnosed deaf child receives an ongoing comprehensive aetiological, audiological and developmental assessment of all functions in addition to hearing.

Recommendation 5 **Overall Impact ***** **Implementation Time ***
In recognition of the different needs of children and adults and different demands on staff skills, procedures, equipment and environments for effective services in paediatric audiology, there should be dedicated facilities for children. Physical proximity to the adult service will be dictated by the need to locate children's services in a paediatric family-friendly environment, though links between the two are important irrespective of geography.

Recommendation 6 **Overall Impact **** **Implementation Time ***
In view of the significant benefits to be gained from liaison between adult and children's services, Trusts should establish common management structures, and sharing of specialist hardware and audiological expertise.

Recommendation 7 **Overall Impact ***** **Implementation Time ****
With the introduction of universal newborn hearing screening (UNHS), NHS Boards should develop an investment plan for paediatric audiology services to cope with the increased demands and avoid excess pressure on other aspects of the service. The resources should be in place prior to the implementation of UNHS.

Recommendation 8 **Overall Impact **** **Implementation Time ****
Because the implementation of UNHS will result in many children being diagnosed at a very young age, NHS Boards should develop and implement an early intervention programme to support such families, in conjunction with education, social work and voluntary organisations.

Recommendation 9 **Overall Impact **** **Implementation Time ****
NHS Boards should develop robust identification and referral systems to identify late-onset, progressive and acquired hearing losses in children. Services require effective community clinics with functioning inward and onward referral routes.

Recommendation 10 **Overall Impact **** **Implementation Time ****
Audiology services should ensure that there is a phased transition to the adult environment from the extensive support in a paediatric service. The transition should be tailored to the special needs of individual young people and should include liaison with education, social work and employment services.

NHS HOSPITAL AUDIOLOGY SERVICES

Recommendation 11 **Overall Impact **** **Implementation Time ***
NHS Boards should ensure that all facilities and equipment used for audiological procedures are fit for purpose, so as not to compromise the integrity of the procedures undertaken. In view of the shortcomings identified for both children and adults, NHS Boards should cost and implement an appropriate corrective action plan based on detailed audit of accommodation and the purpose for which it is used. NHS Boards should also put in place mechanisms for a rolling audit of equipment and facilities.

Recommendation 12 Overall Impact * Implementation Time **
Audiology services should have the capability to use visual as well as auditory means of alerting and communicating with patients. The physical layout, lighting and acoustical conditions in departments should be of a standard to ensure that services are accessible to all hearing-impaired people, by maximising both verbal and non-verbal communication.

Recommendation 13 Overall Impact * Implementation Time ***
Audiology services should develop and implement plans to improve access for patients by the provision of facilities outwith traditional clinic hours.

Recommendation 14 Overall Impact ** Implementation Time ***
Audiology services should actively engage with local and national voluntary and statutory organisations regarding available services. They should be aware of, and provide information about, counselling, support, communication training, equipment and maintenance services provided by voluntary and statutory organisations where these are available at a local level.

Recommendation 15 Overall Impact ** Implementation Time ***
Audiology services should provide a comprehensive range of literature and information about auditory conditions, equipment and other supports produced by voluntary and other organisations.

Recommendation 16 Overall Impact ** Implementation Time **
Audiology services should have access to and provide appropriate means of communicating (e.g. British Sign Language (BSL), lip speaking etc) for all patients with appointments whose primary form of communication is not written or spoken language. All staff in audiology departments should receive accredited Deaf Awareness training. All new staff should have received basic training in, for example, BSL to facilitate communication.

Recommendation 17 Overall Impact ** Implementation Time **
Audiology services should establish links to facilitate training, for both professionals and patients, in alternative communication methods (e.g. BSL, lip-reading etc). This should be routinely available, readily accessible, and co-ordinated across health, education, social work and voluntary services. Such training should be delivered by accredited organisations.

Recommendation 18 Overall Impact * Implementation Time **
In the light of established service shortfalls and technological improvements in hearing aids, audiology services should seek to re-engage with people with severe and profound hearing losses via links with social work and education departments and voluntary bodies.

Recommendation 19 Overall Impact ** Implementation Time **
NHS Boards should develop flexible multi-agency approaches to delivery of accessible cost-effective services in remote and rural areas, where people have the

right to expect equal service standards to those in urban areas. This means that everyone involved in the care of such people should have a creative approach to provision of services. Other professionals could be trained to deliver services which would otherwise be supplied by audiologists, provided that appropriate training and monitoring arrangements are in place.

Recommendation 20 Overall Impact ** Implementation Time **
Where there is significant co-morbidity (e.g. vision impairment, learning disability) which might compromise effective communication or management, clinical leaders should co-ordinate a multi-disciplinary team and multi-agency approach to diagnosis, assessment and management.

Recommendation 21 Overall Impact ** Implementation Time **
NHS audiology and social work services should establish formal two way links and structures for sharing of information, mutual education and training, to facilitate joint working and effective referral.

Recommendation 22 Overall Impact * Implementation Time ****
Audiology services should ensure that all patients whose hearing difficulties are not adequately managed by hearing aids are referred to social work for support services and assessment as candidates for assistive communication and alerting devices. Comprehensive information about diagnosis and management should accompany the referral.

Recommendation 23 Overall Impact ** Implementation Time **
Health and social services should routinely review the communication needs of older people receiving residential care, and develop services to meet those needs via the provision of hearing aids and assistive listening devices.

Recommendation 24 Overall Impact * Implementation Time ****
NHS Boards should put in place validated information systems to manage data for all aspects of the patient's journey, assessment and management. A pre-requisite will be to agree common definitions and data reports to enable inter- and intra-service comparisons.

STRUCTURES AND ORGANISATIONS

Recommendation 25 Overall Impact * Implementation Time ****
Each NHS Board in conjunction with Education, Social Work Services and Voluntary Organisations, should establish an Audiology Services Working Group to inform local policy and practice for adults and children, comprising input from NHS professionals, social work and education services, and representatives from voluntary organisations and service users.

Recommendation 26 Overall Impact ** Implementation Time *
NHS Boards should review the services and standards provided at base and, in

particular, peripheral sites and their relative distribution in the light of population, transport and geography. Each NHS Board should develop and deliver services on a series of "hub-and-spoke" models and establish an acceptable balance between centralisation and concentration of expertise, and accessibility of services and local demand.

Recommendation 27 Overall Impact ** Implementation Time *
The accommodation and facilities available in peripheral sites and the potential patient pool will determine which services can be offered. In the light of the large number of inadequate facilities at sites serving remote and rural areas, NHS Boards responsible for the delivery of such services should ensure that any inadequacies do not compromise effective service delivery.

Recommendation 28 Overall Impact ** Implementation Time *
NHS Boards should establish specialist centres or managed clinical networks to ensure the critical mass of expertise required for the development and delivery of specialist services such as aspects of paediatric audiology, the assessment and treatment of tinnitus and balance disorders, and bone-anchored hearing aids. Such arrangements may require consortia of NHS Boards to deliver effective services.

Recommendation 29 Overall Impact * Implementation Time ***
Where an NHS Board offers specialist services for bone-anchored hearing aids, these should be funded separately from hearing aid services.

Recommendation 30 Overall Impact * Implementation Time ***
Audiology services and specialist centres for cochlear implantation should establish mechanisms for agreed referral criteria, responsibilities and information exchange.

Recommendation 31 Overall Impact * Implementation Time ****
NHS Boards should cost and implement a plan for modernising adult hearing aid services via complete compliance with the Good Practice Guidance for Adult Hearing Aid Services. This will require significant investment in infrastructure (e.g. staff, equipment, accommodation) in addition to funding for hearing aids.

Recommendation 32 Overall Impact ** Implementation Time ***
The Scottish Executive Health Department and NHS Boards should develop a clear understanding, acceptance among professionals, and implementation of the differing roles of Audiology Services as both independent clinicians responsible for all aspects of a patient journey (as instanced by direct referral by GPs), and as providers of technical and diagnostic assessment information to medical specialists.

Recommendation 33 Overall Impact ** Implementation Time **
NHS Trusts should develop appropriate administrative structures for audiology services, which are managerially and financially distinct from Ear, Nose and Throat (ENT) Departments, following the development of appropriate skills in audiology staff for their implementation.

Recommendation 34 **Overall Impact **** **Implementation Time *****
ENT clinics should be configured and structured to maximise the efficient use of audiological resources in their provision of support to ENT services via the use of specialist outpatient clinics where geographical circumstances allow. Audiology services should be reconfigured to offer the most cost-effective service to ENT.

Recommendation 35 **Overall Impact ***** **Implementation Time ****
In view of current shortfalls in staff training and expertise, NHS Trusts should institute a process of in-service professional development and training to ensure competence in modern assessment, hearing aid fitting and evaluation, and other rehabilitative techniques as part of a comprehensive modernisation programme.

Recommendation 36 **Overall Impact ***** **Implementation Time ***
Each NHS Board should review its staffing levels, profile and inter-relationship for adult and children's services, and produce an overall investment plan for additional staff to deliver a modernised hearing aid service and the implementation of UNHS.

Recommendation 37 **Overall Impact **** **Implementation Time ****
In parallel with longer-term increases in specialist (e.g. Audiological Scientist and Hearing Therapist) skills via new recruitment, NHS Trusts should develop and implement interim programmes of professional development to develop clinical, scientific, managerial and financial leadership in existing senior staff.

Recommendation 38 **Overall Impact ***** **Implementation Time ****
NHS Boards should initiate the training and recruitment of additional Medical Technology Officer Audiologists and new specialist staff (e.g. Audiological Scientists and Hearing Therapists) as soon as possible to address medium and long term capacity deficits. In view of current shortfalls, additional Assistant Technical Officer and Clerical staff should be recruited as an immediate step to release trained staff for service development.

Recommendation 39 **Overall Impact ***** **Implementation Time ****
NHS Quality Improvement Scotland should produce an agreed set of standards for audiology services, and conduct an assessment of the service's ability to meet these standards, taking into account established documents from voluntary bodies and professional organisations.

Recommendation 40 **Overall Impact **** **Implementation Time *****
The Scottish Executive should establish a formal Audiology Services Advisory Group with representation from NHS professions and Boards, education, social work, the hearing aid industry, and voluntary sectors representing and reflecting patients' interests, to inform and monitor the development of Audiology services in Scotland.

Recommendation 41 **Overall Impact **** **Implementation Time *****
The Scottish Executive Health Department should ensure that any new initiatives and resources flowing from the recommendations in this report are tied to an audit of the expenditure and its effectiveness

Recommendation 42 **Overall Impact **** **Implementation Time ***
The Scottish Executive Health Department and NHS Boards should plan the future development of audiology in the light of current levels of un-met need and the projected increases in numbers of hearing-impaired people which will accompany future changes in the age profile of the population.

Recommendation 43 **Overall Impact *** **Implementation Time ***
In the light of the established un-met need in the population, the Scottish Executive Health Department should use the appropriate mechanisms to consider the evidence-base for the early identification and management of hearing-impaired adults in the over 50's.

1. INTRODUCTION

Organisations representing deaf and hearing-impaired people have orchestrated sustained campaigns in recent years for the development of audiology services, particularly with an emphasis on the issue of digital hearing aids. These campaigns are not local to Scotland and have led to major initiatives elsewhere in the UK. Initial consultations at the Scottish Executive Health Department concluded that digital technology was too narrow a focus, and that a more comprehensive appreciation of audiology services and their functioning was required for future planning and decision making. As an interim step, the Scottish Executive commissioned and delivered to NHS Boards the Good Practice Guidance on Adult Hearing Aid Fittings[1] prior to initiating this independent review.

The Scottish Executive has constituted an Audiology Services Review Group which drew up the remit for this report. The broad remit was to:

- Assess the needs of patients in Scotland for audiology services;
- Establish from the results of an audit of current provision of services whether they are adequate and consistent across Scotland;
- Make recommendations on actions to address any inadequacies identified.

Specific objectives were to:

- Describe the population prevalence and clinical epidemiology of audiological and related (i.e. balance disorders, tinnitus) conditions in Scotland;
- Identify good practice models of service;
- Survey user perceptions of the standard and coverage of services across Scotland;
- Use survey and audit information to assess the status of current services in Scotland;
- Identify the appropriate agents and agencies relevant to audiology and related services and to examine liaison between them;
- Identify options and future priorities for development;
- Produce a set of recommendations for action by relevant agencies;
- Examine the financial implications of future potential changes.

It was considered inappropriate for such a review to be solely in the hands of NHS service providers, and therefore the Public Health Institute of Scotland (PHIS) agreed to facilitate the process and to act as the organisation under whose auspices the report would be produced. A number of members of the audiology services review group and representatives from PHIS reviewed the skill-mix required for the enterprise to form the Audiology Needs Assessment Group. In addition to NHS service providers (audiological medicine, audiology, paediatrics) and NHS administration (public health medicine and financial management) the Audiology Needs Assessment Group has membership from associated stakeholders including education and social work services. Membership also includes representation from hearing impaired children and adults via the National Deaf Children's Society and the Royal National Institute for Deaf People. Input to the report is therefore wide ranging and allows examination of the interface between health and other agencies, in addition to internal NHS considerations.

Members of the Audiology Needs Assessment Group have adopted an evidence-based philosophy to their findings and recommendations. The sources of the evidence upon which this report is based are outlined in each appropriate section and the associated appendices.

The remit for the report focuses on those services which are provided by the NHS in Scotland. While it does encompass the links and liaison between health services and other agencies (such as education and social work services and voluntary organisations) it does not include the financing, staffing or effectiveness of services that are delivered by these agencies.

The Executive Summary and Recommendations sections of this report encapsulate the overall findings. The subsequent sections of the main report deal separately with services for adults and children with hearing impairment, for tinnitus and balance problems, and with inter-agency issues. Individual recommendations are identified in each appropriate section, and an overview of each recommendation and a brief supporting rationale forms a separate section. Each section of the main report is designed to be self-contained. The associated appendices contain more detailed information on epidemiology, service take-up, service models, established standards, evidence of service quality, and literature references.

Audiology services are concerned with the problems that adults and children experience with hearing, balance and tinnitus. Although hearing aid services constitute a large proportion of audiological workload, a narrow focus on hearing aids at the expense of wider issues involving hearing assessment and the management of tinnitus and balance problems would be inappropriate.

2.1 Tinnitus

Tinnitus is the sensation of buzzing or ringing noises in the head or ears. Based on population prevalence figures from the National Study of Hearing[2;3] and from the Government Actuarial Department,[4] over 450,000 people had tinnitus in Scotland in 2002. Over 45,000 had their quality of life severely affected. Those more severely affected tend to be those with more severe hearing loss, but current practice accepts that it is important for both the hearing loss and the tinnitus to be addressed for optimum rehabilitation.

Diagnosis and management of tinnitus will depend upon the cause in any individual, but all sufferers should have ready access to a specialist with sufficient relevant training and experience. Thereafter specific assessment and therapy is possible in the audiology service. Assessment should include comprehensive hearing tests as well as characterising the tinnitus itself. Structured interviews and questionnaires give the therapist an understanding of the person's particular difficulties and can provide measures of progress for both parties. Management of tinnitus is largely through counselling. This varies from simple reassurance, through relaxation and anxiety management, to cognitive behavioural therapy. Further details of services for tinnitus sufferers may be found in Section 6.

2.2 Balance Problems

From population estimates[4] and figures from the British Association of Audiological Physicians,[5] it is likely that over 35,000 people in Scotland contacted their GP in 2002 because of a balance disorder. Of these, more than 80 per week were referred for a specialist opinion (although this is likely to increase if levels of service to GPs and those referred improve). Over 10% of these were severely disabled by their symptoms. Many balance disorders originate from defects in the vestibular system, particularly in the inner ear. Balance disorders, like tinnitus, are often associated with hearing disorders, but again it is important to address both problems.

The assessment of people with balance disorders involves administering questionnaires as well as vestibular function testing. These instruments also allow for outcome measurement. Specialist medical and surgical therapy is more commonly needed in this group of patients than in those patients with tinnitus. However, psychological and physical rehabilitation are also important either as adjuncts to drug therapy or as the only treatments. Psychological rehabilitation includes the management of people whose dizziness is secondary to psychological problems, such as anxiety or panic attack, as well as those where anxiety is caused by their imbalance.

Interventions range from simple anxiety management, through patient centred counselling, to cognitive behavioural therapy. Physiotherapists may be involved in the physical rehabilitation of people with balance problems. Further details of the assessment and management of balance problems may be found in Section 6.

2.3 Other Otological and Audiological Disorders

Although hearing, balance and tinnitus are the conditions which form the predominant workload for audiology departments, there are other disorders which can require assessment and management. These include hyperacusis (complaints of excessive sensitivity to sounds), central auditory processing disorders (CAPD) in children and in adults, and King-Kopetzy Syndrome (Obscure Auditory Dysfunction). Hyperacusis in isolation (i.e. not associated with hearing impairment or tinnitus) is rare, and definitions for CAPD and its diagnosis are under-developed. CAPD may be a factor in delayed language acquisition in children.

Services for these conditions, given their low prevalence and absence of service standards and development, are not considered in detail in this report.

2.4 Hearing Problems

Hearing problems arise from defects in either the middle or the inner ear. The former lead to conductive hearing losses and the latter to sensorineural hearing losses.

The epidemiology of hearing loss can be usefully categorised separately for children and for adults. The population prevalence of permanent childhood hearing impairment is 13 per 10,000 live births,[6] and whilst this prevalence is low, the consequences of permanent childhood hearing impairment on language acquisition, all aspects of communication and pervasive aspects of child development are very severe.[7;8]

Audiology services for children do not concern themselves only with permanent childhood hearing impairment, but are also required to assess and monitor conductive hearing loss in children. This occurs for at least one episode in around one third of all children before the age of five.[9;10] Audiology is required to identify those cases which do not resolve and for whom surgery is appropriate. Such surgery for conductive hearing loss is the single most common operation undertaken by the NHS for children. Given the ways in which hearing problems impact upon child development there are significant workloads for children's services in assessing the large numbers of children with developmental problems to exclude any implication of hearing deficits.

Hearing impairments are common in adults, with almost one in five of the adult population suffering from a measurable deficit in hearing which is likely to lead to difficulties in understanding speech, particularly in noisy backgrounds.[3]

Figure 2.1

Prevalence of conductive, mixed and sensorineural hearing loss greater than 25 decibels hearing level (dB HL) in the better hearing ear as a function of age.

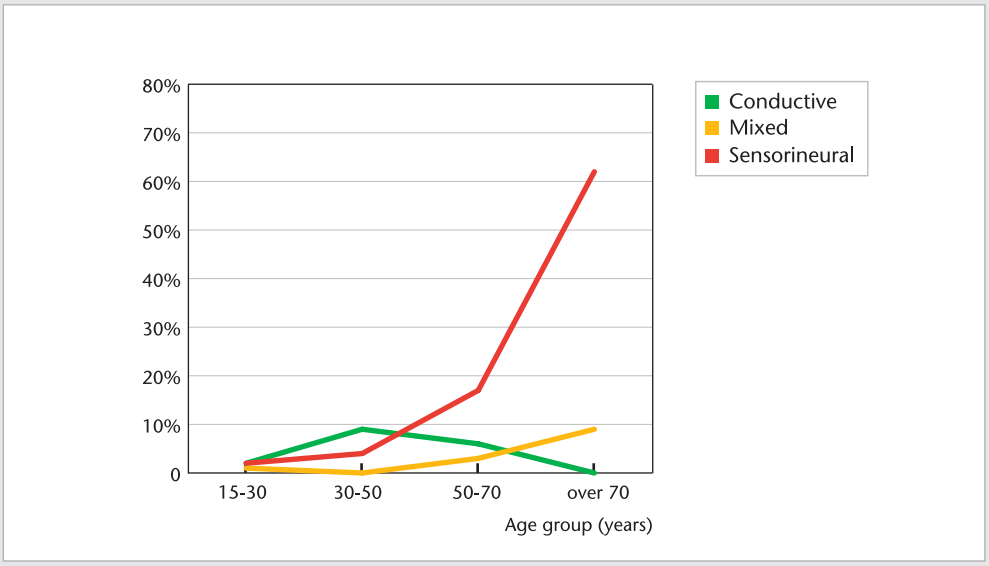


Figure 2.1 shows the population prevalence of hearing impairment as a function of age and exhibits an exponential increase with increasing age.[11] Changes in population demographics will have important implications for future services.[12;13] Additionally, population prevalence halves with every 10 dB increase in hearing level. This leads to large numbers of people in the population with moderate to severe hearing problems and smaller numbers with severe and profound hearing losses, though the latter do of course have a much more severe impact. While around one in six adults could benefit from current NHS hearing services, only one third of candidates attend for management, leading to substantial un-met need in the population.[14]

Audiology departments supply services to manage disability and handicap associated with hearing impairment. This includes, in addition to hearing aid provision, support and counselling. This may involve care from Hearing Therapists and Speech and Language Therapists. It should also include onward referral for those with significant residual disability to appropriate services such as agencies providing assistive listening devices, courses on non-verbal communication, cochlear implants and bone anchored hearing aids.

The services which should be offered by audiology departments with suspected hearing impairment include:

- Appropriate hearing testing, with screening for other causes of hearing impairment and onward referral as appropriate;

- Evaluation of the audiological needs of the patient;
- Agreement with the patient on the best aiding device(s) for their problems, and discussion about the likely effect of such devices on their ability to hear;
- Fitting of aids to provide sufficient and appropriate amplification;
- Training patients in the use and maintenance of their aid(s), and provision of rehabilitative support to ensure that they can use them effectively;
- Providing information on other sources of help, support, equipment and assistive devices, or referral to organisations which can provide these as appropriate;
- Ongoing repair and maintenance of hearing aids (including provision of batteries and replacement tubing).

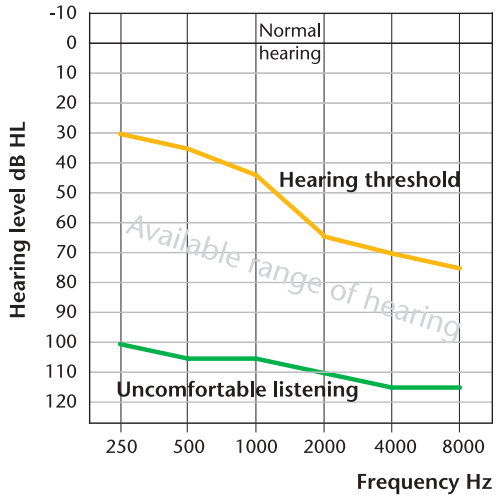
Further details of services for children with hearing impairments may be found in Section 4 and Appendix 6 and for adults in Section 5 and Appendix 7.

2.5 Hearing Aids

Middle ear problems leading to conductive hearing loss are potentially managed by surgery. At present there are no surgical or medical interventions for sensorineural hearing loss, and the only effective management available is the provision of amplification via hearing aids. Some conductive hearing losses are not suitable for surgery and also require management via hearing aids. Hearing aids require an appropriate rehabilitative context to be effective.

Figure 2.2

A typical audiogram for a listener with moderate sensorineural hearing loss.



Hearing function is displayed on an audiogram. This is a plot of the quietest sounds that a listener can hear as a function of their frequency. Defects in the middle ear lead to a conductive hearing loss which is a simple attenuation

(quietening) of sound which often varies only relatively little as a function of frequency. The vast majority of hearing losses (particularly in the elderly) are sensorineural in origin and result from damage to the hair cells in the inner ear which convert sound into nerve impulses.

A typical audiogram is shown in Figure 2.2. Sensorineural hearing losses are usually more severe at high frequencies than at low frequencies. Vowels in speech have predominantly low frequency energy, while consonants are predominantly high frequencies. Thus speech can be audible though not intelligible.

In addition to simple attenuation of sounds, sensorineural hearing loss results in a number of other distortions. This results in listeners with sensorineural hearing loss being much more susceptible to the effects of background noise than their normally-hearing counterparts. Simple amplification (making sounds louder) will not necessarily remove all of the difficulties that such a listener experiences.

Furthermore, while people with sensorineural hearing loss experience impaired auditory sensitivity (inability to hear quiet sounds), more intense sounds are perceived as just as loud by such individuals as they are by people with normal hearing. In particular thresholds of uncomfortable listening are not elevated in the same way as hearing thresholds. Thus listeners have a reduced range of hearing (dynamic range) between the threshold of hearing and the threshold of uncomfortable listening (see Figure 2.2).

A hearing aid is required to take a signal that a listener wishes to hear and to amplify it so that its components are above threshold but not uncomfortably loud. This means that higher frequency sounds have to be amplified by more than lower frequency sounds. Hence a hearing aid has to have the capability to shape the way it amplifies sounds according to the profile of a listener's hearing loss. Hearing aids which have greater degrees of flexibility in this regard will be more effective.

Given that listeners have reduced dynamic ranges, hearing aids are required to amplify low intensity sounds by more than they will be required to amplify high level sounds. This differential amplification as a function of level will vary with frequency, because the dynamic range between thresholds of hearing and threshold of uncomfortable listening varies between low and high frequencies (see Figure 2.2). This form of hearing aid processing is termed "amplitude compression", because it attempts to squeeze, or compress, the wide range of input signals into the reduced range of hearing.

Because listeners with sensorineural hearing loss experience more difficulty in noise than do normally-hearing listeners, hearing aids attempt to amplify the signal by more than any noise. One option is a directional microphone. The hearing aid is more sensitive when it is pointing towards a sound source and is less sensitive to sound sources which are off to the side or behind the listener. This is effective given that people usually orientate themselves so that they are facing a sound

source that they want to hear. Thus a microphone with a directional pattern can help to improve the relative levels of the signal and the noise.

Any amplifier is prone to whistling or feedback and hearing aids are no exception. If the sound delivered to a hearing impaired listener's ear is able to leak back to the microphone such feedback can occur, even in the presence of well fitting ear-moulds. Hearing aids can attempt to identify when feedback is likely to occur and to either try and cancel it or to turn down the gain in a particular frequency region so that feedback is avoided.

The foregoing is a highly simplified condensation of the sorts of processing and fitting features that are potentially available in hearing aids.

2.6 Hearing Aids Styles and Implementation

Hearing aids can be classified by the physical type and size, as well as the ways in which the processing features are achieved. The majority of hearing aids used in the NHS in Scotland are behind-the-ear (BTE), which is sometimes called post-aural. More miniature devices (in-the-ear (ITE) or completely-in-the-canal (CIC)) offer greater cosmetic acceptability to listeners, though sometimes at the expense of their ability to provide the processing that is required. These are often chosen when the option is available.

Until the 1990's all hearing aids achieved their processing by analogue electronics (i.e. amplifiers and filters were employed in exactly the same way, though on a miniaturised scale, as the technology in domestic hi-fi systems). When a control required to be adjusted, this was achieved by a small screwdriver-driven potentiometer, similar to the base or treble control on a domestic music system. These are analogue hearing aids.

One development was the ability to control these analogue hearing aids using digital computer systems, leading to digitally programmable hearing aids. In these hearing aids the underlying processing was still achieved by analogue technology, but was now controlled from a computer, removing the need for a series of miniaturised controls on the hearing aid.

More recently has been the development of fully digital devices where, in a similar manner to developments in music systems, the electrical signal is represented in digital format and the mathematical and signal processing is achieved using this form of technology.

Potential advantages of digital processing are increased ability to shape the frequency response to match a hearing loss, greater flexibility in compression characteristics, and greater capabilities to manage feedback.

The development of new technology always brings with it a cost, and hitherto digital hearing aids have only been available at the "top end of the market", and

have been comparable in price to the most expensive analogue devices. However, as manufacturers devote more and more of their research, development and manufacturing capability to digital implementations, the relative cost penalties of digital versus analogue devices will inevitably narrow and disappear. This narrowing is accelerating. Within the next three years nearly all new hearing aid models brought to market will be digital.

2.7 Analogue and Digital Hearing Aids in Scotland

The word "digital" has pervasive connotations in today's society with an almost automatic assumption that anything that employs digital technology is more modern, advanced and more effective. There are many examples where this is true, but also counter-examples. It is certainly true that the cheapest analogue hearing aid is less expensive than the cheapest digital hearing aid. It is also less effective than the cheapest digital hearing aid because it employs less processing and less fitting features. For example, its ability to appropriately shape the frequency response according to the listener's hearing loss will be severely compromised. Thus, in terms of a basic fitting, a digital device is always going to provide superior benefit than an analogue device.

Figure 2.3

Distribution of unit costs of analogue and digital hearing aids on the Scottish central NHS contract.

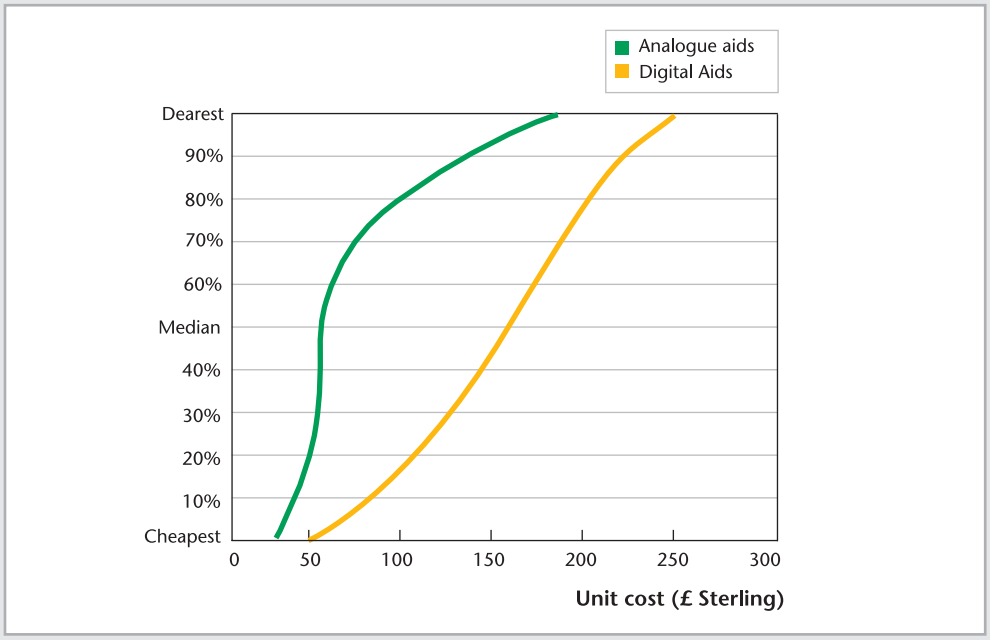


Figure 2.3 shows the distribution of the unit cost to the NHS in Scotland, separately for analogue devices and digital devices, currently on the contract negotiated by Scottish Healthcare Supplies. This supports the above statement that the cheapest digital devices are more expensive than the cheapest analogue devices, though it is very clear that there is a large degree of overlap. Digital and analogue devices are not differentiated simply by price.

The issue is not whether NHS patients in Scotland receive digital as opposed to analogue devices, but whether they receive a hearing aid with the features that are required to best overcome the consequences of their impairment. As services in Scotland are developed to match patient needs and move away, in line with the Good Practice Guidance issued by the Scottish Executive, from a simple reliance on the cheapest devices that can be made available, then more and more, and eventually all, patients are going to be fitted with devices that are digital.

2.8 The Rehabilitative Context for Hearing Aid Fittings, and Lessons from Developments Elsewhere

Some lessons can be learned from the modernisation programme of hearing aid services in England for any developments in Scotland. More complex analogue or digital hearing aids require: more time to fit; greater staff understanding and skills; matching of acoustical targets and the processing features to listeners' needs; and appropriate verification and outcome assessment. Thus, in addition to implementing any technological advances, there has to be an investment in infra-structure and the process aspects of service delivery, independent of changes in hardware. The programme in England contained an evaluation element so that the pre-modernisation service using analogue technology could be compared, not only with the post-modernisation service employing digital technology, but the post-modernisation service also employing the old analogue technology (concurrent controls). Thus, one might be able to dissociate the effects of the technology from the effects of a well founded matching of features to patients' needs in a properly structured rehabilitation process. Such a process will involve:

- tailoring of the acoustical characteristics of a hearing aid to an appropriate target derived from the listener's hearing loss;
- the verification using real-ear measures that a hearing aid is indeed delivering an appropriate acoustical signal;
- appropriate patient contact time both in fitting and follow-up to ensure an understanding of the mechanical competence with the hearing aid system (which, if not adequately performed will of necessity undermine hearing aid use and acceptance).

Figure 2.4

Distribution of Outcomes on the Glasgow Hearing Aid Benefit Profile (GHABP) from the evaluation element of the English Modernised Service. The GHABP yields scales for (i) Hearing Aid Use, (ii) Reported Benefit from Hearing Aids, (iii) Satisfaction with Hearing Aids, and (iv) Residual Disability.

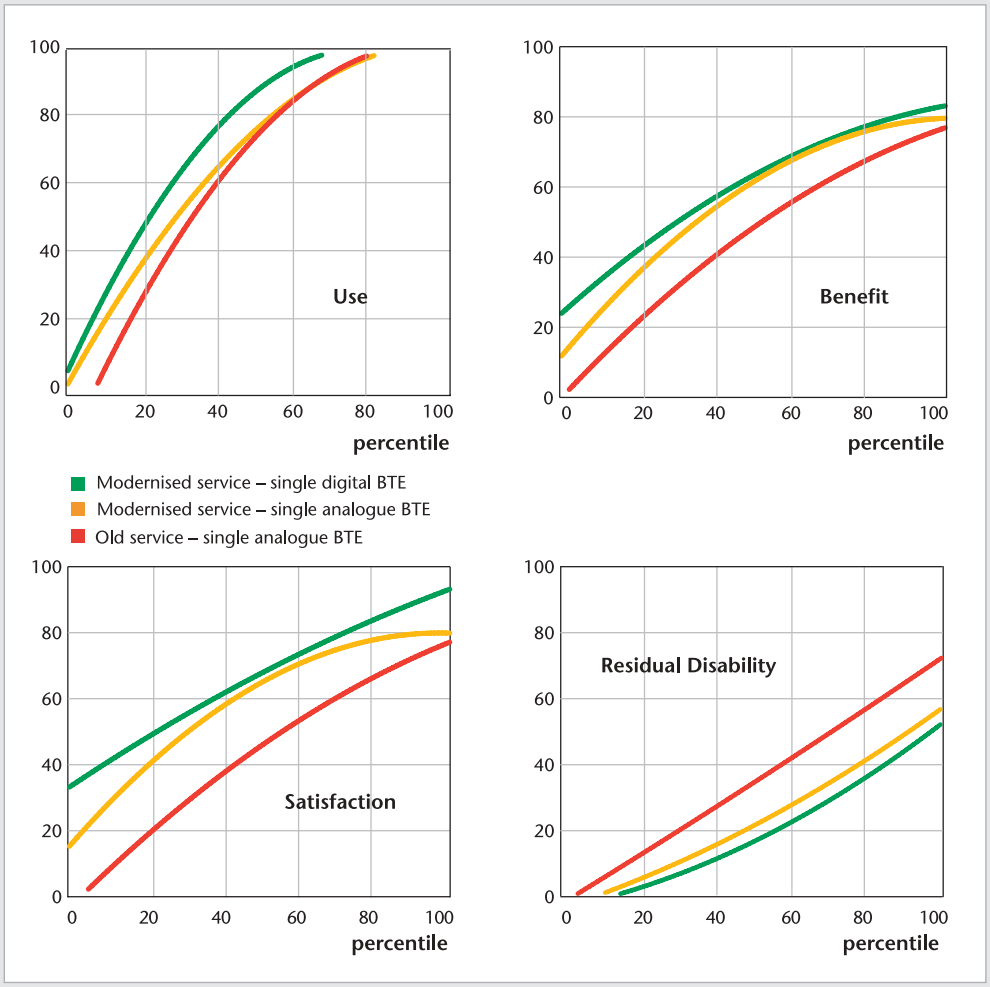


Figure 2.4 shows a series of outcome measures on the Glasgow Hearing Aid Benefit Profile (GHABP) from the modernisation programme in England. The data, from July 2002, are drawn from an interim analysis by Professor Adrian Davis (MRC Institute of Hearing Research, Nottingham) and reported to the Department of Health in England. The GHABP[15] is a validated self-report questionnaire for the assessment of hearing aid fittings and services. Figure 2.4 compares a single analogue BTE (behind-the-ear) fitting in the pre-modernised service, with a single BTE in the modernised service which can either be of analogue (old technology – the concurrent controls) or digital (new technology) form. The digital types include many processing and fitting features not available in the analogue models. The data are drawn from the modernisation sites in England which had the concurrent control arm.

All of the different outcomes show that there are very substantial benefits to be delivered from a modernised hearing aid service. Some of these benefits from the service modernisation programme accrue because of improvements in the structure and process of fitting, delivery and managing the hearing aids. Others are a result of the improvement in technological features embodied within the digital devices. Thus any programme of modernisation which pays attention only to either technology or the rehabilitative context will inevitably not deliver the desired benefits to hearing impaired people. Such a programme would not be an efficient use of NHS resources.

A rational approach to service modernisation and improvement should embrace the overall rehabilitative context within which the technology is delivered and the technology itself. The information from the modernisation programmes in England furnishes a valuable context when appraising options for audiology services in Scotland. They encourage a comprehensive review of staffing levels, staff skills, and the process and infrastructure required to deliver an effective service. The English experience shows that substantial improvements in service outcome are possible.

2.9 Cost-Effectiveness

Data from the Health Utilities Index Mark 3 (HUI3)[16] derived from the modernisation programme in England allows utility values before and after fitting of hearing aids to be calculated. The hearing aids that are used vary from unsophisticated analogue devices in the pre-modernisation service context, through unilaterally fitted BTE digital devices, to bilaterally fitted ITE digital devices in a modernised service context. Extrapolation of the mean incremental cost and mean incremental HUI3 gain over an individual's future life expectancy, discounting future costs and benefits at 6% per annum, yields an estimated cost utility of between £500 and £1,000 per quality adjusted life year (QALY) gained.[17]

Thus, hearing services show remarkable cost-effectiveness when compared to other NHS interventions. In summary, substantially improved services are available at highly advantageous cost-effectiveness ratios.

3. METHODS

This report is based on evidence derived from a number of sources. They include published literature, unpublished studies and reports provided by a number of the stakeholders. In addition, the working group have gathered new information to inform and justify the findings and recommendations within this report.

3.1 Audit of NHS Audiology Services

Audiology services in Scotland are provided by twelve NHS Boards. Services to the Western Islands Board are delivered by Highland, and Grampian delivers services to the Orkney and Shetland. Within those twelve Boards there are 22 audiology units, of which two (Yorkhill at Greater Glasgow and the Children's service at Edinburgh Royal) are stand-alone paediatric units.

An audit was conducted within each of the 22 audiology centres. The audit consisted of a 52 page questionnaire which was pre-circulated to each of the centres. This was followed by a visit from an external audiologist who facilitated final completion. The questionnaire covered aspects of catchment population and budget, accommodation, staffing numbers and grades, staff qualifications training and development, audiological equipment, information technology facilities, patient throughput, hearing aid repair and battery services, referral routes, specialist paediatric services and services for tinnitus and balance problems. A copy of the audit booklet can be found in Appendix A3.

It is from this audit that much of the factual information on current practice and service provision is drawn and leads to many of the recommendations. It would be prudent to sound a word of caution regarding the data that is available. One striking finding has been the inability of the service to provide accurate detailed information about aspects of structure and process. Only 23% of audiology units reported having a database, but even those units did not have routinely available information on such statistics as the numbers and types of patients seen, waiting times, hearing aid activity, and detailed budgets. Confirmatory follow-up information for many of the units has been required, accompanied by cross-referencing to the financial systems within the host NHS Trust. There is a degree of uncertainty associated with the data and it would be imprudent to interpret too literally any given figure, particularly where comparison across NHS Boards is attempted. Nevertheless, for many criteria the variation across NHS Boards is substantial and very unlikely to be a simple product of the uncertainties rising from the data collection process.

3.2 Surveys of Service Users

The ways in which users of services perceive the standards and quality of the care they receive do not necessarily align perfectly with those of service providers. A service which providers perceived as well founded and effective, but which left users dissatisfied, would not be successful. Service quality as judged by users is an essential element of any comprehensive review. Five different surveys were undertaken to gain the perceptions about access, process, quality of care, and outcome from:

- Children and their parents who had attended an audiology department in the previous twelve months because of a hearing problem for the child;
- Children and their families for whom the child had a diagnosed hearing problem, and who were known to their local education services;
- Residential and nursing homes for the elderly (care homes);
- Adults with a hearing problem who had attended an audiology department in the previous twelve months;
- A group of BSL users who had at some stage been in contact with an audiology department.

For each survey, the final questionnaire was agreed in the light of the results of a pilot on a small sample of people. Copies of the questionnaires used in each of the surveys can be found in Appendix A4.

The survey of children who had been in contact with audiology was conducted in four centres in Scotland. These centres were Fife, Lothian, Paisley and Tayside. As the surveys were conducted at only a sub-set of sites within Scotland, the individual sites are not identified in this report. The data for any given site is available to the host service. Children were identified from hospital clinic lists, and questionnaires were sent out by the local clinical governance or clinical effectiveness department. The completed questionnaires were returned anonymously to the Public Health Institute of Scotland. Each questionnaire had a code which identified only the centre which distributed it. Details of the questionnaire are provided in Appendix A4. In total, 950 questionnaires were distributed of which 24 were returned as not known at this address. A total of 317 completed questionnaires were returned.

Children with a diagnosed hearing impairment were identified by contact with the Directors of Education throughout Scotland. Twenty five services agreed to take part and were able to distribute their questionnaires before the end of the summer term 2002. A total of 810 questionnaires were distributed, and returns from 246 hearing-impaired children and their families were obtained. As with the survey of clinic contacts described above, the questionnaires asked about access, process, quality of care and outcome. In addition this survey also covered a number of issues around hearing aid fitting and support. Each of the returns was anonymous apart from the originating centre. The details of the questionnaire can be found in Appendix A4.

Care homes for the elderly were surveyed to determine the existence and functioning of links with NHS Audiology Departments, given the high prevalence of hearing impairment in their residents. This survey included specialist units for hearing and deafness as well as general care homes. Nine hundred and eighty three questionnaires were sent out, from which 500 responses were obtained. The questionnaires were completed by the care home staff. These covered the relationship between the home and its local audiology department, and the level of information and training with which the home was supplied.

For the fourth survey, adults who had been in contact in one of five audiology centres were identified in a manner similar to the attendees at children's services. The five centres which took part in this survey were Aberdeen, Fife, Glasgow, Paisley and Tayside. Questionnaires were distributed by local clinical governance or clinical effectiveness departments or by the MRC Institute of Hearing Research. The questionnaires covering issues regarding access, process, quality of care and outcome were completed anonymously and returned to the Public Health Institute of Scotland. Of the 1000 questionnaires sent out, 304 were returned.

The final survey was similar to that of adults attending audiology services, but was targeted at people who had been in contact with audiology and for whom the primary form of communication was BSL. These individuals were approached under the auspices of Societies in the East and West of Scotland affiliated to the Scottish Council on Deafness and were returned to the Public Health Institute of Scotland. Help was available for respondents to complete the questionnaires where written English was not an appropriate means of communication. Ten completed questionnaires were returned.

3.3 Stakeholder Consultation and Interviews

The multi-agency nature of services for hearing problems necessitated mechanisms to access perceptions from outside the health arena. When the report structure and process had been developed, a consultation of stakeholders was undertaken in February 2002. This sought to identify and consult with a wide and diverse range of groups. This included professions, specialities and organisations within health as well as the voluntary sector, social work, education and the private sector. These were identified by a combination of internal discussion by the needs assessment group, and contacting key organisations to request information on people to whom the consultation pack should be sent (e.g. the Scottish Council on Deafness).

A consultation pack was sent to a total of 367 organisations and individuals. The pack contained:

- a covering letter, explaining the aims of the group and posing a number of questions to which the recipients were invited to respond;
- the remit of the group;
- a plan for the contents of the final report;
- plans for a number of surveys of users of audiology services.

Stakeholders were invited to comment on the group's plans, the services provided by audiology departments and how these could be improved.

A total of 71 substantive responses were received and analysed. The topics raised were discussed within the group, and resulted in a number of changes to the plans for the report.

A summary of the topics raised has been provided in Appendix A2. Many of the responses included helpful enclosures. These included qualitative information

from attendees at lip-reading classes on the services provided by local audiology departments, reports on examples of good and bad practice across the country, and copies of standards and guidelines from a number of organisations.

A number of responses were identified which the group felt required a fuller exploration. Two members of the group were delegated to meet with the authors of these responses to discuss the issues that they had raised more fully and report back to the group. These included the following.

- Service provision in remote and rural areas and the use of the voluntary sector. This resulted in an additional section in the report.

- Services to children and their families, links with education and the surveys planned for this group. This resulted in fruitful co-operation with the "Achievements for deaf pupils in Scotland" project group in the University of Edinburgh, and in the inclusion of a section on the transition from paediatric to adult services within the report. This project group also provided the needs assessment group with a report on the comments on audiology services made by deaf children and young people as part of their study on attainment. These included comments from BSL users.

- Links between audiology clinics and the cochlear implant teams in Scotland.

- Links with social work. This resulted in a professional from this area being co-opted onto the needs assessment working group.

- People with multiple needs. This informed a section in the report.

The issues raised by the stakeholders, their comments on local services, their concerns, and their descriptions of good practice underpinned the discussions of the group and the preparation of the report. The consultation exercise and meetings with stakeholders was one of the methods used to address gaps in the information on which the report was based, and to gain qualitative information about audiology services across Scotland. The qualitative information derived from their responses form part of the evidence upon which some of the findings and recommendations are based.

3.4 External Surveys

The Audiology Needs Assessment Group made use of surveys which had been conducted by external organisations as part of their own activities independent of this review. These included:

- Survey of audiology departments in Scotland conducted by the Royal National Institute for Deaf People in August/September 2001 and published in February 2002;
- Sense Scotland survey conducted in the summer of 2002;
- "Achievements of deaf pupils in Scotland" survey conducted by Moray House in Edinburgh;

- Other local enterprises undertaken by voluntary organisations, education and social work services.

Further details of the surveys which fed into this report can be found in Appendix A2.

3.5 Comparisons with NHS Services in England and Wales

Modernisation programmes for audiology services are underway in the UK outwith Scotland and those processes have been used to inform some aspects of this report. In particular the modernisation programme in Wales included surveys of accommodation needs and service quality standards prior to modernisation. Comparative data has been gathered for the services in Scotland.

Staffing levels for English services are available as part of their pre-modernisation surveys. These have been used to inform the comparative levels and distribution of staff and staff skills available to the audiology services in Scotland.

The steps towards the implementation of UNHS in England and Wales led to widespread surveys of all paediatric audiology services from which an index, the Paediatric Audiology Services Index (PASI) was developed. Similar data have been gathered for Scotland. This indicator provides a summary measure for comparison of service levels and quality.

3.6 Good Practice Standards

Where possible, services in Scotland have been compared to good practice standards which have a degree of acceptance and validity. In particular, the recommendations from the Scottish Executive Health Department on Good Practice Guidance for Hearing Aid Fittings[1] has provided a benchmark against which the hearing aid services for adults in Scotland can be compared. The National Deaf Children's Society (NDCS) has well-developed quality standards for paediatric audiology services,[18] and the Royal National Institute for Deaf People has also published service standards.[19] Professional organisations such as the British Association of Audiological Physicians (BAAP)[5] have also produced service standards and recommendations. In addition to these UK based standards there are standards and recommendations from Europe and North America, which have informed the comparison process.

4. SERVICES FOR CHILDREN WITH HEARING IMPAIRMENT

Audiology services for children aim to identify permanent childhood hearing impairment, to monitor common conductive hearing losses in childhood, and to determine whether hearing problems are implicated in developmental delay. The epidemiology of hearing losses in children is described briefly in Section 2 of this report, and in more detail in Appendix 6.

Permanent hearing impairment in children (PCHI) has a profound effect on the development of babies and young children,[7;8] which can be mitigated by early, effective intervention.[20-24] Given this profound effect on development, we need mechanisms to identify PCHI early. There is a high prevalence of conductive hearing loss, especially in the pre-school years, which, if untreated, may affect a child's speech and language development.

It must be recognised that, whereas adults develop hearing problems when they already have an established language base, vocabulary and the rules of speech, in children this sensory deprivation can occur during the critical language learning period.

There are a number of ways in which hearing loss may be identified or is currently being identified. These include screening programmes, monitoring of children with persistent or recurring otitis media and through Child Health Surveillance Programmes. These are in addition to mechanisms to ensure access to testing services for any child, where there is suspicion or concern that they may have a hearing problem.

4.1 Pathways of care

Hearing impairment in children is complex, with a high prevalence of co-morbidity.[6;25] Children may be referred to audiology services from many sources and for any one of a number of reasons. These have been summarised for the Lothian service in Figure 4.1.

Figure 4.1

Patient Pathways for the Lothian Paediatric Audiology Service

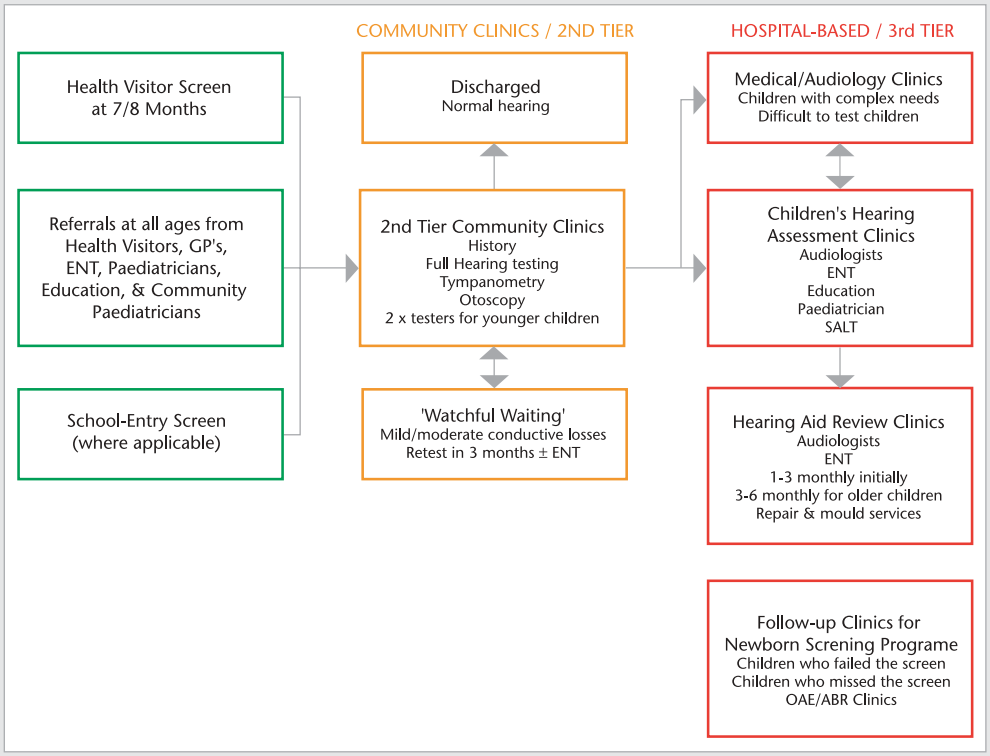


Figure 4.1 also provides information on the pathway of children through the various clinics which audiology departments are involved in providing. There will be variations in the way that each service organises its clinics. However it does provide an insight into the complexity of the services offered and the children seen within an audiology department. Only a small percentage of such children will prove to have a permanent hearing loss and require hearing aids.

Services include community-based clinics, and clinics which are based within hospitals. There is no one model of how these should be distributed and organised.

Hearing impairment may be suspected either because a child has failed a screening test or due to concerns of the family or a professional working with the child. Examples of current screening programmes are:

- Infant distraction test (IDT) at 7 months;
- School entry screen at age 4/5 years;
- Targeted newborn screening – for that group of babies with known risk factors for hearing loss (approximately 7-10% of birth cohort);
- Universal newborn hearing screening – presently only in one NHS Board (Highland), but due to begin in January 2003 in 2 more pathfinder sites (Lothian and Tayside), and to have complete coverage in Scotland by 2005.

Children who fail the IDT or school entry screens, and all those for whom there is concern, are normally referred to second tier, community clinics in the first instance. If there is evidence or suspicion of sensorineural hearing loss, the child is referred to a third tier clinic (which is often hospital-based). There they undergo more extensive assessment and if appropriate, they are fitted with hearing aids. Continued management of these children is undertaken in the third tier setting.

Conductive hearing loss results from external or middle ear problems and can fluctuate over time. Otitis media with effusion (OME) is the common cause of conductive hearing loss in children. This can be a self-limiting condition. If it persists, it can be corrected by surgery or may be managed more conservatively by the use of hearing aids. Most children undergo a period of "watchful waiting" which includes monitoring by audiologists before a decision on surgery is made.[26] This may be conducted prior to a decision on referral to a hospital ENT department. This monitoring can be conducted in second tier, community clinics.

There are many hereditary syndromes associated with hearing loss.[6;25] In addition, hearing loss may be suspected or implicated in children with a range of developmental disorders such as speech and language disorders, autism, visual impairment and cerebral palsy. It is therefore important to assess the hearing of children with a variety of conditions and developmental problems to exclude hearing impairment as a possible component or a contributory factor in their developmental delay.

Thus, paediatric audiology services are involved in the assessment and care of a complex group of patients, many of whom will have significant co-existing conditions or developmental problems. It is important that audiologists work in concert with a number of other disciplines and professions to ensure that the services they provide are centred on the needs of the child and family. The co-ordination of such a service requires clear leadership and a recognition of the roles and responsibilities of each of the professions and disciplines involved in the care of each child. Currently, eight mainland NHS Boards indicated that they have a designated lead clinician for audiology services. These come from a variety of backgrounds including ENT surgery, audiology, paediatricians, and audiological medicine.

Recommendation 1

NHS Boards should ensure that for each paediatric audiology service there is an established multidisciplinary team with an identified clinical leader. There will be written protocols for the diagnosis and management of hearing impairment in children. Local circumstances will determine from which discipline the clinical leader is drawn.

4.2 The Quality of the Services Provided Within Scotland

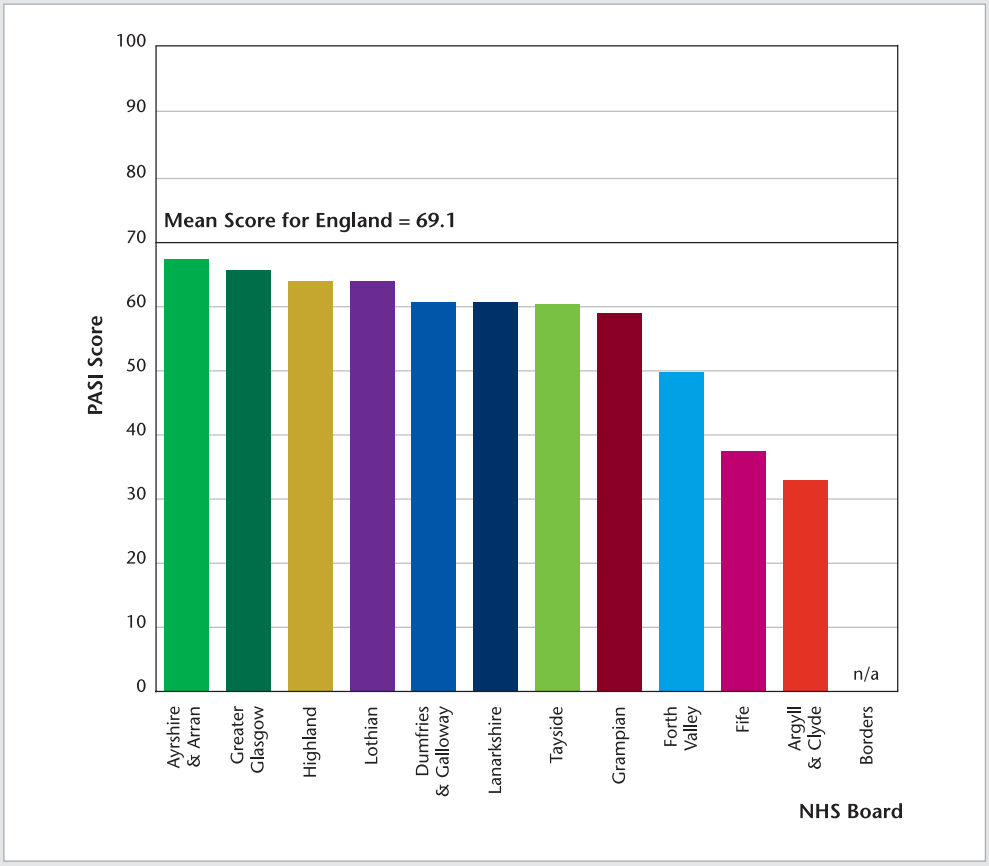
John Bamford and Clare Battersby at the Department of Audiology and Education for the Deaf, University of Manchester developed an overall score as a measure of

the quality of services provided within paediatric audiology (the PASI score).[27] The index was developed as one of the tools to evaluate the effectiveness of the modernisation of paediatric audiology services in England. The components of the score have been summarised below:

- The use of appropriate procedures and technology in the assessment of hearing and the verification of hearing aids;
- Communication with the child and family in the form of information about the child's hearing (e.g. routine provision of the child's audiogram);
- Breaking of the news of diagnosis (e.g. how this and the immediate aftermath is handled);
- Collaboration with education (e.g. how soon colleagues in education are informed of a diagnosis and routine sharing of information with education);
- Joint working in terms of the existence of paediatric working groups and parental involvement in these groups;
- Written policies;
- Frequency of ongoing review.

Figure 4.2

Scores on the Paediatric Audiology Services Index (PASI) for the NHS Boards in Scotland (note that paediatric services for Borders are supplied by Lothian).



Those audiology departments which provide a paediatric service completed the PASI questionnaire in a survey conducted by the National Services Division (NSD) who kindly released the results to the Audiology Needs Assessment Working Group. As this survey was also conducted in England it has been possible to compare Scottish centres with those in England. There was a wide variation between the Scottish centres but none achieved a score as high as the mean score for England (see figure 4.2).

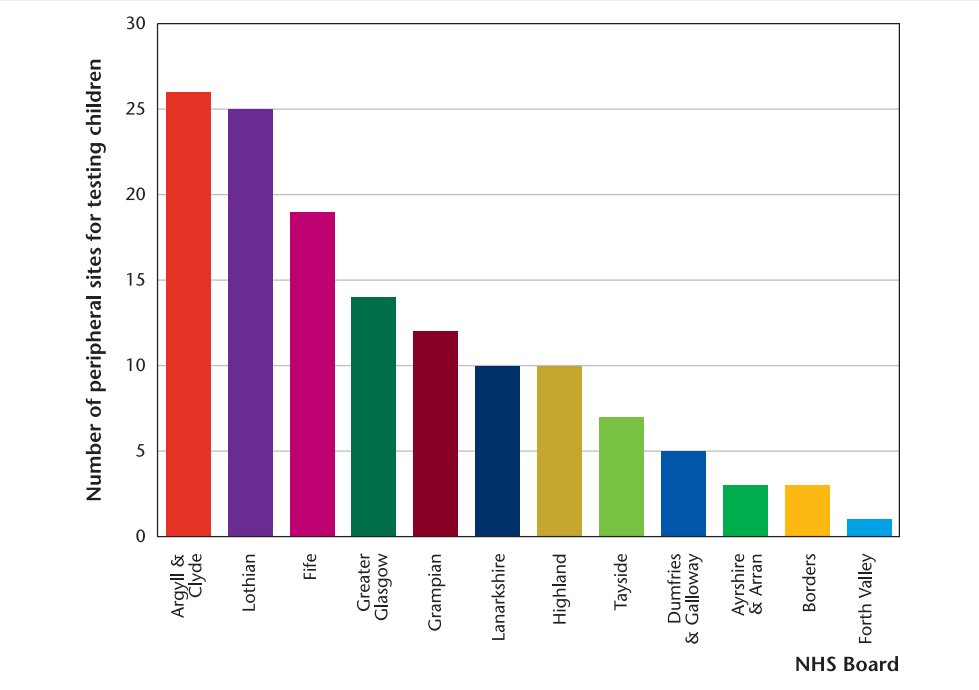
4.3 Facilities for Paediatric Audiology

Audiology departments provide services and clinics from base and peripheral sites, some of which may be located some distance from the base site. Peripheral sites allow local access to audiology services.

Departments reported the use of a large number of peripheral sites for paediatric clinics (figure 4.3) in the audit. This did not appear to be wholly dependant on the rurality of the NHS Board area, with some of the most urban boards reporting the highest number of peripheral clinics.

Figure 4.3

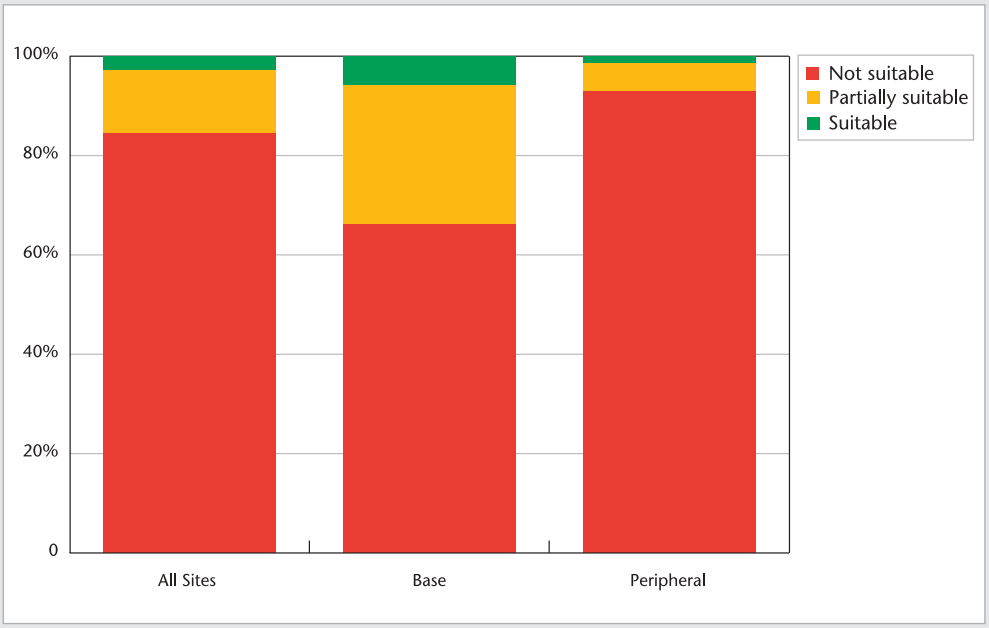
Number of peripheral sites used for testing children's hearing in each NHS Board.



Decisions on the number and sites of peripheral clinics require a balance between ease of access for the children and their families and the fitness for purpose of the rooms which are used for such clinics. Ease of access and provision of more local clinics were issues which were raised in response to the open questions in the surveys of children and their families. This should not be at the expense of compromising the integrity of the procedures conducted within them.

Figure 4.4

Suitability for purpose of rooms in base and peripheral sites used for testing children's hearing.



In the audit of services (figure 4.4), departments reported that across Scotland, 84% of the rooms in which hearing testing was conducted on children were not fit for that purpose. Only 3% were considered to meet the published guidelines on the facilities which should be used for this purpose.[5;18] The rooms at base sites were slightly better on average than those in peripheral sites, with 34% of rooms in base sites being partially or fully fit for purpose in comparison to 7% of those in peripheral sites.

Paediatric clinics have to be family friendly. In terms of facilities this would mean:

- The use of larger sound-proofed rooms with one way mirrors for the assessment of young children;
- A reception area which is child friendly – this would include a play area and appropriate toys and books;
- Reasonable access for buggies to the clinic;
- Nappy changing facilities.

Recommendation 26

NHS Boards should review the services and standards provided at base and, in particular, peripheral sites and their relative distribution in the light of population, transport and geography. Each NHS Board should develop and deliver services on a series of "hub-and-spoke" models and establish an acceptable balance between centralisation and concentration of expertise, and accessibility of services and local demand.

4.4 Access

4.4.1 Access to Clinics

In order to ensure effective intervention as early as possible, it is essential that there are no barriers to appropriate access and that children are seen as soon as possible following referral. It is important that parents' concerns are listened to and not dismissed, and that there are clear lines of referral and two-way communication between all concerned professionals and the audiology clinic.

In surveys of children and their families, 28% of children with impaired hearing and their families reported difficulty in getting a referral to audiology, while 14% of those responding to the survey of children and young people who were recent clinic contacts reported such difficulty.

There was a wide variation in the waiting times reported by the various departments in the audit of services which was conducted during 2002, with waiting times ranging from less than a week in Ayrshire and Arran to 15 weeks in Tayside.

4.4.2 Communication between Second and Third Tier Clinics

Given the complexity of children's problems, it is often necessary to monitor their progress over time. It may be necessary for them to be seen at different times in different settings (e.g. ENT clinic when there is a middle ear problem or third tier clinic if more complex assessment or aids are required). It is essential therefore that there are no barriers between the community and hospital service and that there is free flow of information.

4.5 The Ongoing Management of the Child

The on-going management of the child with hearing impairment involves much more than the provision of hearing aids.

4.5.1 Breaking the News

Initial breaking of the news of the diagnosis of hearing impairment is crucial. This can have a profound effect on the way in which the family cope with the news and on their subsequent relationship with health services. NDCS have published a number of guidelines about this period.[18]

There are a number of elements in ensuring that breaking the news is done as well as possible, these have been listed below.

- The diagnosis should be timely, and as soon as possible after the result is available. It is unacceptable for parents to wait while documentation is passed between audiology and ENT consultants and then to wait until the next available ENT clinic appointment.

- The person breaking the news should be in a position to answer all of the parents' questions, and provide adequate support. Formal counselling training may be helpful to people in this position.

- The diagnosis should be given sensitively, in a suitable environment and at a time when the professional can give their uninterrupted attention to any questions that the parents might have.

- There should be representatives from those professions who will be involved in the child's care (including education) available to speak to the family immediately after the news is broken.

- At the time of diagnosis, parents must be given information about sources of help and advice including contact names, addresses and telephone numbers.

Evidence from the audit and the survey of deaf children would suggest that this is not being managed well in all areas of Scotland. Only 41% of departments reported that the audiology team was involved in breaking of the news. Often parents had to wait for the next available appointment to be given this news.

In the survey of deaf children and their families:
- 30% indicated that the news had not been broken to them sensitively;
- 28% had not been encouraged to ask questions;
- 33% had not been given enough time to talk;
- 13% did not feel that the person who broke the news to them knew the subject or could answer their questions;
- 53% were not given a contact telephone number to call if they had any additional questions once they went home;
- 63% were not given the opportunity of a follow-up clinic visit a week later;
- 15% of children and their families thought that they had first seen their teacher of the deaf within 4 weeks of their first diagnosis.

Recommendation 3
Breaking the news to parents of a newly diagnosed deaf child should be done by a professional with experience and knowledge of child development and the support and education options for deaf children, with sufficient time and in privacy. The appropriate support personnel (e.g. education, speech and language therapy etc) should either be introduced at that time or informed promptly to ensure immediate and ongoing support and information sharing as desired by parents.

4.5.2 Audiological Management of the Child

The assessment of children's hearing levels and the fitting of appropriate hearing aids is generally more complex than in adults. In adults audiologists would usually require one or perhaps two assessments to obtain a picture of their audiological status. The complexities in children include:
- Babies and young children cannot tell you how much they can hear, and whether their hearing aids are working;
- It is not possible to establish the threshold of uncomfortable listening, and this information only emerges as the child grows older and develops;

- Because of this it takes time for the full audiological picture to emerge, which makes it more difficult to establish the most appropriate aid for the child, this results in a need for frequent fine tuning and at some points radical changes;
- In young children the ear canal grows quickly and so their moulds have to be changed at frequent intervals (which can be as often as every 3 to 4 weeks in a young baby);
- As a child grows and develops his or her hearing needs change and so will the most appropriate type of hearing aid (e.g. when the child starts school they may need a radio aid).

This results in a more acute need for regular follow-up and review of children with hearing impairment. However, in the audit of audiology services, 18% of departments indicated that they did not have a system for the review of children.

Ongoing follow-up and support also includes the provision of hearing aid repair services to children and their families. The survey of children with hearing impairment and their families indicated that:

- 90% of children and their families reported that their hearing aids were repaired "very quickly" or "reasonably quickly";
- 53% of children and their families felt that their clinic provided open access for hearing aid repair;
- 64% of children and their families had confidence that the audiology clinic was "always there if they needed it", 19% indicated that they felt the clinic was only able to provide limited help.

4.5.3 Rehabilitation and Intervention

It is crucial that a rehabilitation programme for the deaf child and support for the family are instituted immediately. This will usually be through the auspices of the education services, either a teacher of the deaf or an educational audiologist. A speech and language therapist is also often involved. It is essential that, whoever is providing this early support, they should have appropriate knowledge of audiology and early language development and not just have generic training in special needs.

4.5.4 Aetiological Investigation

Aetiological investigation seeks to identify for the cause of deafness. There are many reasons why we should seek for the underlying cause:

- to answer the parents' questions;
- to identify medical conditions which will affect the child's health and progress;
- to assist the family in making decisions about communication mode and educational placement;
- to inform genetic counselling;
- for epidemiological information.

4.5.5 The Evaluation of Disability, Handicap and Co-morbidity

It is important that we look at the whole child and do not think only in terms of the deafness. We need to consider the child in the context of the family and wider educational and social circle.

Recommendation 4

Paediatric audiology services should put in place a system to ensure that every diagnosed deaf child receives an ongoing comprehensive aetiological, audiological and developmental assessment of all functions in addition to hearing.

4.6 Communication

Effective communication with children and their families is paramount. It is important to ensure that they are provided with adequate information about their condition and are fully involved in decisions about the management of the child. Families are often involved with a large number of professionals, and we need to take care that they are not overwhelmed, and that the deaf child and family are at the centre. The family must come first and be treated as equal partners in the "Team around the child".

4.6.1 Aspects of Good Practice

Audiology departments cannot work effectively in isolation from the other professions and disciplines who contribute to the ongoing care and development of the child. Hearing impairment is likely to affect the language and educational development of the child. It can also mask a number of co-existing conditions. In addition, there are a number of conditions which will have a major impact on the most appropriate methods of assessment and management of the child (e.g. visual impairment or learning disability).

A successful early intervention programme requires support and management of the child and family, as well as the fitting of hearing aids. Effective hearing aid fitting and evaluation requires information from the home and school as well as the clinical environment. In many areas of the UK, this information is provided to audiology departments by educational audiologists who play a pivotal role in the relationship between health, education and the child and family.

The experience of modernising paediatric audiology services in England is that the role of the educational audiologist has extended and become more important. Many educational audiologists have found it necessary to develop their knowledge and skills of the more sophisticated hearing aids, such as those which rely on digital technology. In Scotland there are only a small number of educational audiologists, who do not cover the whole country. In some areas, at least part of the role associated with this profession is taken by speech and language therapists, who visit the family on a regular basis.

4.6.2 Feedback from Users and Stakeholders

Communication was raised on a number of occasions in:

- The surveys of service users;
- The stakeholders consultation;

- The external surveys by Moray House and Sense Scotland.

The findings are summarised below.

- Children and young people felt that in many cases audiology staff did not communicate directly with them, preferring to speak over their heads to their parents or carers.

- Families often did not have full information shared with them regarding the child's hearing levels, benefit from hearing aids, communication strategies, support from voluntary bodies etc. Information was not shared throughout the young person's life in addition to at time of diagnosis.

- Communication and information sharing did not occur between professionals, both from within health services and with other agencies (in particular, colleagues in education and social services).

- Other agencies expressed frustration at a perceived blanket ban on sharing of information in some areas on the grounds of medical confidentiality. While it is important to gain parental consent for the sharing of such information, this would not appear to be an issue with most families. In the survey, 92% thought that such sharing of information was a "good idea". However, only 37% felt that this information was "fully" shared with their teacher of the deaf and 26% with their school.

Recommendation 2
NHS Boards should ensure that all children's audiology services have properly functioning links with education, social work, child health and speech & language therapy services, and ensure that all are equal partners with families in decision making regarding the ongoing management of the child. There should be complete transfer of diagnostic, management and progress information between families, health, education and social care at identification and throughout the pre-school and school years.

4.7 The Transition from Children's Services to Adults' Service

This issue was raised as a concern by a number of stakeholders. At the time of this transition, young people move out of the more protective and supportive environment of paediatric audiology. They move into the adult service where they are expected to access services as they require them, often through GP referral. This is the time that they also move away from the support provided by education, losing the services of their educational audiologist and their teacher of the deaf (if they have access to either of these two professions).

Young people must be adequately prepared for this transition. They should be encouraged to take responsibility for the care and management of their own hearing aids, and to participate in their own management planning. They should also be provided with information on their own hearing.

There is evidence that this is not happening effectively. Qualitative studies organised by SENSE Scotland and by the "Achievements of Deaf Pupils" project based at Moray House in Edinburgh revealed that young people are not adequately prepared for this transition. In the audit of audiology services, 78% of departments indicated that they had no procedures in place for the transition from paediatric to adult services.

Recommendation 10
Audiology services should ensure that there is a phased transition to the adult environment from the extensive support in a paediatric service. The transition should be tailored to the special needs of individual young people and should include liaison with education, social work and employment services.

4.8 Implications of Universal Newborn Hearing Screening (UNHS)

The introduction of UNHS is likely to have a major impact on existing audiology services.[28] It will lead to earlier detection and intervention.

Earlier detection with confirmatory assessments as early as four weeks of age will lead to:

- An increase in the number of assessments for each child, in order to establish the nature, severity and shape of the hearing loss;
- An increase in the number of neuro-physiological assessments for each child;
- The requirement for staff to extend their knowledge and skills to allow the assessment and fitting of hearing aids in very young babies;
- The complexities of assessing and fitting hearing aids to very young children will result in a need for more audiologists, available for longer appointment times;
- An increase in the number and range of equipment required for the assessment of very young babies.

Confirmation of hearing loss before the age of three months should be followed where appropriate by the early provision of hearing aids. However, care must be taken to go at the parents' pace and not to provide hearing aids until the parents are ready. Early provision of hearing aids will require:

- A wider range of hearing aids;
- An increase in the funding required for these hearing aids;
- An increase in the number of moulds provided – possibly every two weeks in the very young growing child;
- An increase in the number of visits to the audiology centre by the families in the early stages of establishing hearing aid use – and a more flexible approach to appointments for these families.

Recommendation 7
With the introduction of UNHS, NHS Boards should develop an investment plan for paediatric audiology services to cope with the increased demands and avoid excess pressure on other aspects of the service. The resources should be in place prior to the implementation of UNHS.

Family support, advice and information need to be provided immediately following the confirmation of hearing loss, if not earlier. It must be recognised that, if this is poorly managed, it will have a profound effect on how families cope. Appropriate training on counselling and early intervention may help to provide staff with skills to help at this time. While support of the family has usually been given by the education service, at this very early age, there will require to be more multi-agency involvement and information sharing.

It is recognised that education services play a crucial role in supporting the child and their family, through the auspices of the educational audiologist and/or the teacher of the deaf. In many areas these services are supplied to children and their families from the time of diagnosis, regardless of whether the child has reached school age at this time. The introduction of UNHS will result in identification of hearing problems in very young babies. It is essential that, before this is introduced, there are systems in place to ensure that the child and family receive adequate ongoing support. If this is not a role which education feel that they can fulfil, then it is important that the other models are found and put in place.

Recommendation 8
Because the implementation of UNHS will result in many children being diagnosed at a very young age, NHS Boards should develop and implement an early intervention programme to support such families, in conjunction with education, social work and voluntary organisations.

There are a number of factors which may result in a more acute need for a well organised and easily accessible second tier community audiology service. These are:
- The establishment of UNHS;
- The phasing out in some areas of the universal screen at 7 to 8 months by health visitors;
- The phasing out in some areas of a school entry screen.

There will still be a need for an assessment service to:
- Identify children with late onset, progressive or acquired hearing loss;
- Assess children with conductive hearing loss;
- Assess children with developmental problems.

The second tier community audiology service must be able to provide good skilled assessments, good facilities and easy and quick access to third tier hospital facilities for all children with suspected permanent childhood hearing impairment. They must also ensure that those children with additional disabilities such as developmental delay, autistic spectrum disorder, and severe visual impairment are provided with similar high-quality audiological assessment.

Recommendation 9
NHS Boards should develop robust identification and referral systems to identify late-onset, progressive and acquired hearing losses in children. Services require effective community clinics with functioning inward and onward referral routes.

5. SERVICES FOR ADULTS WITH HEARING IMPAIRMENT

Audiology services contribute to the care of hearing impaired people in a number of ways. Upon referral to an audiology department, hearing is always assessed, regardless of the referral route. Patients with conductive hearing loss may then be managed at ENT departments, either surgically or medically. Those with sensorineural hearing loss can only be managed with hearing aids and rehabilitation.

The effectiveness of hearing aid management is dependant on:

- the features of the hearing aid;[29]
- how well these match with the patients audiological needs;[30]
- and crucially, the level of support and rehabilitation which the patient receives.[31]

The prevalence of hearing impairment rises significantly with age (see Figure 2.1), increasing from 3% of 20 to 24 year olds with at least 25 dB hearing loss in their better ear to 76% of those in the 75 to 79 year age group.3 Because of this, audiology services deal, predominantly, with older people. The median age for fitting a hearing aid for the first time is 74 years.[32]

Pre-modernisation data from England reported that 30% of hearing aids were not used, and 50% were not used effectively.[32] The modernisation of hearing aid services in both England and Wales have sought to address these issues by ensuring that patients are fitted with the most appropriate aid(s) within the appropriate rehabilitative context. The Good Practice Guidance for the fitting of adult hearing aids which was issued as a Health Department Letter in Scotland in 2001 sought to provide a similar framework for the modernisation of services in Scotland.[1]

5.1 Sources of Referral

There are a number of possible referral routes to audiology departments. Patients who meet clearly defined criteria[33] may be referred directly to the audiology services who are responsible for their audiological assessment, hearing aid dispensing and fitting, rehabilitation, and onward referral. In the audit, 18 of the 20 services surveyed in Scotland reported that they have direct GP referrals for new patients. All of them allow direct GP referrals for existing patients.

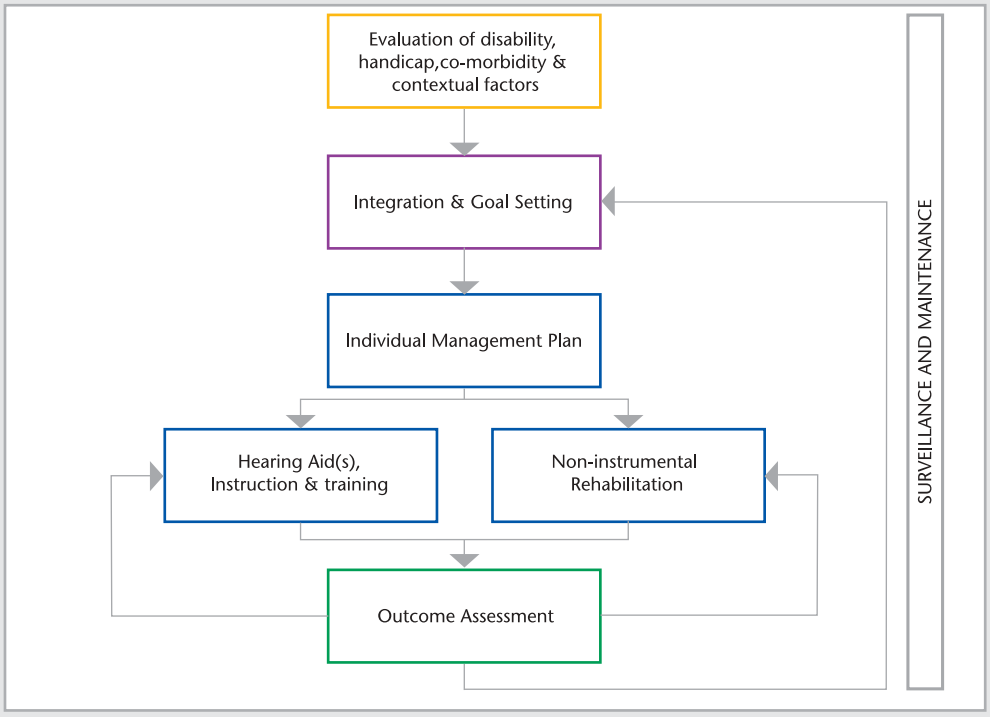
Patients may also be referred to ENT surgeons or another medical specialty in the first instance. Some departments operate a vetting system for such referrals, passing the referral directly to audiology departments without the need for an ENT consultation first (accelerated referral). Others will first see the patient at the ENT clinic before referring to audiology staff. In most services, audiologists are responsible for decisions about the most appropriate hearing aid for patients, although in some areas ENT surgeons may be involved in this decision.

5.2 Pathway of Care

The main processes involved in hearing aid fitting and rehabilitation are summarised in figure 5.1 below. More detailed models and structures for rehabilitation are developed in the literature.[34;35]

Figure 5.1

Schematic Outline of Audiological Assessment and Management



The various elements of this pathway are described in more detail below.

- **Evaluation** of the problems the patient is experiencing with their hearing, the impact that this is having on their life, and what else is worrying them. This will include contact with "significant others" in their lives (e.g. do they live alone or with others in a family home or in a care home). All of these will impact on the most appropriate intervention.

- **Integration and goal setting** involves agreeing with the patient what the intervention is trying to achieve. This will ensure realistic expectations and agreed goals against which outcomes can later be measured.

- **Individual management plans** agreed with the patient ensure that priorities and phasing are discussed and agreed.

- **Hearing aid fitting, instruction and training** involves a number of elements discussed in more detail in the Scottish Executive Good Practice Guidance.[1] Essentially this includes fitting the acoustically appropriate hearing aid which makes audible the things that the patient wants to hear, and does not make noises uncomfortably loud. The patient should receive sufficient information, training and support to ensure that they are able to use their hearing aid effectively.

- **Non-instrumental rehabilitation** should always occur. This involves the patient re-learning to listen. Both the patient and those close to them may have to learn new communication strategies. Such support may be provided by Hearing Therapists and Speech and Language Therapists.

- **Outcome assessment** includes reviewing how well the agreed goals have been met with the patient, and this loops back to reviewing, verifying and fine tuning the hearing aid, and into non-instrumental rehabilitation. Goals can be re-negotiated and redeveloped.

- **Ongoing surveillance and maintenance** is essential to ensure the continued effectiveness of hearing aids. This should include open access and regular review of the patient's hearing and hearing needs, without the need for a new referral from a GP.

Audiology services should include onward referral as appropriate to the needs of the patient to agencies providing assistive listening devices, courses on lip reading or sign language, and specialist services such as cochlear implants and bone anchored hearing aids.

5.3 Good Practice Guidance for Adult Hearing Aid Fittings

This guidance was issued by the Scottish Executive as a Health Department Letter (HDL) in 2001.[1] The full text of the guidelines have been appended to this report (Appendix A5). It aimed to address the issues surrounding the provision of a modernised service including adequate audiological and rehabilitative management. For example, the provision of a large percentage of hearing aids which are never worn or which are not used effectively constitutes a significant waste of resources. A summary of the guidance has been provided below (Table 5.1). Each paragraph represents a standard of good practice that should be in place.

The twenty audiology units providing services to adults were surveyed in June 2002. They were asked to rate their compliance with each of the standards summarised above on a 3 point scale (full/partial/absent). From these ratings, an overall score was derived which could vary from zero (no compliance with any of the standards) to 100 (full compliance with all of the standards).

Each department was also asked to indicate the standards which they considered to be most important in the provision of audiological services. A consensus was derived as the five standards which were most frequently selected. A score from 1 to 100 was derived which was based on compliance with these five standards. The five paragraphs selected were 3, 7, 8, 12, 29. These have been highlighted in Table 5.1.

Table 5.1

Summary of the Good Practice Guidance

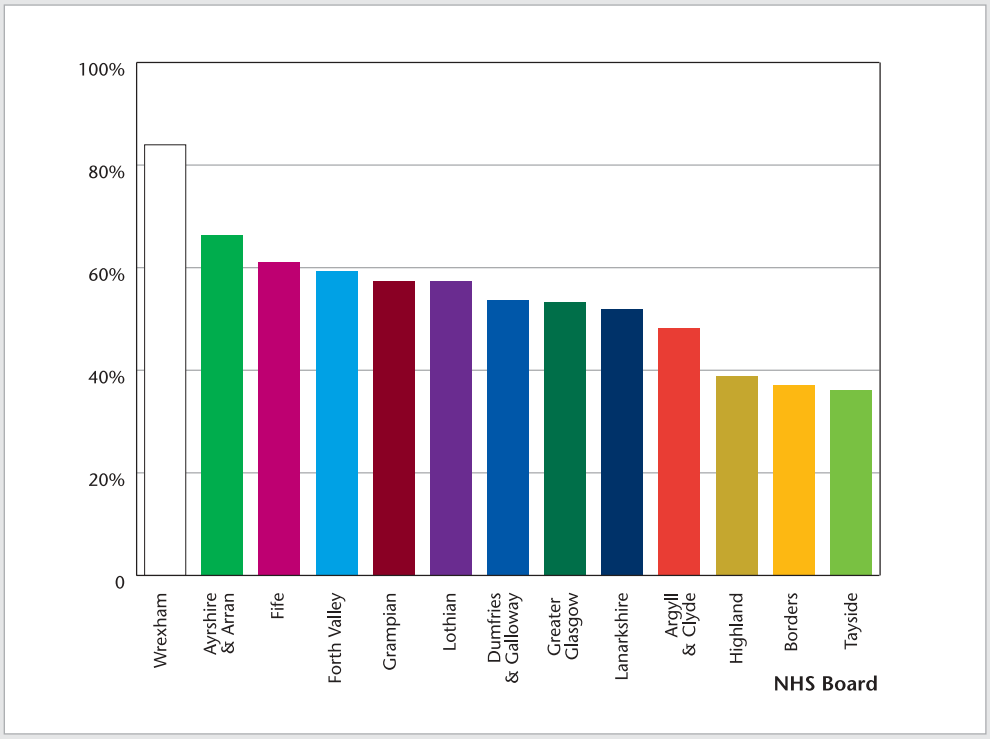
Paragraph number	Summary of guidance
1	Introduction to document (not applicable to the audit)
2	General description of management of hearing impairment (not applicable to the audit)
3	**Facilities, test rooms and equipment conform to standards and recommendations**
4	Materials and methods conform to appropriate recommended procedures with appropriately trained staff
5	Calibration of equipment to appropriate standards on at least an annual basis
6	Appropriate referral routes (including direct GP referral)
7	**Provision of appropriate timing and time allocation for assessment, fitting and follow-up sessions**
8	**Comprehensive needs assessment and agreement of an individual management plan**
9	Choice of BTE and ITE fittings
10	Conform to minimum technical standard for hearing aids
11	Documented use of recognised fitting rationale
12	**Explicit procedure for matching features of hearing aid fittings to clinical need**
13	Norm for provision of hearing aids should include more than linear baseline (not applicable to the audit)
14	Verification of acoustical targets by real ear measurement
15	Systematic rationale for the setting of maximum power output of hearing aids
16	Systematic fine tuning at fitting
17	Offer bilateral fittings as default option
18	Stage 2 offering of bilateral fittings later in rehabilitation

19	Information and instruction on hearing, listening skills, hearing aid technology, ear moulds and manipulation
20	Routine application of outcome measures on all patients
21	Structured fine tuning at follow-up visit
22	The assessment of hearing aid features according to clinical need at follow-up
23	Local protocols and policy for matching hearing aid technology, ear mould characteristics and rehabilitative support and listening devices to individual hearing impaired listeners
24	Systematic fine tuning and outcome assessment at all subsequent follow-up visits
25	Appropriate procedures and staff resources and staff skills for rehabilitative counselling and support
26	Effective information and liaison regarding assistive listening devices
27	Systematic longer term review and open access review
28	Ongoing support via repair clinics and open access "for emergency care"
29	**Comprehensive information management system**
30	Appropriate overall documentation and assessment of effectiveness and cost effectiveness
31	Acknowledgement that there are significant resource implications in the implementation of the above (not applicable to the audit)

A summary of overall compliance has been provided in Figure 5.2. Data was also obtained from Wrexham, post-modernisation centre in Wales. Wrexham is a centre which has a strategic emphasis and a skill mix which allows the appropriate provision of hearing therapy. It has concentrated on organisational and management issues to ensure that patients are provided with effective care. It therefore provides a realistic target to which Scottish services could reasonably aspire.

Figure 5.2

Percentage Compliance with the Good Practice Guidance for NHS Boards in Scotland, and comparison with a site in Wales following investment in staff and infrastructure.

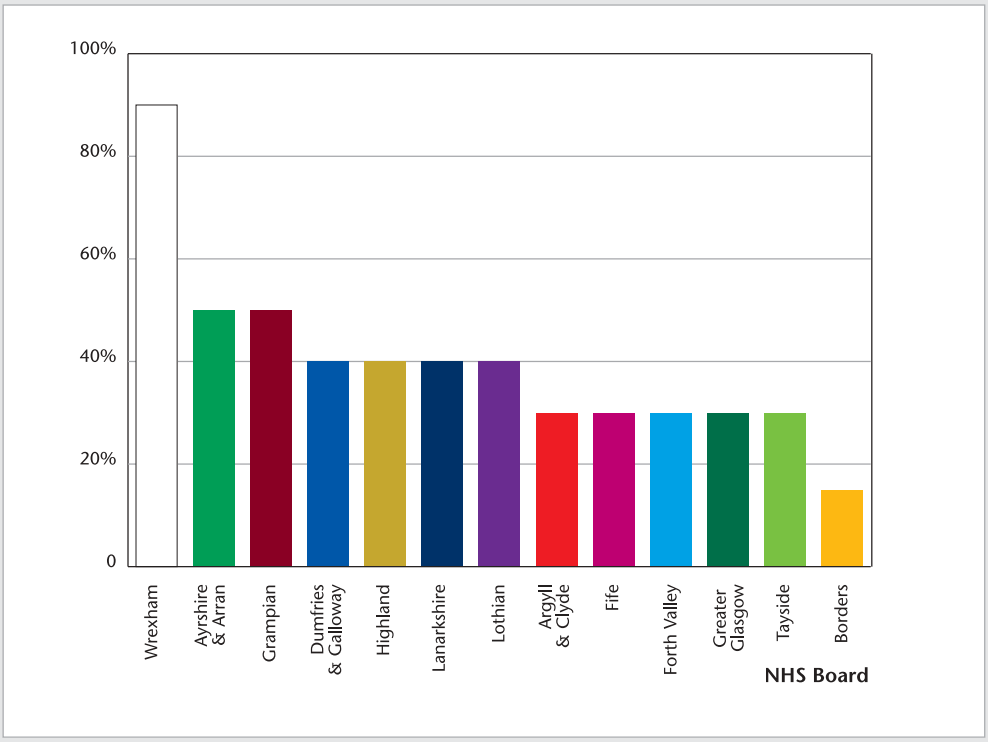


None of the Scottish centres currently report the level of compliance with the good practice guideline which Wrexham has achieved. In addition, within Scotland there was great variability, with the least compliant areas reporting levels less than half the compliance which was reported for Wrexham.

To assess the extent to which the Scottish centres were able to comply with the elements deemed most crucial for quality services, the abbreviated index of compliance is shown in Figure 5.3.

Figure 5.3

Percentage Compliance on the five paragraphs in the Good Practice Guidance rated as most crucial by the service over NHS Boards in Scotland, and comparison with a site in Wales following investment in staff and infrastructure.

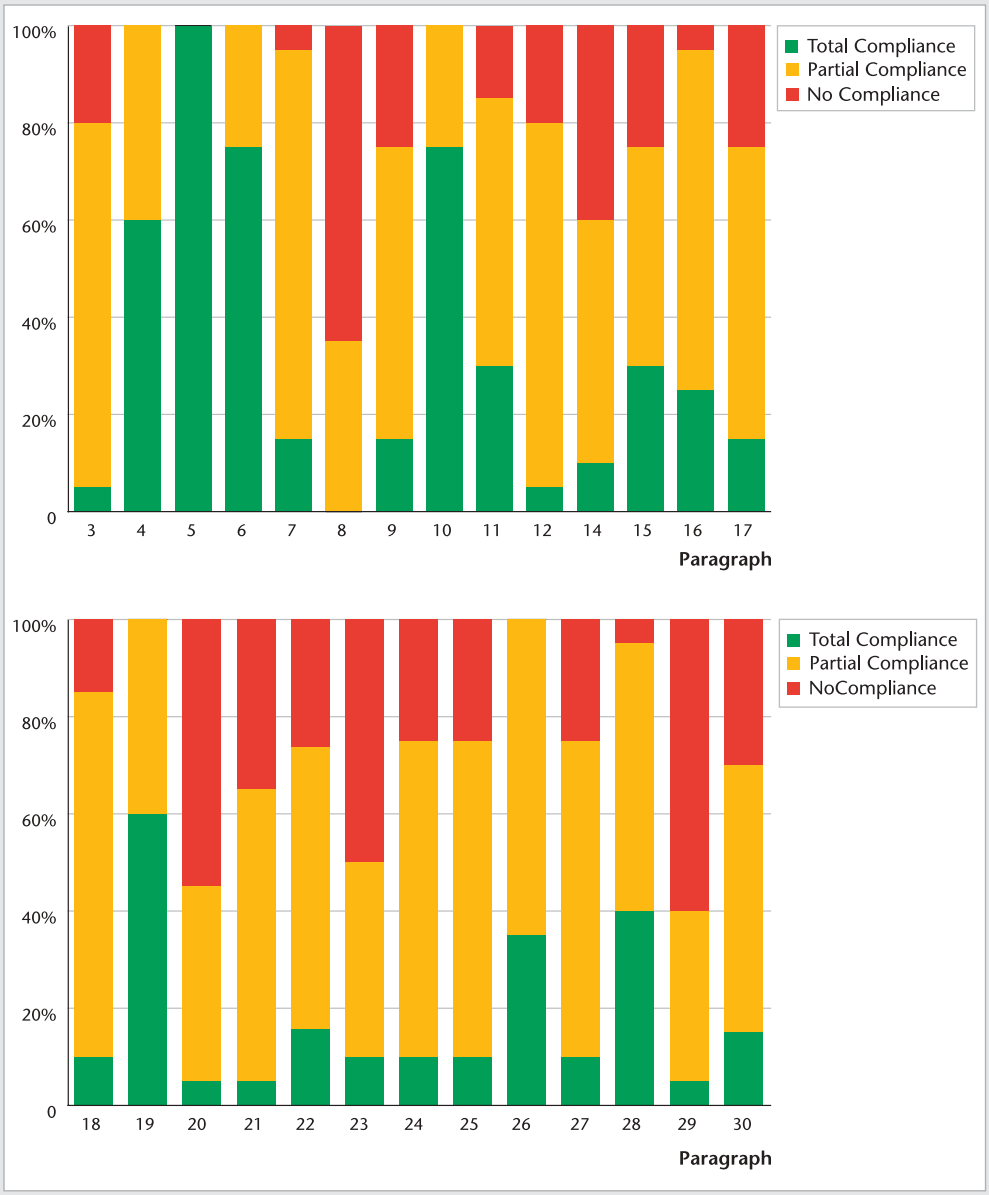


There was evidence from the audit that Scottish services are not conforming to the standards which they consider to be the most important within the good practice guidance, as the level of variability and the difference between Wrexham and the Scottish sites were even more pronounced in the abbreviated quality index (see Figure 5.3). This leads to the conclusion that there has been inappropriate investment and concentration on process within Scotland.

The data in Figures 5.2 and 5.3 reflect overall compliance with the Good Practice Guidance and with the five elements that the Scottish services deemed most crucial. Figure 5.4 shows the compliance for each of the individual standards of the Guidance amalgamated across the Scottish units.

Figure 5.4

Compliance with individual paragraphs of the Good Practice Guidance amalgamated across all audiology units in Scotland. Each paragraph of the Good Practice Guidance corresponds to a standard of care, and is summarised in Table 5.1.



Compliance ranged from all services reporting total compliance with paragraph 5 (calibration of equipment to appropriate standards on at least an annual basis) to no services reporting full compliance with paragraph 8 (the requirement for a comprehensive needs assessment and agreement of an individual management plan).

Inspection of Figure 5.4 and aligning the data with Table 5.1 demonstrates clearly that non-compliance is not associated solely with technological aspects of hearing aid selection and fitting. There is poor compliance with the rehabilitative components of hearing aid fitting, particularly:

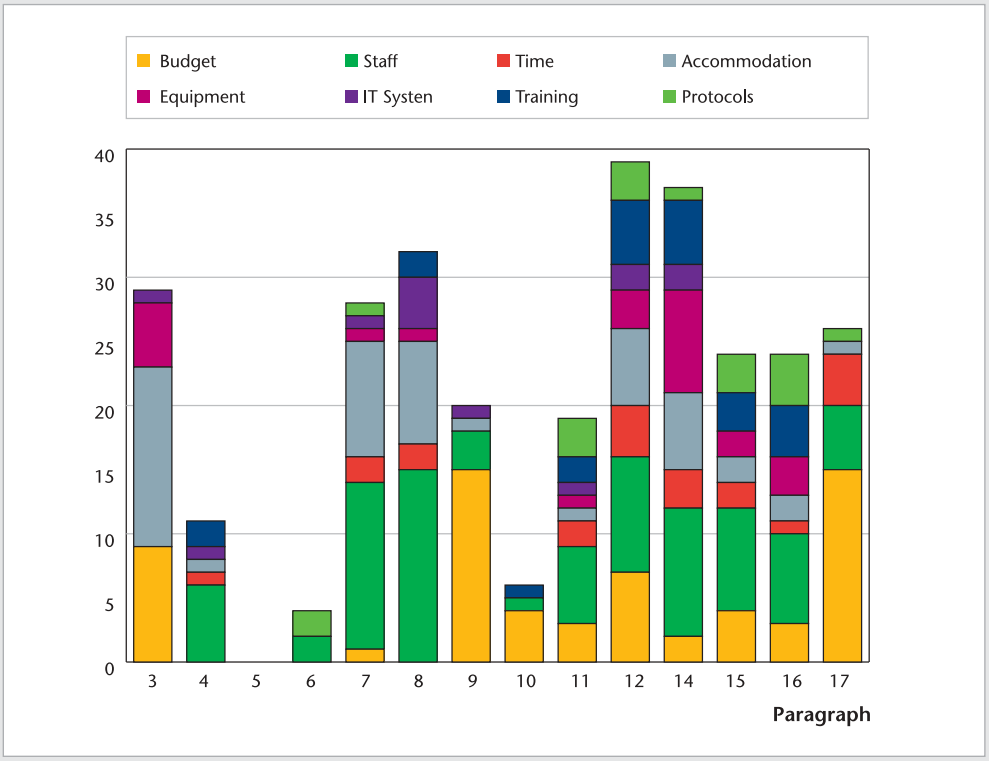
- development of individual management plans;
- matching solutions to interventions;
- assessment of eventual outcome.

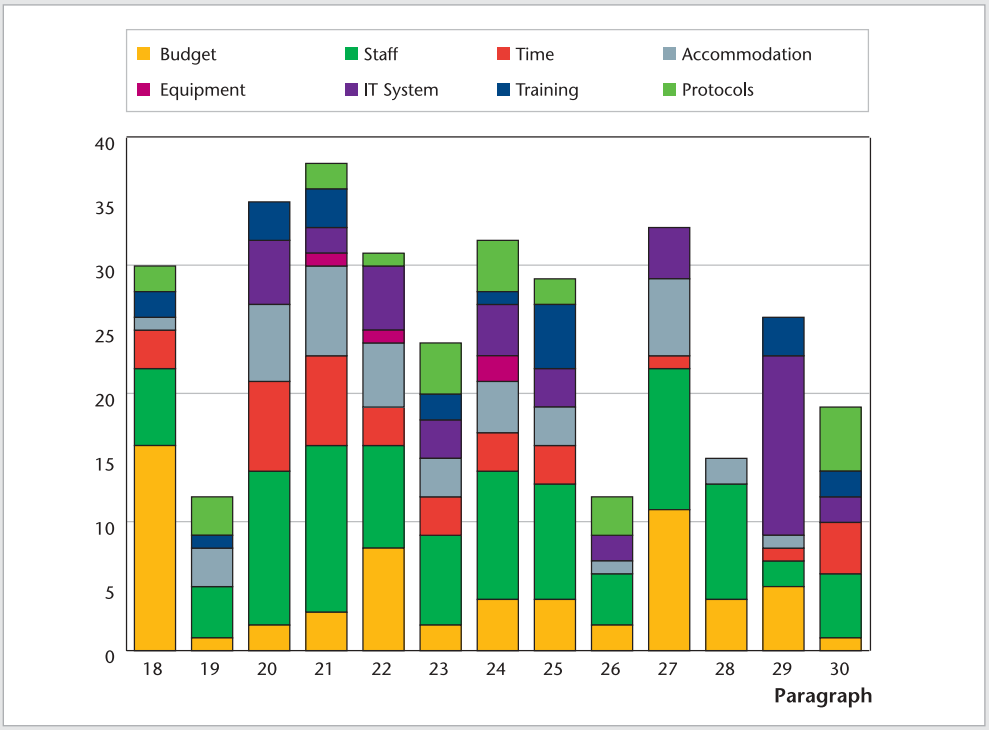
Similarly the continued follow-up and support elements of the guidance demonstrate poor compliance. A more detailed discussion of compliance with the individual elements of the Good Practice Guidance is available in Appendix A7.

As part of the audit of compliance with the Good Practice Guidance, audiology units were asked to specify what developments would be required to achieve satisfactory compliance. The free-text responses were classified and are shown in Figure 5.5.

Figure 5.5

Reported Requirements for the Implementation of the Good Practice Guidance





The data in Figure 5.5 demonstrate clearly that action in no single area will achieve compliance across the service. Differing investments in differing forms are required to achieve compliance. These include accommodation, training, protocols, staff as well as increased budgets for hardware and equipment. Further discussion of compliance to individual paragraphs of the Good Practice Guidance, requirements for compliance and variations across NHS Boards are available in Appendix A7.

There are clear deficiencies in the service's ability to comply with the Good Practice Guidance in terms of access to appropriate hearing aids, ability to select and fit appropriate hearing aids, development of an appropriate rehabilitative context and continued follow-up and support. Rehabilitation and support are two areas for which hearing therapists take responsibility in other parts of the UK.

Recommendation 31

NHS Boards should cost and implement a plan for modernising adult hearing aid services via complete compliance with the Good Practice Guidance for Adult Hearing Aid Services. This will require significant investment in infrastructure (e.g. staff, equipment, accommodation) in addition to funding for hearing aids.

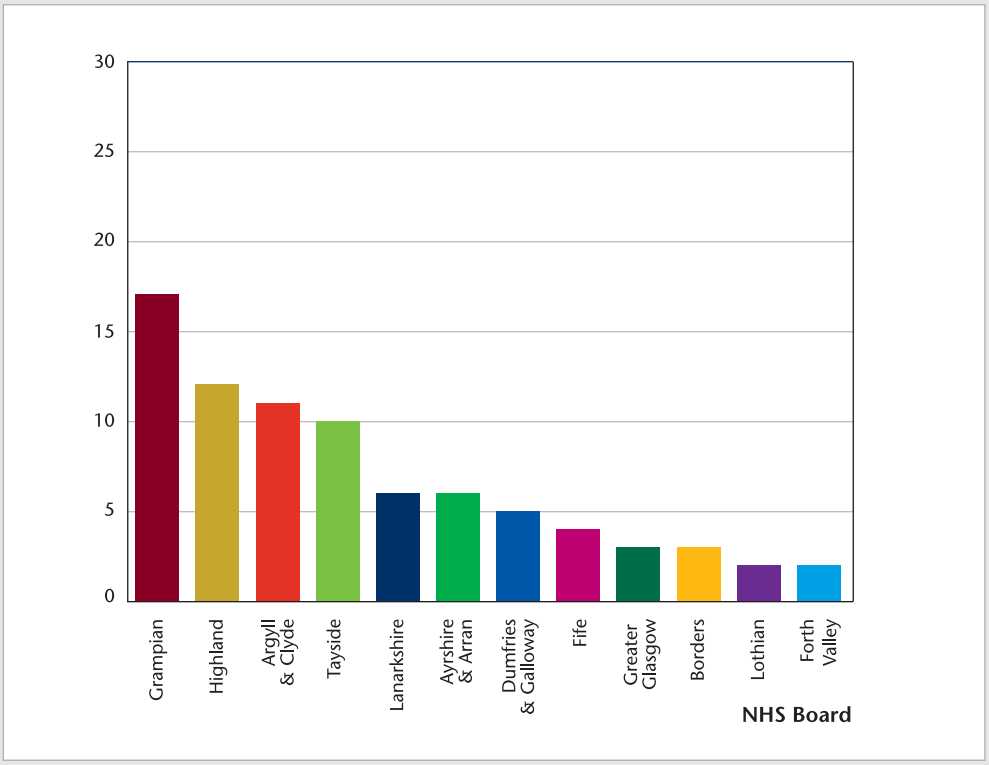
5.4 Facilities

In the audit of services, departments were asked about the number of base and peripheral sites and the fitness of purpose of each room used for particular procedures.

There were considerably fewer peripheral sites in use for adults (Figure 5.6) than was observed for children (see Figure 4.3). There was no apparent association between the level of rurality within an NHS Board area and the number of peripheral sites which it supported.

Figure 5.6

Number of peripheral sites used for testing adults' hearing in each NHS Board.

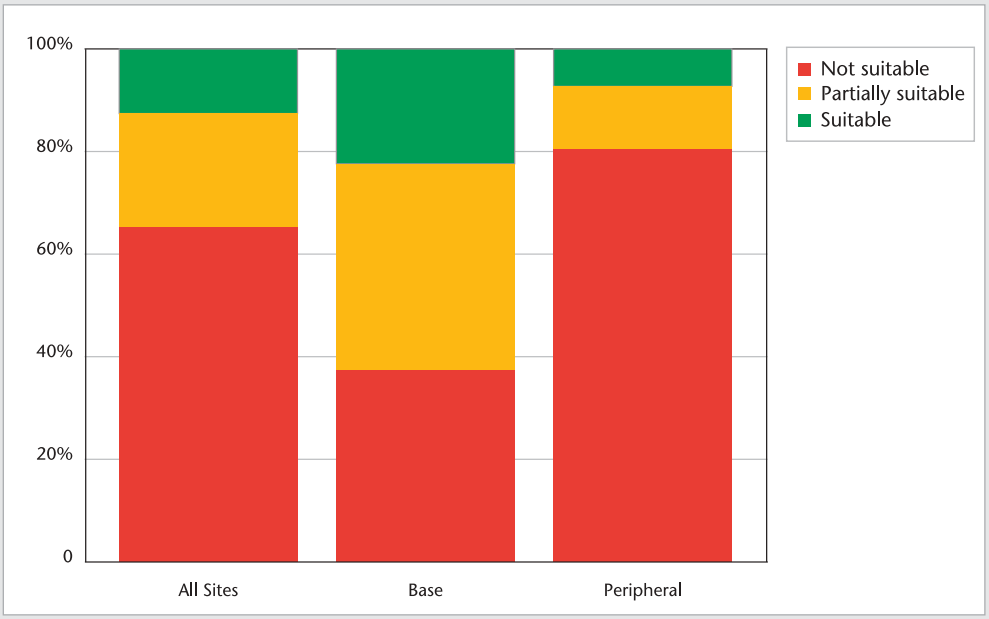


The diverse pattern of peripheral sites across NHS Boards strongly suggests that there is no consistent policy in configuring services to appropriately balance concentration of expertise and ease of access for patients.

Figure 5.7 shows the reports from the audit of the fitness for purpose of facilities in peripheral and base sites for testing hearing in adults. As with the children's section, a three point scale is employed. The major reasons for not being suitable were inadequate sound proofing, ventilation and size.

Figure 5.7

Suitability for purpose of rooms in base and peripheral sites used for testing adults' hearing.



The audit of services revealed that 65% of the rooms used for hearing testing in adults across Scotland were not fit for that purpose. This was a particular problem in peripheral sites, where 81% of such rooms were not fit for purpose, and a further 12% were only partially fit for purpose (Figure 5.7). In base sites 22% of rooms conformed to the appropriate guidelines standards.

The audit revealed a low level of compliance with published standards in the facilities which are currently being used in Scotland. Further details on base versus peripheral sites, accommodation and equipment and their variation across NHS Boards are available in Appendix A7.

Recommendation 11

NHS Boards should ensure that all facilities and equipment used for audiological procedures are fit for purpose, so as not to compromise the integrity of the procedures undertaken. In view of the shortcomings identified for both children and adults, NHS Boards should cost and implement an appropriate corrective action plan based on detailed audit of accommodation and the purpose for which it is used. NHS Boards should also put in place mechanisms for a rolling audit of equipment and facilities.

Recommendation 26
NHS Boards should review the services and standards provided at base and, in particular, peripheral sites and their relative distribution in the light of population, transport and geography. Each NHS Board should develop and deliver services on a series of "hub-and-spoke" models and establish an acceptable balance between centralisation and concentration of expertise, and accessibility of services and local demand.

Recommendation 27
The accommodation and facilities available in peripheral sites and the potential patient pool will determine which services can be offered. In the light of the large number of inadequate facilities at sites serving remote and rural areas, NHS Boards responsible for the delivery of such services should ensure that any inadequacies do not compromise effective service delivery.

5.5 Quality of Care

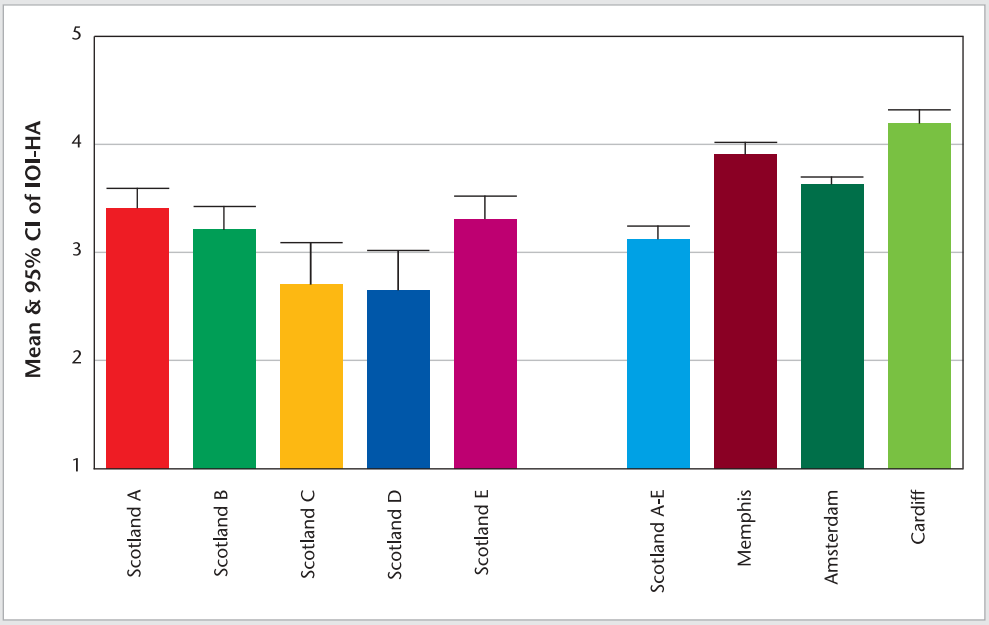
The information shown in Sections 5.3 and 5.4 is illuminating but concentrates almost exclusively on aspects of structure and process. Services for hearing impaired people attempt to alleviate the disabilities and handicaps that they experience as a result of hearing loss. The ultimate indicator of service quality will always be the extent to which these consequences are alleviated.

The survey of users of adult services contained the seven questions which form the International Outcomes Inventory for Hearing Aids (IOI-HA). This is a validated self-report instrument which measures dimensions of outcome including hearing aid use, benefit from hearing aids, residual disabilities with hearing aids, impact on significant others, aspects of handicap and general health-related quality of life. The IOI-HA forms an overall score which can range from 1 to 5, with higher scores denoting higher outcomes. Figure 5.8 shows data from the five Scottish clinics who contributed to the user survey and reference data from the published literature.[36-38]

The data in Figure 5.8 shows a number of striking findings. Firstly, there are highly significant variations across the five Scottish centres in terms of the overall service quality as experienced by hearing aid wearers. Secondly, all of the Scottish centres fall significantly short of the comparison clinics in the Netherlands, the United States and Wales. There are thus inappropriate variations in quality of services delivered throughout Scotland, all of which compare unfavourably to the standards achieved in other service contexts. Further details of the separate dimensions of the IOI-HA are available in Appendix A7.

Figure 5.8

Mean (and 95% confidence intervals) on the overall score from the International Outcomes Inventory for Hearing Aids (IOI-HA) for the five surveyed Scottish centres, the average of the five Scottish centres, and published comparison data from clinics in Memphis (USA), Amsterdam (The Netherlands), Cardiff (Wales).



5.6 Access and Communication

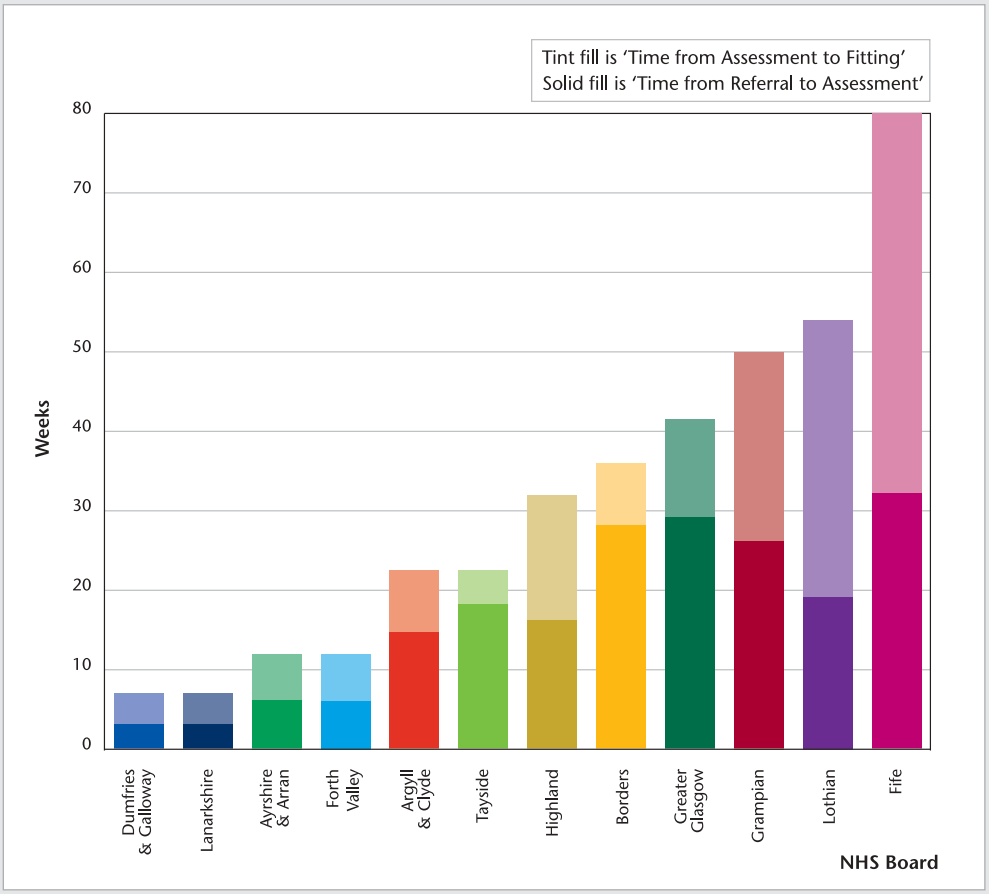
Departments reported a wide variation and a number of unacceptably long waiting times from referral to assessment across Scotland. When this was added to the reported waiting times from assessment to hearing aid fitting (Figure 5.9) it became apparent that there are people in some areas of Scotland who have to wait for more than a year from referral to getting a hearing aid fitted.

The accessibility of services in Scotland is variable. Experience of the modernisation programme in England has shown that absence of prior investment can degrade rather than improve the accessibility of services. Modernised services require hearing aids which are more complex and take longer to match patients' needs, employ procedures to verify that the acoustical properties of fittings are appropriate, require an appropriate needs assessment to select hearing aid features, require ongoing follow-up to ensure continued use and benefit, and require investment in infra-structure, staff training, information technology and rehabilitative protocols, in addition to hearing aids and audiological equipment.

Although adults do not necessarily need the immediacy of access to earmould facilities that is required by children, they do require a service which is responsive when problems occur, either with hearing aids or with earmoulds. It is accepted good practice that an open access repair system should be in place. Although 73% of services indicated that they did provide open access for repair, in the majority of centres with such a service, the facility was only available for less than two days a week.

Figure 5.9

Waiting times (May 2002) from referral to fitting of hearing aids across NHS Boards in Scotland, partitioned into time from referral to assessment, and time from assessment to fitting.



5.7 Links with Other Organisations

It is crucial that patients are given access to all of the appropriate services, support and equipment which would provide significant benefit. Many of these are provided by organisations outwith the health sector. In particular these include social work services and a number of voluntary organisations. The precise organisations which supply such support, services and equipment can vary by

geographical area. Audiology departments are in a good position to inform, direct or refer patients as appropriate for any of the above. These issues are discussed more fully in Section 7. Support may take the form of:

- Information leaflets;
- Counselling and support;
- Training in lip reading;
- Training in BSL;
- Provision of assistive listening devices;
- Support and maintenance of hearing aids;
- Referral to other services provided by local authorities.

5.8 Ongoing Management, Review and Follow-up

A number of issues were raised in the stakeholder consultation around issues of access. A hearing aid user often requires a referral from his or her GP if he or she has problems with their hearing aid, or feels that their hearing has deteriorated. This causes frustration and anger. The Good Practice Guidance[1] requires systematic longer term review and open access review (paragraph 27) and open access for emergency care (paragraph 28). Reported compliance with these standards, and in particular with paragraph 27, was poor (Figure 5.4, above). The need for ongoing rehabilitation and communication support may be the result of under-investment in hearing therapy (Appendix A9).

5.9 Future Trends

Evidence from the literature[14] shows that while one in six adults would benefit from current NHS hearing services, only one third of these people currently access them. As services improve in their ability to meet people's needs and perceptions of these improvements become widespread, take-up of services will increase. There is preliminary evidence[39-41] that pro-active identification of hearing impaired people at younger ages leads to effective hearing aid use and increased benefit. To date though, the cost-effectiveness of such screening has yet to be established.

Population demographics show that the number of hearing impaired older people will increase in the coming decades.[12] Increased numbers will require forward planning if audiology services are to cope effectively with future service demands.

Recommendation 42

The Scottish Executive Health Department and NHS Boards should plan the future development of audiology in the light of current levels of un-met need and the projected increases in numbers of hearing-impaired people which will accompany future changes in the age profile of the population.

Recommendation 43

In the light of the established un-met need in the population, the Scottish Executive Health Department should use the appropriate mechanisms to consider the evidence-base for the early identification and management of hearing-impaired adults in the over 50's.

5.10 Summary

The status of audiology services for hearing impaired adults in Scotland is not encouraging. The ability of the service to comply with the Good Practice Guidance is limited, especially so in the elements that are deemed fundamental to quality standards by the service providers themselves. There are striking aspects of non-compliance in the rehabilitative context of hearing aid fittings and ongoing follow-up and support, as well as hearing aid technology. The variations across NHS Boards in service configuration are significant and facilities are not suitable for purpose in both base and, particularly, peripheral sites.

The ultimate outcome of reduced disability and handicap for hearing impaired people shows large variations across the service and poor comparison with data from overseas and elsewhere in the UK.

Comparison with other services and with modernised services elsewhere in the UK demonstrates what can be achieved in an NHS context with appropriate investment. This investment will need to include infra-structure, staff, staff development, hearing aid technology and rehabilitation and serves as a realistic target to which Audiology Services in Scotland should aspire.

As will become clear, services for people with tinnitus and balance disorders in Scotland are under-developed. This section differs from the preceding sections in that there is no associated appendix. It contains more details on epidemiology and models of service, and less detailed information on current practice in Scotland.

6.1 Tinnitus

Although tinnitus is a symptom rather than a disease process it:

- May be the first indicator of important pathology, such as acoustic neurinoma;
- Often accompanies hearing impairment which may be causing disability, but had not previously been acknowledged;
- May be an indicator of risk of developing future problems, such as noise induced hearing loss;
- Is a symptom like pain, that can cause much suffering and anxiety concerning its cause and prognosis.[42]

6.1.1 Causes of Tinnitus

In a very quiet environment more than half of people will hear a humming, buzzing or ringing noise.[43] These sounds may arise from the normal electrical activity in the muscles near the ear, the hum of blood circulation within the ear, or even due to Brownian movement in the air near the tympanic membrane or in the cochlear fluids. This noise is usually drowned out, or masked, by ambient background noise and will only rarely develop into significant tinnitus. Persistent Spontaneous Tinnitus (PST) is tinnitus lasting more than five minutes with no obvious cause or trigger.

Table 6.1

Percentage of people with tinnitus as a function of reported hearing loss.[3]

				PST by reported annoyance			
Hearing difficulty in worse ear	Number	No tinnitus	Tinnitus but not PST	None	Slight	Moderate	Severe
None	19,418	69%	24%	1%	3%	2%	1%
Slight	2,341	42%	36%	1%	11%	7%	3%
Moderate	912	40%	30%	2%	10%	10%	8%
Great	604	36%	31%	1%	11%	13%	8%
Cannot hear	277	39%	24%	3%	4%	11%	18%

Table 6.1 shows the relationship between degree of hearing loss and degree of tinnitus. The severity of PST increases with the severity of hearing loss with 18% of those with no hearing reporting severe tinnitus as compared to only 1% of those with normal hearing. There are two important facts that are evident from this table:

- Not all people with hearing loss have tinnitus;
- Not all people with tinnitus have hearing loss.

PST is most commonly associated with hearing impairment[44] due to ageing or noise exposure, but it can be caused by any condition affecting the auditory pathway from the pinna to the auditory cortex.

Tinnitus can, however, also arise from conditions outside the ear. The noise of blood travelling through a diseased carotid artery (carotid bruit) or other abnormal blood vessel is often heard as a pulsatile tinnitus. Non-pulsatile tinnitus can arise from tempero-mandibular joint and bite disorders,[45] the cervical spine,[42] muscular noises such as clicks heard during palatal myoclonus and the sound of loud breathing in asthma or patulous Eustachian tube. Occasionally people present with auditory hallucinations secondary to psychosis, because they constantly hear music (1% in a large clinic population[42]), because they perceive an external noise as coming from their ears, or rarely because the tinnitus is feigned (possibly as part of a claim for noise induced hearing loss).

6.1.2 Epidemiology of Tinnitus

Based on prevalence figures from the National Study of Hearing,[46] and population estimates from the Government Actuarial Department[4] and the Scottish Government[47] a total of 463,450 persons aged 17 and over had tinnitus in Scotland in 2002.

Table 6.1

Estimate of the number of people in Scotland with varying degrees of tinnitus annoyance in 2002.

Moderately annoyed	112,840
Severely annoyed	64,480
Quality of life severely affected	45,156
Normal life severely affected	20,150
Total	463,450

Tinnitus therefore affects a significant number of people in Scotland. In addition, there is an increased risk of accidents in people under 50 years old with tinnitus.[48] This means that there is an economic cost of tinnitus.

The prevalence of tinnitus rises with increasing age, with a peak in the 65 to 74 year age band. There is a higher prevalence of reported tinnitus in young females than in young males. In later years this trend is reversed. The prevalence of tinnitus also increases with socio-economic group (with manual workers reporting higher levels of tinnitus than professional and managerial groups).[49]

6.1.3 Impact of Tinnitus

Tinnitus may lead to anxiety, irritability, tension, depression, loss of peace and quiet, interference with sleep and prevention of work through reduction of efficiency.[50] These effects can themselves lead to an exacerbation of the tinnitus resulting in an increasing symptom/effect spiral.

Coles, Davis and Smith give results of an open ended questionnaire sent to 92 members of a tinnitus self help group.[50] Of the 72 people responded and a summary of their reported difficulties has been provided in Table 6.3.

Table 6.3

Problems reported by tinnitus sufferers.

Difficulty	Reported %
Getting to sleep	57
Persistence of tinnitus	49
Worse on waking up	17
Avoid noisy situations	15
Withdraw, avoid friends	14
Avoid quiet situations	11
Pain, headaches	18
Despair, frustration, depression	36
Annoyance, irritation, can't relax	35
Concentration, confusion	33
Insecurity, fear, worry	17

6.1.4 Models of Services for Tinnitus

There are models and guidelines for what constitutes a high quality tinnitus service. Guidelines for what is involved in assessment and rehabilitation and the staffing levels required are given in the BAAP Document,[51] RNID's "Best Practice Standards for Adult Audiology" published in July 2002[19] and the British Tinnitus Association's "Up-date on the Management of Tinnitus by Audiologists" (1999).[52] Examples where these models are in practice include the Tinnitus and Hyperacusis Center at the University of Maryland, Baltimore,[53] the Sheffield Tinnitus Service, the multi-disciplinary group at the Audiology Department of the Royal National Throat Nose and Ear Hospital (RNTNE) in London and at the University Hospital of Wales, Cardiff.

Specific assessment and management is possible in the audiology department as long as there are close links with relevant medical specialists. Assessment should include more than basic audiometry, tinnitus matching and minimum masking level. Structured interviews with specific questions and questionnaires give the therapist an idea of the person's particular difficulties and can provide objective measures of progress for both parties – outcome measures. Useful assessment and monitoring tools have been published.[54-56]

Those more severely affected by tinnitus tend to be those with more severe hearing loss, but current practice accepts that it is important for both the hearing loss and the tinnitus to be addressed for optimum rehabilitation.

If the tinnitus is associated with a hearing loss then it is important to address the hearing disability. Appropriate rehabilitation, including the fitting of hearing aids and other assistive listening devices, often helps tinnitus rehabilitation. This is both by restoring audibility of ambient noise and by reducing anxiety and stress resulting from the hearing disability.

Management of tinnitus is largely through counselling. This varies from simple reassurance and explanation, through relaxation and anxiety management, to cognitive behavioural therapy. A particular model of counselling combined with the use of white noise generators is called Tinnitus Retraining Therapy (TRT).[57-59]

6.1.5 Current Services for Tinnitus in Scotland

Counselling should only be undertaken by experienced staff, who have attended a training course in tinnitus and a counselling skills course.[55] In some centres in the UK clinical psychologists are employed within audiology departments (Sheffield and RNTNE for example). This is not the case in any department in Scotland. The lack of clinical psychologists in Scotland in general means that there is a long waiting time for people to be seen. For instance the waiting list is currently 18-24 months in Tayside. The audit has shown that there is only one Audiologist in Scotland with a counselling diploma and even this person is a part-time worker and has other duties in addition to counselling. Only 4 of the 22 sites mention counselling as part of the management of their tinnitus patients, although 19 indicated that they offer some form of rehabilitation for tinnitus and many mention TRT. There is, however, insufficient detail to make any accurate assessment of whether or not this is TRT as defined by Jastreboff and Hazell, the originators of TRT.[53]

The British Tinnitus Association has published a useful list of points to consider in an outline business plan for the development of a tinnitus service[52] and practical advice on developing a tinnitus service[52]. RNID[19] and the British Association of the Hard of Hearing (BAHOH)[60] give other recommendations with regard to staffing and skill mix but these are not specific to tinnitus within audiology departments. They do, however give recommendations about the length of time needed by audiology departments when dealing with people with tinnitus. RNID suggests a minimum of two visits with an average total time per patient of six hours. BAHOH recommends one hour per counselling session plus 45-60 minutes for a fitting of a white noise generator. The audit has shown that none of the departments can allocate this amount of time to patients.

The audit of audiology departments shows that no one in Scotland is using any form of structured interview or questionnaire in the assessment of people with tinnitus. None of the departments employs a clinical psychologist and no one can allocate the recommended time for assessment and rehabilitation.

When planning this report the authors intended to investigate how many people with tinnitus were actually referred to audiology departments. We hoped to identify whether or not all people with troublesome tinnitus accessed the available services and to canvass the views of those who did and the reasons why others did not. During the information-gathering phase of the study however, it became apparent that the Scottish audiology departments could not provide the data required.

6.1.6 Future Developments in Tinnitus Services

Most people with tinnitus are helped by simple assessment, explanation of their symptoms and reassurance. This can be done within departments across Scotland as long as there is the resource to allow time for this process. There will then be a smaller number of people who have significant problems habituating to their tinnitus. These people will benefit from specialist assessment and counselling services. These should include clinical psychologists as well as counsellors. Scaling up from the figures from the tinnitus service in Tayside suggests that approximately 900 new patients each year in Scotland require these services. The services could be organised on a regional or supra-regional basis and could be peripatetic.

6.2 Balance Disorders

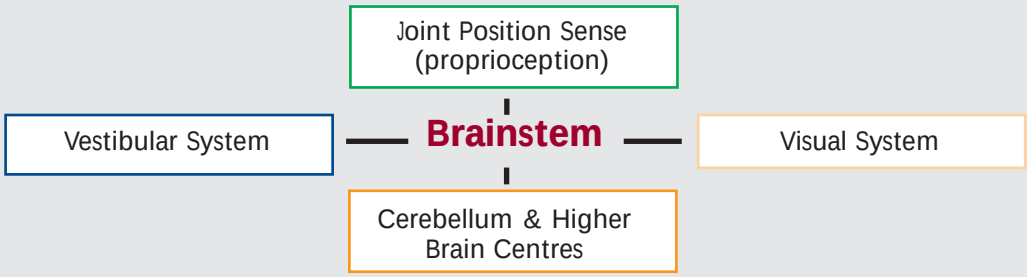
6.2.1 Causes of Balance Disorders

The ability to move around in space and maintain equilibrium and balance is a complicated process, which depends upon the integration of several body systems. The main components are:

- The vestibular system in the inner ear and the vestibular nerves;
- The visual system;
- Joint position sense – or the ability of the body to know the exact position of all joints in three dimensions and how they are moving – especially at the ankle joints;
- The central nervous system connections at higher levels such as the cerebellum and both the motor and sensory cortex.

Figure 6.1

Diagrammatic representation of the systems contributing to balance



The whole process is integrated and co-ordinated in the brain stem. It is also necessary for the anti-gravity muscles to be working and for there to be an adequate blood supply to all of the component parts. This blood supply must contain the right balance of cells, chemicals and nutrients and be at the correct pressure.

Because of the multi-component nature of this whole system it is possible to compensate for minor degrees of impairment in one or two systems without symptoms. However, if there is a major problem with one system, or if there are minor problems with three of them, then difficulties with balance are inevitable.

It is evident that balance difficulties can be caused by problems other than in the inner ear and even acute episodes of vertigo may arise from other sites (e.g. in migraine or acute cerebellar infarction).

6.2.2 Epidemiology of Balance Disorders

Because of difficulties with definitions and diagnosis the exact prevalence in the community is unknown. There are, however, some figures available and these include:

- Dizziness is the most common cause of presentation to the primary physician in people over 74 years old;[61]
- Self-report of current dizziness in the community is 17%;[62]
- Over 25% of 50-64 year olds state that they currently suffer dizziness;[63]
- By the age of 80 two thirds of women and one third of men will have experienced episodes of vertigo.[64]

In Scotland, given the population estimates[4;47] and figures from the BAAP document[51] it is likely that some 36,600 people contacted their GP in 2002 because of a balance disorder. Of these more than 80 per week were referred on for a specialist opinion, (although this is likely to increase if the GPs and those referred receive a good service).[51] Over 10% of these were severely disabled by their symptoms.[65]

6.2.3 Impact of Balance Disorders

For a more detailed insight into the impact of dizziness and vertigo on the individual sufferer see Lucy Yardley's book.[65] The main points are highlighted here.

- There is a lot of uncertainty as to the diagnosis, significance of symptoms and prognosis of the person's condition. There is uncertainty about the value and validity of investigations. This can lead to a lot of disquiet and anxiety as the individual may not feel that their complaint has been legitimised in terms of an organic disorder.

- People with chronic symptoms eventually come to the belief that they are going to have to adapt to their condition, as there is no "cure". This is often not formally discussed with them by professionals.

- There are profound changes in the way that the person interacts with their physical environment. As examples, escalators, supermarkets and moving

images on television can all precipitate or exacerbate disequilibrium. This can be associated with anticipatory disability and withdrawal from social interactions. This may prolong the habituation process.

- The physical parameters of the experience of dizziness are intricately linked with the psychosocial elements of the experience. There may be lack of spontaneity of movement and the appearance of premature ageing.

- Other people's attitudes and social stigma are further sources of difficulty.

- The interaction between the physical and psychological aspects of dizziness is very important in the management process.

6.2.4 Models of Services for Balance Disorders

Specialist medical and surgical therapy is more commonly needed than in people with tinnitus. However, psychological and physical rehabilitation is also important either as an adjunct to medical therapy or often as the only treatment.[66] Balance disorders may be associated with hearing disorders[2;65] and it is important to address any associated hearing problems.

Guidelines for what is involved in assessment and rehabilitation of balance disorders and the staffing levels required are given in the BAAP Document,[51] RNID's "Best Practice Standards for Adult Audiology"[19] and the "Handbook of Vestibular Rehabilitation".[67]

Within audiology departments the assessment of people with balance disorders involves questionnaires such as the Vertigo Symptom Scale,[68] the Dizziness Handicap Inventory[69] and the Vestibular Handicap Questionnaire[69] as well as vestibular function testing. Yardley has evaluated the reliability and validity of various assessments and outcome measures for dizzy patients.[70] She has found that simple clinical tests and self-report questionnaires are cheap but effective and that Computerised Dynamic Posturography (CDP) is effective but expensive. CDP can also be used as a rehabilitation tool.

Psychological rehabilitation includes the management of people whose dizziness is secondary to psychological problems, such as anxiety or panic attack, as well as those where anxiety is caused by their imbalance.[67] Interventions range from simple anxiety management through patient centred counselling to cognitive behavioural therapy.[19;67] Physiotherapists may also be involved in the physical rehabilitation of people with balance disorders and are again often employed within audiology departments – although not in Scotland. The three main physical interventions are Cawthorne Cooksey exercises,[71;72] Brandt-Daroff[73] exercises and the Epley manoeuvre.[74] The RNID[19] and the BAHOH[60] give other recommendations with regard to staffing and skill mix but these are not specific to balance disorders within audiology departments. They do, however give recommendations about the length of time needed by audiology departments when dealing with people with balance

problems. RNID suggests a minimum of two visits with an average total time per patient of six hours. BAHOH recommends 1 hour per counselling session plus 2.5 hours for vestibular function tests.

6.2.5 Current Services for Balance Disorders in Scotland

When planning this report the Audiology Needs Assessment Working Group intended to investigate how many people with balance problems were actually referred to audiology departments. We hoped to identify whether or not all people with troublesome disequilibrium accessed the available services and to canvass the views of those who did and the reasons why others did not. During the information-gathering phase of the study, however it quickly became apparent that none of the Scottish audiology departments could provide the data required.

The audit of Scottish departments revealed that no department is using questionnaires. Only 11 of the 22 sites are able to carry out any form of vestibular function testing. There is no CDP in Scotland. There are no clinical psychologists employed within audiology departments in Scotland and only one audiologist has a counselling diploma (see tinnitus section).

There are no physiotherapists employed in audiology departments. Only two sites are able to offer the Epley manoeuvre (although medical staff may perform it elsewhere). Two different sites offer Cawthorne-Cooksey exercises (at one site the physiotherapy department carries this out). No department is able to offer Brandt-Daroff exercises.

The audit has shown that none of the departments can allocate sufficient time to patients with balance disorders. These deficiencies need to be rectified to allow for the development of high quality services for balance disorders in Scotland and to allow for ongoing audit of these services.

6.2.6 Future Developments in Services for Balance Disorders

Ideas for setting up a balance service are given by Davies[75] and by Flanagan[76] and Hall.[77] There are current models in Leicester and the National Hospital for Neurology and Neurosurgery in London. Both the necessary medical input and some of the equipment used in the assessment and management, including rehabilitation, of people with balance disorders is expensive. Because of this and the fact that there is a relatively small proportion of the population who will need such services, it will not be cost effective to have fully equipped and staffed specialist balance centres in each NHS Board.

There is, however, a need for such services in Scotland. Three or four centres could serve the population if correctly spread geographically. Initial screening could be performed locally with referral to the specialist balance centre reserved for those with more complicated or chronic conditions. There would be a need for good links and liaison between the centres and audiology departments.

6.2 Summary

Surveys of current services in Scotland when compared to good practice standards and recommendations show that services are largely absent. Where they do exist, they are delivered on an *ad hoc* basis and are poorly structured and resourced. These deficiencies will need to be rectified to allow for the development of high quality services for tinnitus and balance disorders in Scotland and to allow for ongoing audit of these services. For both conditions specialist medical therapy is more commonly needed than in patients with hearing problems. However, psychological and physical rehabilitation are also important either as an adjunct to other therapy or as the only treatment. The equipment and staff skills required to develop and deliver specialist services for tinnitus and balance problems are unlikely to be available in all NHS Boards. One model which has been effective elsewhere have been the specialist balance centre. As part of a concentration of resources and expertise, services could be developed in Scotland at a supra-Board level. *Ad hoc* developments at individual unit level will be neither effective nor efficient.

The baseline from which services for tinnitus and balance disorders might develop in Scotland is low. Some combination of specialist centres and managed clinical networks would be appropriate. Because of the investment in specialist diagnostic and rehabilitative equipment required for balance disorders, there are attractions in the specialist service option. The counselling skills required for effective tinnitus services could be made accessible at more local levels via managed clinical networks.

Recommendation 28

NHS Boards should establish specialist centres or managed clinical networks to ensure the critical mass of expertise required for the development and delivery of specialist services such as aspects of paediatric audiology, the assessment and treatment of tinnitus and balance disorders, and bone-anchored hearing aids. Such arrangements may require consortia of NHS Boards to deliver effective services.

There is a complex web of services, support and technology which is available to people with hearing impairment, tinnitus and balance disorders. These are provided by a number of agencies, sectors and organisations, the precise nature of which varies according to geographical area.78 The overall objective is a comprehensive and seamless service where patients with audiological problems have adequate access to effective services. All those who are involved are required to share information to ensure that each individual's disability is managed as effectively as possible, and to ensure effective communication between such people and their services. People should not have to go to different places to find out about, and access the different resources and kinds of support they need to participate fully in everyday life.

This section describes some of the organisations and specialties who play a role in the care of people with audiological problems. It also recommends how audiology departments should interact with such organisations, professions and specialties. The evidence and details upon which the conclusions and recommendations are based is available in Appendix A8.

7.1 Voluntary Organisations

Voluntary bodies provide a wide range of services to individuals and organisations which complement and support the services provided by statutory bodies. Audiology departments can either access them directly or they can provide information, particularly to the newly diagnosed, on sources of help and support available through the voluntary sector. There is a wide range of voluntary organisations which provide support and services to deaf and hard of hearing people and their families. These operate at a variety of levels with particular client groups. Such services include:

- Provision of leaflets and other written material;
- Volunteer support;
- Communication support;
- Provision of equipment;
- Support for audiology departments;
- Joint working with audiology departments;
- Other support for individuals e.g. social clubs, newsletters, employment learning and skills service.

In the light of the important contributions which voluntary organisations make in the care and support of people with audiological problems, the working group have made a number of recommendations to ensure effective links with these organisations, and to access the resources which they are able to provide.

Recommendation 14

Audiology services should actively engage with local and national voluntary and statutory organisations regarding available services. They should be aware of, and provide information about, counselling, support, communication training, equipment and maintenance services provided by voluntary and statutory organisations where these are available at a local level.

Recommendation 15
Audiology services should provide a comprehensive range of literature and information about auditory conditions, equipment and other supports produced by voluntary and other organisations.

Recommendation 17
Audiology services should establish links to facilitate training, for both professionals and patients, in alternative communication methods (e.g. BSL, lip-reading etc). This should be routinely available, readily accessible, and co-ordinated across health, education, social work and voluntary services. Such training should be delivered by accredited organisations.

Recommendation 18
In the light of established service shortfalls and technological improvements in hearing aids, audiology services should seek to re-engage with people with severe and profound hearing losses via links with social work and education departments and voluntary bodies.

7.2 Social Work Services

The input to this report shows that contacts between audiology and social work services are often informal, unstructured, uncoordinated, highly variable and over-dependant on goodwill and individual relationships between professionals. In addition, information exchange and awareness or understanding of respective roles and responsibilities is limited. The main activities of social work services include:

- Direct social work provision including care management and community care assessments;
- Assessment, provision, installation and support in the use of assistive communication and alerting devices;
- Counselling;
- Advocacy;
- General support including translating correspondence, making telephone calls, negotiating and liasing with services such as housing, health, legal, employment and education.

The interface between social work services and audiology varies greatly across Scotland. The quality of this interface relies heavily on the relationship between individuals. Where good practice exists, this is often dependent on the personnel involved, and when individuals move, links and relationships often have to be rebuilt from first principles. This can result in gaps in provision and the loss of previous good practice.

There are a number of areas of concern in the way in which audiology departments and social work department interact, which can result in sub-optimal care and support of the deaf or hearing impaired person. These cluster and can be summarised under the headings of (a) referrals and joint working, and (b) support and training for communication skills in staff and patients.

There are a number of actions which will greatly improve the provision of services by improving the links between audiology and social work. These include:

- Social services encouraging the use of hearing aids;
- Agreed cross-service referral criteria;
- Information available on each of the services in corresponding locations;
- The development of provision of a comprehensive service to deaf blind and deaf people with additional disabilities;
- Agreed funding of lip-reading classes;
- The provision of the hearing therapist role in audiology departments.

In the light of these issues, the working group have made a number of recommendations about improving the interface between social work services and audiology; improving mutual knowledge of the services which each provides; and ensuring joint working where appropriate to the care of patients. These links should be established at both the operational and the strategic levels.

Recommendation 17
Audiology services should establish links to facilitate training, for both professionals and patients, in alternative communication methods (e.g. BSL, lip-reading etc). This should be routinely available, readily accessible, and co-ordinated across health, education, social work and voluntary services. Such training should be delivered by accredited organisations.

Recommendation 21
NHS audiology and social work services should establish formal two way links and structures for sharing of information, mutual education and training, to facilitate joint working and effective referral.

Recommendation 22
Audiology services should ensure that all patients whose hearing difficulties are not adequately managed by hearing aids are referred to social work for support services and assessment as candidates for assistive communication and alerting devices. Comprehensive information about diagnosis and management should accompany the referral.

Recommendation 23
Health and social services should routinely review the communication needs of older people receiving residential care, and develop services to meet those needs via the provision of hearing aids and assistive listening devices.

7.3 Education Services

The audiological care of children with hearing impairment requires exceptionally good links and joint working between audiology departments and the appropriate staff in education. This includes educational audiologists and teachers of the deaf, as well as the school which the child attends. Educational audiologists, teachers of

the deaf, and speech and language therapists act as the conduit for this effective information flow. This ensures that both health and education have all the information they require to ensure the most effective management of the hearing impaired child, both audiologically and educationally.

The educational audiologist or teacher of the deaf has a number of roles and responsibilities which include (in some areas some of these are undertaken wholly or partly by speech and language therapy):

- Explanation of audiological test results and their implications to parents and children;
- Provision of additional diagnostic information to the audiology clinic (in partnership with the family);
- Explanation of the education and social implications of the child's hearing loss to class teachers and co-professionals;
- Explanation of the impact of the child's hearing loss on language development;
- Use of age-appropriate programmes to monitor the child's progress and difficulties in accessing speech and language in various acoustic environments;
- Provision of reports of these observations to the audiology clinic to facilitate fine tuning of the hearing aids;
- Support to parents to establish a hearing aid management programme including a daily routine of ear mould and hearing aid checking;
- Regular testing of hearing aids and updating of hearing aid management;
- Informing audiology departments of ongoing problems with earmoulds or with the management of hearing aids to ensure that children can be seen at a review clinic.

The introduction of UNHS will result in the diagnosis of hearing loss being made at an earlier age. This will change the way educational audiologists and teachers of the deaf support deaf children and their families. Professionals will therefore require a more in-depth knowledge of hearing aids, their fitting features and adjustment.

The working group recognised the importance of a strong working relationship between audiology and education in the holistic care of a child with hearing impairment. It has therefore made a number of recommendations around the sharing of information and joint working between these two agencies. The group have recognised that in some areas this is conducted through educational audiologists or teachers of the deaf, while in others much is conducted by speech and language therapy.

Recommendation 2

NHS Boards should ensure that all children's audiology services have properly functioning links with education, social work, child health and speech & language therapy services, and ensure that all are equal partners with families in decision making regarding the ongoing management of the child. There should be complete transfer of diagnostic, management and progress information between families, health, education and social care at identification and throughout the pre-school and school years.

Recommendation 3
Breaking the news to parents of a newly diagnosed deaf child should be done by a professional with experience and knowledge of child development and the support and education options for deaf children, with sufficient time and in privacy. The appropriate support personnel (e.g. education, speech and language therapy etc) should either be introduced at that time or informed promptly to ensure immediate and ongoing support and information sharing as desired by parents.

Recommendation 8
Because the implementation of UNHS will result in many children being diagnosed at a very young age, NHS Boards should develop and implement an early intervention programme to support such families, in conjunction with education, social work and voluntary organisations.

Recommendation 10
Audiology services should ensure that there is a phased transition to the adult environment from the extensive support in a paediatric service. The transition should be tailored to the special needs of individual young people and should include liaison with education, social work and employment services.

7.4 Links with Cochlear Implant Services

In Scotland there are two centres which provide cochlear implant services,[79] one located at Crosshouse in Ayrshire and Arran NHS Board and one at one located in Edinburgh Royal Infirmary in Lothian NHS Board. The Crosshouse service manages both adults and children and is resourced and staffed in a manner which is completely independent from other audiology services. In contrast, the Edinburgh service manages only adults and is part of the infrastructure for audiology within Lothian NHS Board.

The remit of the current report does not include the structure and delivery of cochlear implantation services in Scotland. However, it is within the remit to examine the interface between audiology services and the specialist implant teams. Details of the functioning of the interface can be found in Appendix A8. Briefly, indices of appropriateness of referral vary both between the Crosshouse and Edinburgh centres, and separately for adults and for children between audiology and the Crosshouse service. There is evidence of greater appropriateness of referral for children than for adults, and some evidence of a lack of appropriate acoustical management by audiology services prior to referral to the implant team. Substantial resources at the implant team can be taken up delivering optimal acoustical management prior to a formal trial of candidature for cochlear implantation.

There are reported deficits in the information flow and continued support for adults and children who have received cochlear implantation between the specialist team and the audiology service. The models of care and divided responsibilities have not been well disseminated and do not appear to have been agreed.

Recommendation 30
Audiology services and specialist centres for cochlear implantation should establish mechanisms for agreed referral criteria, responsibilities and information exchange.

7.5 Joint Working in Remote and Rural Areas

Providing services in remote and rural areas bring their own particular problems, and the balance between equity of access and efficiency is more acutely observed in rural areas where population density is low. One method of addressing these matters is the provision of peripheral clinics offering services on a less frequent basis than would normally be the case in more urban areas, thus ensuring a "critical mass" of patients and professionals. This allows local access, but means that people having problems (e.g. with their hearing aids) either have to wait until the clinic next visits to have these addressed, or have to send their hearing aids away to a central clinic. Both options mean that the patient may be without the use of their aid for an unacceptable length of time. This can be particularly frustrating if the problem is comparatively trivial or can be easily addressed, for example by replacing tubing or reinforcing information on basic hearing aid use or maintenance. For an in-depth consideration of these issues, readers are referred to Appendix A8.

There are a number of areas in Scotland where volunteers and other professionals have received training in the maintenance and minor repairs of hearing aids, and are able to provide some services on a local and frequent basis.

Recommendation 19
NHS Boards should develop flexible multi-agency approaches to delivery of accessible cost-effective services in remote and rural areas, where people have the right to expect equal service standards to those in urban areas. This means that everyone involved in the care of such people should have a creative approach to provision of services. Other professionals could be trained to deliver services which would otherwise be supplied by audiologists, provided that appropriate training and monitoring arrangements are in place.

7.6 Links with the Private Sector

Hearing aids are available both from the NHS and from the private sector. Audiology departments supply hearing aids within the NHS. Private hearing aids are bought from registered hearing aid dispensers (RHADs). RHADs currently go through a different training and examination process from NHS audiologists, although in future the new BSc in audiology may be the basic qualification for both. This may result in a blurring in differentiation between these two groups and encourage more cross-over between them.

Currently there are no well-established links between the NHS and the private sector in many areas. Indeed there has been mutual suspicion between the two.

However, there have been a number of ways in which NHS Audiology Departments have interacted with the private sector:

- Audiology departments have contracted local RHADs to fit hearing aids which could not be provided by the department
- Referral of patients who are willing to buy a more expensive aid than the NHS department is able to purchase;
- If both the department and the audiologist are registered with the Hearing Aid Council, then they can sell hearing aids from the NHS department and are covered by the Hearing Aid Council codes of practice;[80]
- RHADs are legally bound by their code of practice to refer clients with certain conditions to a medical practitioner.[80]

In England, as a result of the shortage of NHS audiologists and increased demand for services arising out of the modernisation programme, two pilot sites have been set up to examine the feasibility of NHS departments contracting work to the private sector to make up the short fall and address the problem of lengthening waiting lists. This may be an option which could be explored in Scotland if the modernisation of services recommended in this report has the same effect on waiting lists and patient throughput as it has in other parts of the UK.

8.1 Relationship with ENT Departments

Audiology personnel were originally classified as Professional and Technical staff and commonly known as Audiology Technicians. Their main function was to provide support to ENT Clinics. This work would consist of routine pure tone audiometry, earmould impression taking and fitting of hearing aids from a very limited range. These hearing aids would often be prescribed by the ENT consultant and the technician function was merely to explain the workings of the hearing aid with no rehabilitative element or follow-up. As the nature of the work has expanded and has included both technical and rehabilitative aspects, the title 'Audiologists' has been adopted, while other staff groups (e.g. Audiological Scientists, Hearing Therapists and Assistant Technical Officers) are now all integral parts of Audiology Services. Audiological Physicians have developed the non-surgical, but medical, aspects of audiology and otology. For a more detailed description of the various professional groupings, see Appendix A1.

While the managerial structures, links and services provided will vary from area to area, historically audiology has been either part of the ENT department or directly managed by that department. In some cases, the audiology department would either have no budget or budgetary control, whereas in others they would have separate budgets. As health service structures have changed, so have the managerial links between ENT and audiology, although in the majority of cases the audiology department will either continue to be part of the ENT department or contained within the same directorate.

This brief history shows that the role of audiology was originally restricted to that of provision of technical information to ENT surgeons and patients, with little or no interpretation, and no responsibility for management decisions or implementation. The development of hearing aid services, and particularly the advent of direct referral, has resulted in audiology services assuming the responsibility for the complete management of patients without any interaction with or responsibility to ENT surgeons (the pathways of care are discussed in more detail in Section 5 and Appendix A7). The current relationships and structures for audiology do not reflect these dual roles and lead to inconsistencies in the scientific, clinical, managerial and financial domains.

Many audiology services in Scotland remain sub-elements of ENT surgery departments with varying degrees of devolved responsibility for budgets. Although managerial and leadership skills are under-developed in audiology at present, following appropriate action audiology services should be responsible for decision making regarding hearing aid management in all of its respects, while retaining appropriate input from and partnership with ENT clinicians. As hearing aids and hearing aid services become technologically more complex and rehabilitatively more demanding, the skills to match patient requirements and characteristics to processing and fitting features are only going to be found in audiology services and will be outwith the expertise of ENT surgeons. Responsibility for such decisions will reside clinically, scientifically and financially within the audiology service.

Recommendation 32
The Scottish Executive Health Department and NHS Boards should develop a clear understanding, acceptance among professionals, and implementation of the differing roles of Audiology Services as both independent clinicians responsible for all aspects of a patient journey (as instanced by direct referral by GPs), and as providers of technical and diagnostic assessment information to medical specialists.

Recommendation 33
NHS Trusts should develop appropriate administrative structures for Audiology Services, which are managerially and financially distinct from ENT Departments, following the development of appropriate skills in audiology staff for their implementation.

Audiology services will continue to have a substantial workload, whose main purpose is to provide ENT surgeons with information regarding hearing status (e.g. in conductive hearing loss, tinnitus and balance problems). Although sub-specialisation is becoming increasingly common in ENT surgery, there are still many examples of general ENT clinics for which audiology resources are required (in their technical support rather than independent clinician role). Such clinics carry a variable and unpredictable workload for hearing testing and are perceived, both by Audiology and ENT Departments, as inefficient use of audiologists' time. Although due regard has to be paid to the unpredictable nature of referrals and clinical demands, particularly in peripheral sites, sub-specialisation into otology, rhinology and laryngology clinics will result in more efficient use of audiology time by a relative concentration on otology clinics as opposed to laryngology and rhinology.

Recommendation 34
ENT clinics should be configured and structured to maximise the efficient use of audiological resources in their provision of support to ENT services via the use of specialist outpatient clinics where geographical circumstances allow. Audiology services should be reconfigured to offer the most cost-effective service to ENT.

8.2 Advisory Groups and Standards

This report has identified the multi-disciplinary and multi-agency nature of audiology services for people with hearing problems, balance problems and tinnitus. Surveys of the service and relevant agencies and stakeholders have identified a relatively small number of Audiology Advisory Groups which are almost entirely aimed at services for children or for adults with profound hearing impairment. Liaison between disciplines and agencies throughout Scotland is under-developed and mechanisms are required to reverse this deficit at both NHS Board and national level. There is an absence of mechanisms to inform both local and national policy. Services within Boards can be more effective and efficient when informed by other statutory and voluntary bodies. Policies developed by NHS Boards should cohere sensibly with the other services available. At a national level there exists no mechanism for audiology services to engage with policy elements or for the types and degree of inter-agency input that is required.

This report has identified a number of national and international standards for good practice in audiology services for children and adults. Many of these have achieved professional consensus and endorsement from voluntary and statuary bodies, though have yet to be assessed by the NHS in Scotland. The needs assessment group is not in a position to undertake this responsibility, though the situation is now ripe for consideration by NHS Quality Improvement Scotland.

Recommendation 25
Each NHS Board in conjunction with Education, Social Work Services and Voluntary Organisations, should establish an Audiology Services Working Group to inform local policy and practice for adults and children, comprising input from NHS professionals, social work and education services, and representatives from voluntary organisations and service users.

Recommendation 39
NHS Quality Improvement Scotland should produce an agreed set of standards for audiology services, and conduct an assessment of the service's ability to meet these standards, taking into account established documents from voluntary bodies and professional organisations.

Recommendation 40
The Scottish Executive should establish a formal Audiology Services Advisory Group with representation from NHS professions and Boards, education, social work, the hearing aid industry, and voluntary sectors representing and reflecting patients' interests, to inform and monitor the development of Audiology services in Scotland.

8.3 Organisation of Audiology Services for Children and Adults

Of the twelve NHS Boards who provide audiology services there are two (Greater Glasgow and Lothian) for which the children's service is completely separate from the adult services. For the other ten Boards there are joint services with shared accommodation, equipment and staff. Although within any combined service there may be separate facilities which may be dedicated to paediatric assessment and management, such arrangements do not accord well with the accepted philosophy within the NHS that children should be managed in dedicated facilities and not expected to attend clinics which are primarily configured for adult patients. The ethos that is required for children and their families is not the same as for adults. In audiological terms the test facilities and procedures will require to be different, but crucially the staff skills required for the appropriate assessment and management of children are not necessarily those found in staff in adult-orientated departments. The whole environment for effective children's services is different from that for adults, and subsuming a children's service into a more general adult environment compromises its effectiveness and acceptance by children and their families. In summary, the distinctive nature of audiology services for children require different staff skills, procedures, equipment and environments.

While dedicated services for children are required, a complete divorce between children's and adult's services would also be undesirable and inefficient. There are specialist procedures and facilities which it would not be cost effective to duplicate in completely independent children's and adults services. Duplication of clinical, scientific and managerial expertise would not make the best use of resources. A balance between dedicated facilities and common management structures is required to configure the most appropriate service environment.

Given the different nature and level of support between children's and adults' services, and the reduction in, for example, support from education services in the transition from school to the adult world, the two elements of the services should have in place coherent arrangements to manage the transition according to the individual needs of hearing-impaired young people.

The service data show that ten of the twelve services do not have dedicated facilities and that only 22% of centres report having in place procedures for the transition from paediatric to adult services. The three recommendations listed below are required to ensure an adequate standard of service.

Recommendation 5
In recognition of the different needs of children and adults and different demands on staff skills, procedures, equipment and environments for effective services in paediatric audiology, there should be dedicated facilities for children. Physical proximity to the adult service will be dictated by the need to locate children's services in a paediatric family-friendly environment, though links between the two are important irrespective of geography.

Recommendation 6
In view of the significant benefits to be gained from liaison between adult and children's services, Trusts should establish common management structures, and sharing of specialist hardware and audiological expertise.

Recommendation 7
With the introduction of UNHS, NHS Boards should develop an investment plan for Paediatric Audiology services to cope with the increased demands and avoid excess pressure on other aspects of the service. The resources should be in place prior to the implementation of UNHS.

8.4 Communication

All patient areas in NHS premises should be designed to optimise communication. However many are not. Audiology departments see a higher number of people who are significantly deaf than any other department. They should take the lead in ensuring that departments are designed to maximise communication. This will include ensuring that people can see the lips of staff who are speaking to them, the use of visual signs to call patients for their consultation and the provision of loop systems in reception and consultation areas, as well as ensuring that the acoustics of consultation rooms are adequate.

Recommendation 12
Audiology services should have the capability to use visual as well as auditory means of alerting and communicating with patients. The physical layout, lighting and acoustical conditions in departments should be of a standard to ensure that services are accessible to all hearing-impaired people, by maximising both verbal and non-verbal communication.

Lack of access to appropriate communication methods and lack of deaf awareness in audiology and reception staff was consistently raised in the stakeholder consultation and the surveys of service users. A small but important number of clinic patients will have BSL or lip-speaking as their primary mode of communication. This is particularly true in families of deaf children who themselves have a higher prevalence of impaired hearing. Additionally, for ethnic minorities BSL itself may not be an appropriate language. The planned introduction of a new BSc in Audiology offers the opportunity to include basic instruction in the training of future audiologists. All professionals and patients should have access to training in alternative methods of communication.

Recommendation 16
Audiology services should have access to and provide appropriate means of communicating (e.g. BSL, lip speaking etc) for all patients with appointments whose primary form of communication is not written or spoken language. All staff in audiology departments should receive accredited Deaf Awareness training. All new staff should have received basic training in, for example, BSL to facilitate communication.

Recommendation 17
Audiology services should establish links to facilitate training, for both professionals and patients, in alternative communication methods (e.g. BSL, lip-reading etc). This should be routinely available, readily accessible, and co-ordinated across health, education, social work and voluntary services. Such training should be delivered by accredited organisations.

8.5 Co-morbidity

For both children and older people with hearing impairments the presence of another deficit, such as impaired vision or learning disabilities, can materially compromise the effectiveness of audiological intervention. A holistic approach to managing the co-existing conditions is required for effective services.

Recommendation 20
Where there is significant co-morbidity (e.g. vision impairment, learning disability) which might compromise effective communication or management, clinical leaders should co-ordinate a multi-disciplinary team and multi-agency approach to diagnosis, assessment and management.

8.6 Access to Services

The surveys of service users highlighted problems with restricted access as a significant barrier to service take up. Parents of children with hearing impairment requested clinics outside school hours to limit the detrimental effect that hearing impairment might have on their children's education, and also outwith work hours to facilitate their own attendance. As adults consult audiology services at younger ages, the need for access outwith working hours will become more important. There are examples of effective implementation in other NHS sites in England and Wales.

Recommendation 13

Audiology services should develop and implement plans to improve access for patients by the provision of facilities outwith traditional clinic hours.

8.7 Services for Bone Anchored Hearing Aids (BAHAs)

BAHAs are a specialist form of device delivering stimulation to the cochlear via bone conduction as opposed to air conduction.[81] A titanium screw is embedded in the mastoid bone and a vibration transducer used to deliver stimulation, thereby bypassing the middle ear structures. Thus, services have an explicit surgical element. BAHAs are an effective and suitable management for hearing impairment for which an air conduction hearing aid with its associated ear mould is not appropriate. In adults, candidates include people with chronic discharge from middle ear disease[82] and people with severe allergic reactions to earmould material.[81] Some conductive hearing losses can be more effectively managed with BAHAs, particularly where feedback becomes a factor. Additional candidates include children and adults with congenital malformations of the external ear structures for whom a conventional hearing aid is not appropriate. The number of candidates for BAHAs is small and services are available in only a relatively small number of NHS Boards. As with the case for specialist services for tinnitus and balance problems, managed clinical networks at supra-Board level are appropriate.

The organisation of current BAHA services does raise one particular structural and resource issue. The treatment involves the titanium implant and a separate sound processor. The latter always (and occasionally also the former) are embedded within the overall audiology budget, often in the same category as conventional hearing aids. Given the high unit costs of BAHAs (approximately £3,000), decisions about candidature for such devices can have a major impact on the overall audiology, and particularly the hearing aid element, of the recurrent budgets. There are reports from the service in Scotland of unreasonable pressures on hearing aid budgets by decisions regarding candidature for BAHAs that are outwith the control of the budget holders. As is the case with funding for cochlear implants (another specialist form of hearing prosthesis), we recommend that the funding streams for the implants and sound processors for BAHAs should be separate from the hearing aid budget. The elements will still be included in the overall audiology budget but should form a specific and non-transferrable element of that resource stream.

Recommendation 28
NHS Boards should establish specialist centres or managed clinical networks to ensure the critical mass of expertise required for the development and delivery of specialist services such as aspects of paediatric audiology, the assessment and treatment of tinnitus and balance disorders, and bone-anchored hearing aids. Such arrangements may require consortia of NHS Boards to deliver effective services.

Recommendation 29
Where an NHS Board offers specialist services for bone-anchored hearing aids, these should be funded separately from hearing aid services.

8.8 Variations Across NHS Boards

Part of the remit of the report included an assessment of the adequacy and consistency of services across Scotland. The detailed data in Appendices A6, A7 and A8 show that there are significant differences in both the process and level of service across different NHS Boards. Clearly, NHS Boards have individual autonomy in allocating resources to priorities, though one would hope that large scale variations were driven by objective circumstances.

Figure 8.1 shows the variation in aspects of budgetary provision across the twelve NHS Boards who provide audiology services. The details have been provided by the finance offices within individual NHS Trusts and amalgamated across NHS Boards. There is approximately a 2:1 ratio in population-adjusted resources, when considering staff and non-staff elements combined. Breaking down separately into the staff and non-staff elements shows that the relative contributions of these two components also vary across NHS Boards in ratios of 2:1. There is no consistent pattern when predominantly urban as opposed to predominantly remote and rural services are compared. The non-staff elements include, as well as purchase of new hearing aids, all accessories such as ear moulds, batteries, tubing, repairs to hearing aids and repair and maintenance of equipment. A further separation into new hearing aids alone shows an even greater variation (now approaching 3:1) in the resources devoted to new devices by different NHS Boards. It should be noted that part of this increased variation might be differential emphasis on purchase of new devices as opposed to repairs of existing devices. Across Figure 8.1, Ayrshire and Arran NHS Board is consistently the highest provider per head of population.

Figure 8.1

Variation across NHS Boards of budgets (2000-2001) for staff, supplies and new hearing aids, adjusted for the populations served (£ per head of population). New hearing aids are a component of supplies, and the total budget is the sum of staff and supplies.

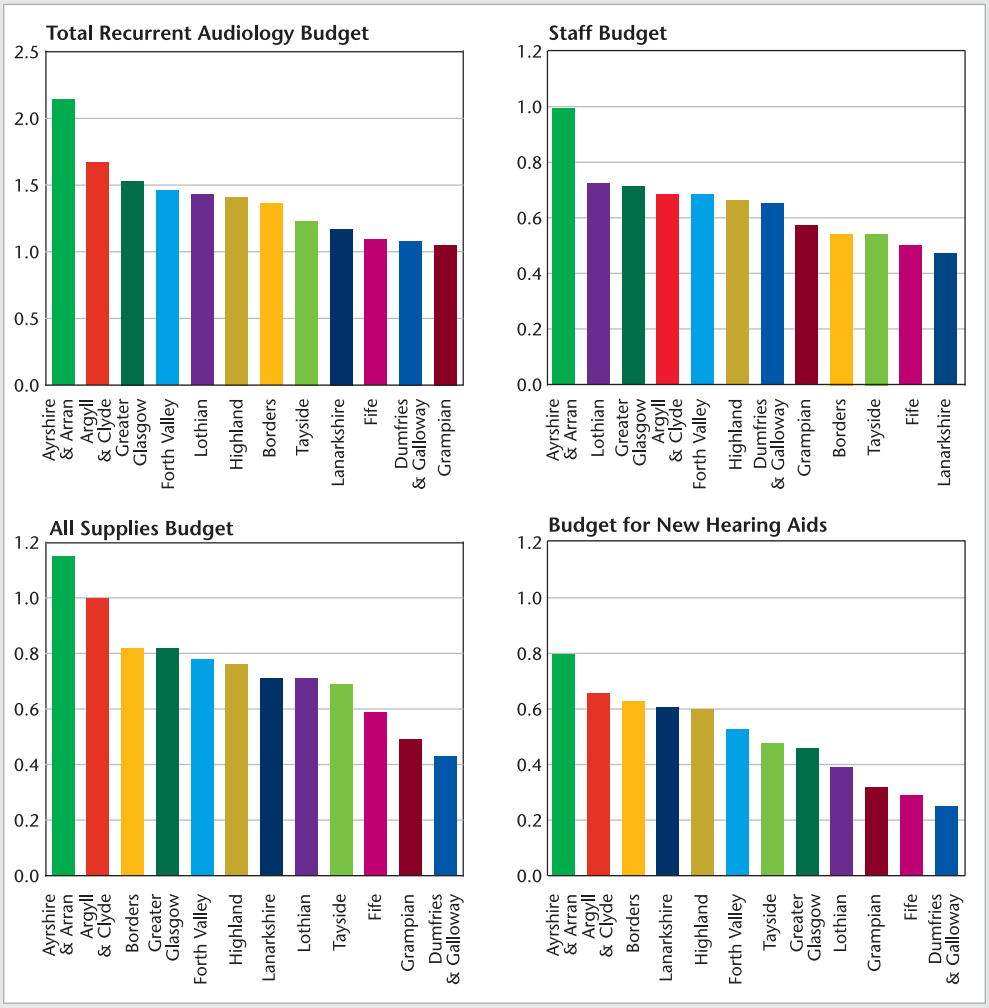


Figure 8.2

Number of sites for each NHS Board at which audiology services are delivered. These are sub-divided into base sites, peripheral sites used for testing children's hearing, and peripheral sites used for testing adults' hearing.

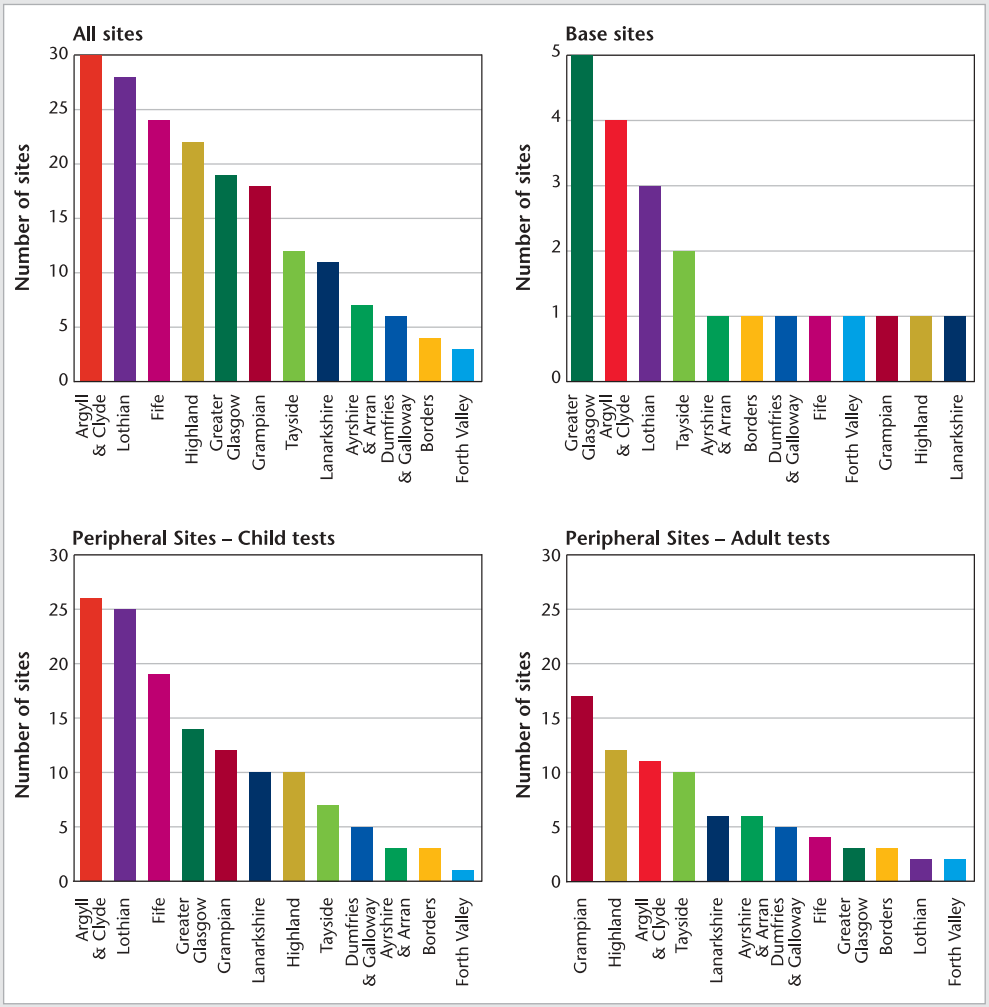


Figure 8.2 shows data regarding the structure of base and peripheral clinics across the twelve NHS Boards. Again there are large variations which are not simple reflections of the urban versus rural environment. This is true for the distribution of base sites, but particularly for peripheral sites for paediatric and for adult services. There was a high proportion of facilities which are unsuitable for hearing testing in the various sites (See Sections 4 and 5, and Appendices A6 and A7), and particularly in the peripheral sites for paediatric testing. Large investments would be required to reverse these inadequacies. The structure of base and peripheral sites and the services which are delivered within those sites therefore require close attention.

Figure 8.3

Distribution across NHS Boards for the number of new hearing aids fitted per annum for each whole time equivalent (WTE) audiology staff.

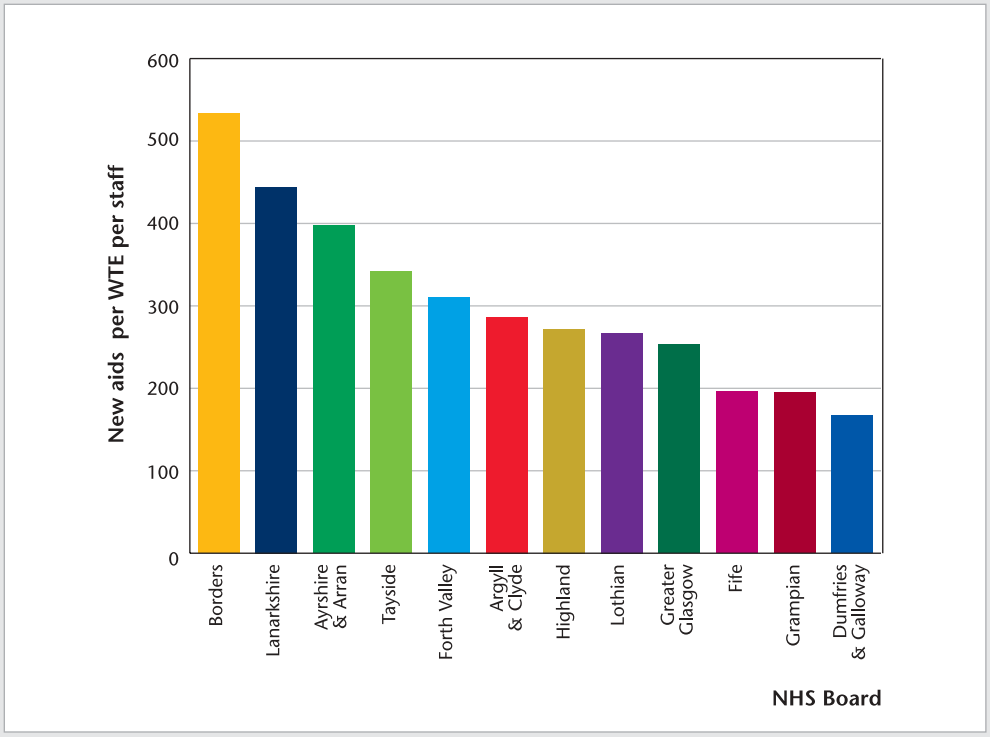


Figure 8.3 shows the number of new hearing aids that are issued for each whole time equivalent (WTE) audiology staff member across the twelve NHS Boards. Again there are large variations approaching a ratio of 3:1 across Boards. It would be overly simplistic to interpret the data in Figure 8.3 as a simple index of efficiency. The data will be a function of: (i) The proportion of audiology resources that are devoted to the hearing aid service as opposed to other aspects of audiology, (ii) The quality of the service in terms of the patient contact time at fitting and at follow-up, as well as (iii) The extent to which the service is well managed. Nevertheless, what the data do demonstrate is that the variations across Boards are large and cannot be explained by simple aspects of geography. It is instructive to note that the two extremes in Figure 8.3 are Borders and Dumfries and Galloway, which have superficially very similar geographical characteristics.

Overall the data show a clear picture of the variation across NHS Boards which is substantially larger than would be expected from planning and allocation of resources on the basis of population need.

9.1 Staff

An interim report of staffing levels in NHS Audiology Departments was delivered to the Scottish Executive Health Department in May 2002. It has been provided in full as Appendix A9 to this report. The data were drawn from the survey of audiology departments and included staffing levels and categories of staff. A description of the various staff categories and professionals involved in the delivery of audiology services can be found in Appendix A1. The figures were compared with published current levels elsewhere in the UK and also compared with published recommendations. In summary, when adjusted for the population served, the data shows substantial variations in overall staffing levels between NHS Boards with a ratio approaching 2:1. There are greater variations between NHS Boards in terms of staff categories, particularly in specialist audiological scientist and hearing therapy staff and in the levels of clerical support.

Overall staffing levels in Scotland were comparable to those in England and Wales prior to their investment in modernised services. Scotland as a whole has a relative under-investment in specialist audiological scientist and hearing therapy staff and in clerical support staff. This implies a narrow skill-base concentration in Audiologists at the Medical Technical Officer grade. Staffing levels in Scotland fall short of the various recommendations for the delivering of good practice modernised services. Experience with the modernisation programmes in England and Wales suggest that delivery of an upgraded hearing aid service (excluding the implementation of UNHS) would require an increase in staffing levels of at least 33%. Implementation of such a strategy and adjustment of the skill-mix to match the rest of the UK implies the greatest proportional increase in clerical support, hearing therapy and audiological scientist staff.

The report identified that existing senior staff had under-developed skills in modern assessment techniques for hearing aid fitting evaluation, and an under-emphasis on rehabilitative support as opposed to technical aspects of hearing aid fitting. The large variations across Boards suggest that individual plans to provide appropriate numbers and skill mix for staff are required at Board level with due regard to the initial service baseline and the overall projections for requirements outlined in Appendix A9.

Lead times for implementation of changes in staffing levels and roles can be long. Given the relative under-development of clinical, scientific, managerial and financial skills in existing senior staff, NHS Boards will require to take steps to develop these skills over the short to medium term. Investment in staff and staff training will be required to reverse the relative decline in services and to provide the modernised services that patients expect and deserve.

Recommendation 35

In view of current shortfalls in staff training and expertise, NHS Trusts should institute a process of in-service professional development and training to ensure competence in modern assessment, hearing aid fitting and evaluation, and other rehabilitative techniques as part of a comprehensive modernisation programme.

Recommendation 36
Each NHS Board should review its staffing levels, profile and inter-relationship for adult and children's services, and produce an overall investment plan for additional staff to deliver a modernised hearing aid service and the implementation of UNHS.

Recommendation 37
In parallel with longer-term increases in specialist (e.g. Audiological Scientist and Hearing Therapist) skills via new recruitment, NHS Trusts should develop and implement interim programmes of professional development to develop clinical, scientific, managerial and financial leadership in existing senior staff.

Recommendation 38
NHS Boards should initiate the training and recruitment of additional Medical Technology Officer Audiologists and new specialist staff (e.g. Audiological Scientists and Hearing Therapists) as soon as possible to address medium and long term capacity deficits. In view of current shortfalls, additional Assistant Technical Officer and Clerical staff should be recruited as an immediate step to release trained staff for service development.

9.2 Test Facilities and Equipment

The audit of audiology services and the reports from the stakeholder consultation identify audiological facilities which in many circumstances are not fit for purpose. There are high proportions of test facilities for adults and for children which do not meet the appropriate standards. Peripheral as opposed to base sites contain a higher proportion of such inadequate facilities.

Recommendation 11
NHS Boards should ensure that all facilities and equipment used for audiological procedures are fit for purpose, so as not to compromise the integrity of the procedures undertaken. In view of the shortcomings identified for both children and adults, NHS Boards should cost and implement an appropriate corrective action plan based on detailed audit of accommodation and the purpose for which it is used. NHS Boards should also put in place mechanisms for a rolling audit of equipment and facilities.

Recommendation 26
NHS Boards should review the services and standards provided at base and, in particular, peripheral sites and their relative distribution in the light of population, transport and geography. Each NHS Board should develop and deliver services on a series of "hub-and-spoke" models and establish an acceptable balance between centralisation and concentration of expertise, and accessibility of services and local demand.

Recommendation 27
The accommodation and facilities available in peripheral sites and the potential

patient pool will determine which services can be offered. In the light of the large number of inadequate facilities at sites serving remote and rural areas, NHS Boards responsible for the delivery of such services should ensure that any inadequacies do not compromise effective service delivery.

9.3 Information Technology (IT)

It has been noted throughout this report that there are very significant barriers to gaining access to information regarding the facilities, process, structure and outcome in audiology services. Surveys of departments showed that only 23% of sites had any form of a patient database, and that (Figure 9.1) there were very large variations in the basic computing facilities available to the services.

Figure 9.1

Number of networked PCs in audiology services for each NHS Board.

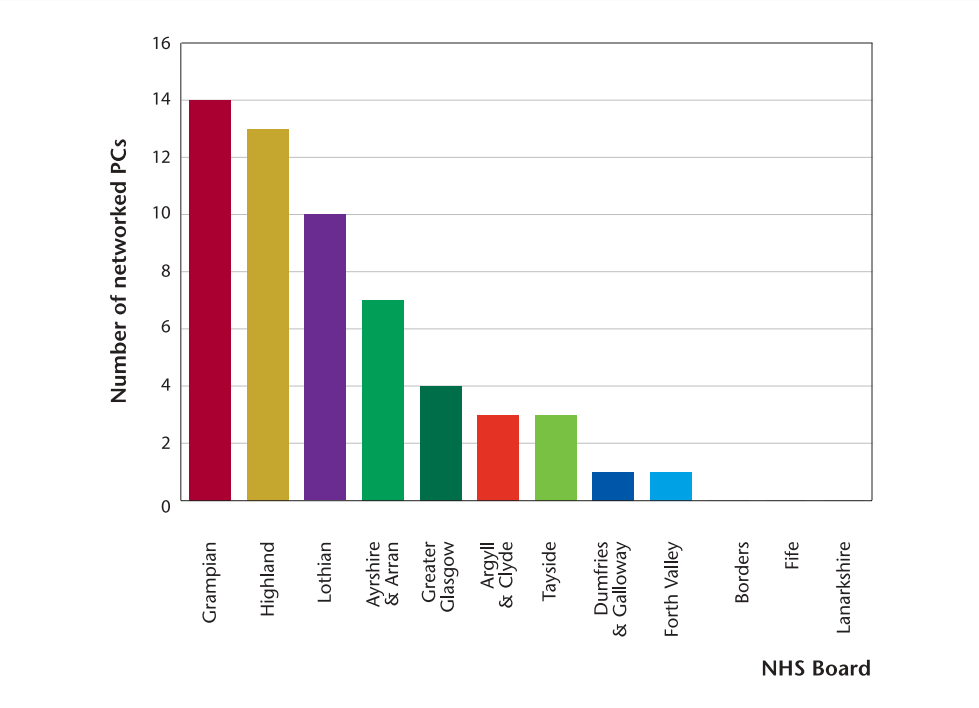


Figure 9.1 shows under-investment in IT systems in audiology services. It is noteworthy that the two NHS Boards with the most extensive computer networks are those serving geographically distributed sites, where information flow is a necessity rather than an option. For Greater Glasgow to report only four networked computers for five major base sites represents a clear failure to realise the benefits that modern IT systems can deliver.

Access to adequate information concerning how staff resources are allocated to tasks, the types, numbers and procedures delivered for patients, comprehensive

information regarding expenditure on hearing aids and accessories are all fundamental prerequisites for the delivery of an effective and efficient system. At present there are no such arrangements in place anywhere in Scotland. No individual service manager is at present in a position to make overall and detailed decisions about the configuration and delivery of their services.

Recommendation 24
NHS Boards should put in place validated information systems to manage data for all aspects of the patient's journey, assessment and management. A prerequisite will be to agree common definitions and data reports to enable inter- and intra-service comparisons.

9.4 Hearing Aids

The Scottish Executive Health Department issued the Good Practice Guidance for adult hearing aid fittings in 2001.[1] A survey of the audiology services shows that ability to comply with this guidance is poor throughout Scotland, but varies significantly across NHS Boards. The data shown in Section 5 of this report demonstrate low overall compliance, even with the fundamental aspects of the Good Practice Guidance. The detailed breakdowns shown in Appendix A7 identify elements for which compliance is almost non-existent.

Compliance is not an academic issue. The data in Section 5 on the IOI-HA shows that overall the outcomes in terms of benefits and residual disabilities for patients in Scotland are poor compared to centres in Wales, in the Netherlands and in the United States. There are very significant variations across the five centres in Scotland who took part in the survey. Thus, the quality of the services that are delivered to hearing-impaired patients in Scotland in terms of outcome, as well as process and structure, are both poor and variable. As indicated by the comparison with a post-modernisation site in Wales, increased compliance with the Good Practice Guidance can be achieved within an NHS context.

It should be noted that the Good Practice Guidance contains many elements which are divorced from the technology that is used, and include on an appropriate needs assessment for individual patients, tailoring of a management plan to meet those needs in an appropriate rehabilitative context, increased patient contact time to achieve appropriate fitting and verification of hearing aid characteristics, and continued support and follow-up as part of an ongoing rehabilitative process. Implementation of the Good Practice Guidance will require investments in staff, staff skills, infrastructure and hearing rehabilitation in addition to hearing aid technology.

Recommendation 31
NHS Boards should cost and implement a plan for modernising adult hearing aid services via complete compliance with the Good Practice Guidance for Adult Hearing Aid Services. This will require significant investment in infrastructure (e.g. staff, equipment, accommodation) in addition to funding for hearing aids.

The list of recommendations has been provided earlier in this report. The recommendations are also developed individually in each appropriate section of the report. This section collects together each of the recommendations and is accompanied by a brief supporting rationale.

Two forms of prioritisation have been developed via a system of star ratings. The star ratings form a consensus from the Audiology Needs Assessment Group. The first represents a global appreciation of the effect of implementation of the recommendation. This includes both the impact of the recommendation on individual patients and service providers and the number of service users who are likely to be influenced. The higher the star rating, the greater the global service impact.

The second rating concerns immediacy of impact. A three star rating implies impact over a shorter (three to nine month) period while a single star rating implies a feed time of a number of years.

There will be no clear association between the two types of star rating and neither implies an overall priority as differing investments are required and returns expected. The recommendations are not presented in order of priority on either dimension.

Audiology Services for Children

Recommendation 1 Overall Impact * Implementation Time ***
NHS Boards should ensure that for each paediatric audiology service there is an established multidisciplinary team with an identified clinical leader. There will be written protocols for the diagnosis and management of hearing impairment in children. Local circumstances will determine from which discipline the clinical leader is drawn.

Rationale

Hearing impairment impacts on the whole child and will affect the child's cognitive, social and language development. This can mask and be masked by other underlying conditions. It is associated with a high prevalence of co-morbidity, which can have a profound effect on the child's assessment, diagnosis and ongoing management. Children with conductive hearing loss often undergo a period of audiological "watchful waiting" until a decision is made about surgery. To ensure that the child is appropriately aided and is enabled to attain his or her full potential, it is essential that all those involved with the child work together. Close links must be established and maintained with the family.

There is a complex web of individuals, professions and agencies who play a significant part in the care of a child with suspected or confirmed hearing impairment (see recommendation 2, below). Hence a multi-disciplinary team should be set up comprising professionals from health (which will include

audiology, speech and language therapy, paediatrics and ENT) and education. Such a team is a prerequisite for effective and efficient care of the child.

It is essential that there is one designated individual whose responsibility it is to co-ordinate services and to ensure that both the family and all appropriate agencies are kept informed of, and participate in, decisions about the child or young person as appropriate. Written protocols will ensure that all members of the team are aware of what should happen and when. The profession of the clinical leader will be dependent on local circumstances (for example the skills and clinical interests of the staff who are available).

Recommendation 2 **Overall Impact ***** **Implementation Time ****
NHS Boards should ensure that all children's audiology services have properly functioning links with education, social work, child health and speech & language therapy services, and ensure that all are equal partners with families in decision making regarding the ongoing management of the child. There should be complete transfer of diagnostic, management and progress information between families, health, education and social care at identification and throughout the pre-school and school years.

Rationale

Optimal audiological management of the child requires assessment in both the clinical setting, and the environments in which they live and use their aids. Those professions who support the child and family in their own home or who work with the child in the school or other environments are best placed to provide information on these aspects.

All services and agencies require up-to-date information on the child's audiological status to ensure that they are able to provide appropriate support and management. Such a transfer of information can only be undertaken with the full consent of the children and their families. The evaluation of hearing aid use and benefit and the need for radio aids and assistive listening devices is best managed by colleagues in education to ensure optimum benefit for the child. Social work services should be introduced to the child and their family early to ensure that there is adequate preparation for the transition from secondary school and away from the support provided by education services. The support services must co-ordinate their efforts.

Recommendation 3 **Overall Impact **** **Implementation Time *****
Breaking the news to parents of a newly diagnosed deaf child should be done by a professional with experience and knowledge of child development and the support and education options for deaf children, with sufficient time and in privacy. The appropriate support personnel (e.g. education, speech and language therapy etc) should either be introduced at that time or informed promptly to ensure immediate and ongoing support and information sharing as desired by parents.

Rationale

The way in which confirmation of their child's hearing loss is broken to families can have a profound effect on how they cope and on their subsequent relationships with the professionals in health and education services, including audiologists. The family's confidence in the information and in the advice which they are given is affected by the way that the news is broken, and the whole habilitation process can be jeopardised if this is not done well. It is essential that this is handled appropriately by a person who is able to provide adequate information on what to expect and what is available to children. As many families report that they are unable to take in all of the information with which they are provided at this time, and as reactions to such a diagnosis will vary on an individual level, it is essential that families are given adequate support and follow-up in the period immediately following the confirmation of hearing loss.

Recommendation 4 Overall Impact ** Implementation Time ***

Paediatric audiology services should put in place a system to ensure that every diagnosed deaf child receives an ongoing comprehensive aetiological, audiological and developmental assessment of all functions in addition to hearing.

Rationale

Hearing impairment is not of itself a complete diagnosis. It may be an isolated condition or it may be only one manifestation of a syndrome. In children, hearing loss is associated with a high prevalence of co-morbidity. In one study, 39% of children with permanent hearing loss had at least one other co-existing condition.[6] Each child should have a comprehensive medical and developmental assessment in order to identify the cause of deafness. This will: help to answer parents' questions; inform genetic counselling; identify medical conditions which require treatment; assist in the monitoring of educational progress; and inform epidemiological research.[5] As a result of the introduction of UNHS, and earlier identification of hearing impairment, a child's hearing loss may be confirmed before the full clinical picture is apparent or other conditions or syndromes identified. It may be the first indication of a condition or syndrome. Systems must be in place to ensure that children receive timely, appropriate care and management and families receive appropriate support.

Recommendation 5 Overall Impact * Implementation Time ***

In recognition of the different needs of children and adults and different demands on staff skills, procedures, equipment and environments for effective services in paediatric audiology, there should be dedicated facilities for children. Physical proximity to the adult service will be dictated by the need to locate children's services in a paediatric family-friendly environment, though links between the two are important irrespective of geography.

Rationale

Children require a child-friendly environment with appropriate waiting facilities away from those for adults. Older children may be tested in smaller sound-

treated rooms or booths but younger children and those with special needs require larger rooms with one-way mirror and observation room. It is inappropriate to have children attending a clinic at the same time as adults. In addition, different assessments and equipment are required for children.

The network of agencies and professions involved in the care of children differs from that of adults. Staff require to build up clear links with colleagues in the other agencies involved with the children and their families. Good communication and interaction with children is a special skill. The confidence of children and their families in services is often increased if they are able to build a long term relationship with a small number of individuals. Lack of continuity was an issue raised as a concern by a number of respondents to the surveys of children and young people.

Recommendation 6 **Overall Impact **** **Implementation Time ***
In view of the significant benefits to be gained from liaison between adult and children's services, Trusts should establish common management structures, and sharing of specialist hardware and audiological expertise.

Rationale
Paediatric services have a number of unique requirements which necessitate a recognition that children's needs of services differ from those of adults, and that there should be a degree of physical and staffing separation from adults' services. However, there is also overlap between the two, and there is a good argument for sharing equipment and facilities, particularly in areas where the need for paediatric services is low. Common management structures would ensure the most efficient use of resources and skills across the service, and would facilitate a close relationship between children's and adults' services at the time of transition from paediatric to adult care.

Recommendation 7 **Overall Impact ***** **Implementation Time ****
With the introduction of UNHS, NHS Boards should develop an investment plan for Paediatric Audiology services to cope with the increased demands and avoid excess pressure on other aspects of the service. The resources should be in place prior to the implementation of UNHS.

Rationale
UNHS is being introduced to ensure that children with congenital hearing impairment are identified as early as possible, and that intervention and support as well as the provision of hearing aids is started at an early stage. Aiding young babies is a particularly specialised skill and will require more frequent visits to the clinic for assessment and mould changes than is the case for older children. Assessment on the very young require the greater skills of more senior staff on more complex (and costly) equipment. This type of assessment is more time-consuming.

Screening will, by its very nature, identify a large number of false positives who will also have to be assessed audiologically until hearing loss is excluded. It is

a prerequisite of introducing any screening system that the resources and services are in place to meet the needs of the people who fail the screen, and require further testing and management. In the case of children this includes adequate support to the family. The audit identified a service which is already under pressure. When UNHS was introduced in Highland NHS, the screening programme was resourced, but the additional assessment and management of young babies who failed the screen resulted in a large increase in the waiting list for adult services (from 650 to 1700 people). It is therefore essential that adequate plans and investment are made prior to the introduction of this screening process to ensure that services are able to meet the needs of this group of children, without compromising the those which are currently being delivered.

Recommendation 8 Overall Impact ** Implementation Time **
Because the implementation of UNHS will result in many children being diagnosed at a very young age, NHS Boards should develop and implement an early intervention programme to support such families, in conjunction with education, social work and voluntary organisations.

Rationale

Much of the support for children with hearing impairment is provided by education services, delivered by educational audiologists, teachers of the deaf and specialist teachers. In some areas, this support is provided from the time of diagnosis, regardless of the age of the child, but this is not the case universally. In other areas, much of this support is provided by Speech and Language Therapists.

UNHS will result in many more children being identified at an earlier age. This will add pressure to the educational services which provide this support to pre-school age children.

These children and their families require adequate and appropriate support, and each area must ensure that there are systems in place to ensure that this is available at the time it is needed. These issues must be explored and addressed with all of the relevant agencies to ensure that resources are in place before the introduction of screening.

Recommendation 9 Overall Impact ** Implementation Time **
NHS Boards should develop robust identification and referral systems to identify late-onset, progressive and acquired hearing losses in children. Services require effective community clinics with functioning inward and onward referral routes.

Rationale

Children's audiology services have a responsibility for identifying those children with permanent childhood hearing impairment, identifying and monitoring children with conductive hearing loss (e.g. "glue ear" or OME), and for defining the hearing status of children with a wide range of complex needs and additional problems.

Assuming that the yield from neonatal screening remains close to 1.06 per 1000 births, then for every ten children with permanent hearing impairment > 40 dB HL detected by neonatal screening, another 5 to 9 (50% to 90%) would

manifest such an impairment by the age of 9 years.[83] The advent of screening in the newborn period and concerns about the effectiveness of later screening programmes are likely to lead to the withdrawal of these later screens. This has already occurred in some NHS Boards.

We will still need methods of identifying and providing access to services for the large number of children with persistent conductive hearing loss, and for children with acquired hearing loss (e.g. as the result of meningitis). This will require ensuring access to effective community clinics if anyone involved in the care of a child expresses concern about their hearing (e.g. the family, school or health visitor). Once identified as requiring further assessment and management the systems must be in place to ensure effective, timely access to tertiary audiology services.

Recommendation 10 Overall Impact ** Implementation Time **
Audiology services should ensure that there is a phased transition to the adult environment from the extensive support in a paediatric service. The transition should be tailored to the special needs of individual young people and should include liaison with education, social work and employment services.

Rationale

Children, young people and families have access to a wide range of specialist services and support from education and specialist voluntary organisations. While there are support mechanisms available for adults, these tend to be provided by different organisations than those who supply such services to children. In addition, paediatric audiology services provide more systematic follow-up and support than adult services, where patients are expected to make contact with the department when they have problems.

The transition from paediatric to adult audiology services occurs about the same time as children are leaving school. It is at this time that many young people stop using their hearing aids, and lose contact with audiology services. Given the high prevalence of co-morbidity in children with hearing impairment, it is important that the transition from children's to adults' services is timed to the individual needs of the young person. Every effort should be made to ensure that the appropriate support network is in place for the young person, which may involve liaison with a number of organisations and agencies.

NHS HOSPITAL AUDIOLOGY SERVICES

Recommendation 11 Overall Impact ** Implementation Time *
NHS Boards should ensure that all facilities and equipment used for audiological procedures are fit for purpose, so as not to compromise the integrity of the procedures undertaken. In view of the shortcomings identified for both children and adults, NHS Boards should cost and implement an appropriate corrective action plan based on detailed audit of accommodation and the purpose for which it is used. NHS Boards should also put in place mechanisms for a rolling audit of equipment and facilities.

Rationale

Audit of accommodation revealed low levels of fitness for purpose for testing hearing in both adults and children. Equipment levels did not match recommendations. It is essential that facilities and equipment are adequate to provide reliable and useable clinical information. These must be reviewed locally in relation to the uses to which both accommodation and equipment are put, to ensure that they are fit for purpose. Where this is not the case, shortcomings should be addressed balancing the needs of equity of access against those of efficiency. In some instances this will involve upgrading of accommodation and equipment, in others it might result in a reduction in the range of services which can be offered from particular premises. Substantial investment will be required to overcome the inadequacies.

Recommendation 12 Overall Impact * Implementation Time **

Audiology services should have the capability to use visual as well as auditory means of alerting and communicating with patients. The physical layout, lighting and acoustical conditions in departments should be of a standard to ensure that services are accessible to all hearing-impaired people, by maximising both verbal and non-verbal communication.

Rationale

Stakeholders, and respondents to both the adults' and children's surveys (including those who use BSL as their primary method of communication) expressed dissatisfaction with the communication, visual display and acoustic environments of departments. All patient areas in NHS premises should be designed to optimise communication with their patients, however many are not.

Audiology departments see a higher number of people who are significantly hearing impaired than any other department. It is imperative that they take the lead in ensuring that their department is designed in a way which maximises communication with this group of people. This includes ensuring that people can see the lips of staff who are speaking to them, the use of visual signs to call patients to their consultation (rather than relying on shouting their name), the provision of loop systems in reception and consultation areas, and ensuring that the acoustics of consultation rooms are adequate to allow optimal communication. Hard walled consulting rooms resulting in highly reverberant environments are the norm rather than the exception.

Recommendation 13 Overall Impact * Implementation Time ***

Audiology services should develop and implement plans to improve access for patients by the provision of facilities outwith traditional clinic hours.

Rationale

Respondents to the surveys of users required this as an improvement to the current service provision. Parents of children with hearing impairment need clinics outwith school hours (to limit the detrimental effect that hearing

impairment may have on their child's education) or outwith working hours. In many families, both parents are in employment, taking time off to take their children to regular clinic appointments can be detrimental to employment, particularly where these are situated some distance from their homes (as is often the case). In areas where one of the limiting factors in patient throughput is the number of suitable rooms or the level of equipment available within the department (rather than staff numbers) it would also ensure a more efficient use of staff time, and reduce waiting lists. Such schemes are presently in place in some centres in England and Wales.

Recommendation 14 Overall Impact ** Implementation Time ***
Audiology services should actively engage with local and national voluntary and statutory organisations regarding available services. They should be aware of, and provide information about, counselling, support, communication training, equipment and maintenance services provided by voluntary and statutory organisations where these are available at a local level.

Rationale

Voluntary organisations provide a wide range of information and support services both to people with audiological problems (e.g. those with hearing problems, tinnitus or balance problems) and directly to audiology departments. These services complement those provided by health, education and social work services, and are an important thread in the network of help and support which is available to people with audiological problems. They provide a rich resource to audiology departments and their patients. However, provision is complex. Some services are available across Scotland. For others, there is a wide local variation in the range and providers of services and support available.

It is essential that departments are aware of the services provided locally, and ensure that their patients and their families have access to the support and services appropriate to their needs. In some instances this may be by providing access to information leaflets, or posters on notice boards or by telling patients about these organisations and how they might be able to help. In others it will involve a formal referral to the voluntary organisation (in particular in those areas of Scotland where the voluntary sector provide those services which are provided elsewhere by social work services). Some of these facilities take the form of service level agreements with local authorities.

Recommendation 15 Overall Impact ** Implementation Time ***
Audiology services should provide a comprehensive range of literature and information about auditory conditions, equipment and other supports produced by voluntary and other organisations.

Rationale

Many people reported that they had not been provided with adequate information about the cause of their hearing impairment; the level of their hearing impairment; and how to care for their aid. In addition the families and

carers of people with hearing impairment reported that they had not received any information on how much the patient could hear with their hearing aid(s) on. It is essential that this type of information is provided in an appropriate style and format for each individual, to better inform both the people with hearing impairment and their significant others.

Many voluntary sector and other organisations provide well researched and expertly produced information leaflets on a number of issues. These are a helpful supplement to the information which audiology services provide and should be available to all patients as appropriate.

Recommendation 16 Overall Impact ** Implementation Time **
Audiology services should have access to and provide appropriate means of communicating (e.g. BSL, lip speaking etc) for all patients with appointments whose primary form of communication is not written or spoken language. All staff in audiology departments should receive accredited Deaf Awareness training. All new staff should have received basic training in, for example, BSL to facilitate communication.

Rationale

Lack of access to appropriate communication methods and lack of deaf awareness in audiology and reception staff was an issue which was raised throughout the stakeholder consultation and the surveys conducted by working group. It is essential that audiologists are able to communicate effectively with patients and their families, and for a small but significant number this will be BSL or lip-speaking. In particular, given the genetic influence of many types of hearing impairment, some of the children attending clinics will have parents who are BSL users. If there is no expertise in this type of communication in-house, then interpreting services should be accessed for all appropriate appointed patients. It is unacceptable that audiology departments are reported as not being deaf-aware. Given the high prevalence of hearing impairment in the patients who attend such clinics, it is essential that they are set up to meet the communication needs of this group, and that staff are able to respond sensitively and appropriately to these needs, all staff must have accredited training in these issues.

The introduction of the new BSc in Audiology allows an opportunity to influence the content of this course and therefore the training of future audiologists. An introduction to and basic training in alternative forms of communication such as BSL and lip-speaking is an issue which should be included in such a course. This will ensure that future generations of audiologists have a grounding in these competencies, and the ability to improve their skills as necessary.

Recommendation 17 Overall Impact ** Implementation Time **
Audiology services should establish links to facilitate training, for both professionals and patients, in alternative communication methods (e.g. BSL, lip-reading etc). This should be routinely available, readily accessible, and co-ordinated across health, education, social work and voluntary services. Such training should be delivered by accredited organisations.

Rationale

There is a complex web of agencies, individuals and organisations which provide care, services and support to people with hearing impairment. All of these should have access to training in alternative methods of communication such as BSL and lip-speaking. In addition, people with hearing impairment should be provided with support and training to maximise their ability to communicate – this includes listening strategies (and communication strategies for families), as well as training in BSL or lip-reading as appropriate.

There are a limited number of agencies and organisations which are accredited to provide training in BSL, lip-reading or lip-speaking. Co-ordination of such training across a number of the organisations which are involved in the holistic care and support of people with hearing impairment will ensure a more even demand for these courses (increasing their viability), and will strengthen working relationships and mutual understanding between the individuals who attend such courses. Coordination at a national as well as at NHS Board level would be advantageous.

Recommendation 18 **Overall Impact *** **Implementation Time ****

In the light of established service shortfalls and technological improvements in hearing aids, audiology services should seek to re-engage with people with severe and profound hearing losses via links with social work and education departments and voluntary bodies.

Rationale

Audiology departments often lose contact with people who have severe and profound hearing impairment, because they have stopped using hearing aids. This is at least in part due to a perception that the instruments which departments have historically been able to provide did not provide adequate benefit to their patients. This was also a direct result of adult services being unable to provide the level, complexity and sophistication of aids which have be provided by children's or other services.

Hearing aid technology and rehabilitative support have improved in the past twenty years. It is important that those who have lost contact with their local audiology clinic are given the opportunity to access these improvements if they wish to do so. One method of making contact with such individuals is through their ongoing relationships with social work services and voluntary organisations.

Recommendation 19 **Overall Impact **** **Implementation Time ****

NHS Boards should develop flexible multi-agency approaches to delivery of accessible cost-effective services in remote and rural areas, where people have the right to expect equal service standards to those in urban areas. This means that everyone involved in the care of such people should have a creative approach to provision of services. Other professionals could be trained to deliver services which would otherwise be supplied by audiologists, provided that appropriate training and monitoring arrangements are in place.

Rationale

It is in the provision of services to remote and rural areas that the trade-off between efficiency and equity of access becomes most acute. The sparcity of the population and large distances between sites means that either patients are asked to travel long distances to clinics in centres of population or that services are provided from a large number of different sites (often less frequently that would be expected in more urban areas).

There are a number of ways of addressing issues of equity of access. There are services and processes which can only be undertaken by a trained audiologist, and these should remain in the domain of the audiology clinic. There are also a number of minor, commonplace types of repairs and maintenance which could be undertaken by professions other than audiologists, provided they have appropriate training and support. Such individuals could provide patients with local access to support in the use, care and maintenance of their hearing aid, particularly in the vital few months after it has first been fitted. Provision of a local service for minor repairs and maintenance would mean that patients requiring such services would not lose the use of their hearing aids for long periods of time while waiting for the next audiology clinic in their area or while the aid is posted back to the base centre. These would include battery provision, and minor repairs such as replacing hearing aid tubing. There are a number of examples of such schemes working effectively across Scotland, where audits of the training of staff and quality of service delivery are conducted.

Recommendation 20 **Overall Impact **** **Implementation Time ****

Where there is significant co-morbidity (e.g. vision impairment, learning disability) which might compromise effective communication or management, clinical leaders should co-ordinate a multi-disciplinary team and multi-agency approach to diagnosis, assessment and management.

Rationale

Any person with hearing impairment cannot be considered or treated in isolation from other needs or morbidities. Hearing impairment can have a profound effect on people's ability to communicate with others, and this can be exacerbated by e.g. vision impairment which may affect their ability to lip-read, communicate using BSL or to access other alternative listening strategies. For those with visual impairment who subsequently suffer from hearing impairment, this will affect their strategies for dealing with their vision impairment.

People with learning disability often require a wider, more complex network of support and care than others in society. They may also have additional needs which determine the most appropriate method of assessing and managing their hearing impairment.

These specific examples are only part of the general co-morbidities which are suffered by people with sensorineural hearing loss. It is important that all the appropriate people are involved in the assessment and audiological management of the patient. It is also important that audiology keeps everyone

informed of the level of the person's hearing, and how much they are able to hear with a functioning hearing aid. This is best achieved by all of the various professions and sectors working together in the care of the patient – through a co-ordinated multi-disciplinary and multi-agency approach.

Recommendation 21 Overall Impact ** Implementation Time **
NHS audiology and social work services should establish formal two way links and structures for sharing of information, mutual education and training, to facilitate joint working and effective referral.

Rationale
Social work services and audiology provide different but complementary services to people with hearing impairment. To ensure that all patients are able to access all the services and support which is appropriate to their needs, it is important that there is a mutual understanding of the range of support and services which each can provide. One of the issues which arose as a result of the stakeholders consultation and in discussions between providers of social work services and those of audiology services was a lack of knowledge and understanding of the services and support which each can provide to people with hearing impairment. Mutual education and information sharing programmes are therefore required. There was also concern that where the links between social work services and audiology departments are strong, these are based on personal contacts and relationships, and one member of staff moving away can negate these links.

It is important that audiology and social work services have a mutual understanding and education about each other's services. The links between the two organisations at a local level should be established both on a personal and an organisational level (to ensure that such links do not disappear if a member of staff leaves or moves on). This will improve the consistency and the quality of the information and support provided by both organisations to people with hearing impairment. Hearing therapists could act as facilitators for these links.

The current arrangements for assistive listening and alerting devices and hearing aids are not optimal and require review at a government level.

Recommendation 22 Overall Impact * Implementation Time ****
Audiology services should ensure that all patients whose hearing difficulties are not adequately managed by hearing aids are referred to social work for support services and assessment as candidates for assistive communication and alerting devices. Comprehensive information about diagnosis and management should accompany the referral.

Rationale
There are many people who could obtain material benefit from the support, services and equipment which social work services provide, but who are not given access to such services because they are not referred to these services by audiology departments. In order to ensure an efficient screening and

prioritisation of such referrals by social work services, it is important that comprehensive information on the patient's hearing, diagnosis, management and (where aids have been provided) aided hearing accompany the referral.

In many areas, social work services to people with hearing impairment are under-resourced both in terms of budget for assistive listening equipment and in terms of specialist staff time. An inappropriate referral to social work services can give rise to unrealistic expectations in those who do not meet the criteria for the equipment and services which social work provide, causing frustration and anger when these expectations are not realised.

An appropriate longer term goal will be the integration of services for personal hearing aids (audiology) with those of assistive communication and alerting devices and communication support (social work services and voluntary bodies).

Recommendation 23 Overall Impact ** Implementation Time **
Health and social services should routinely review the communication needs of older people receiving residential care, and develop services to meet those needs via the provision of hearing aids and assistive listening devices.

Rationale

The prevalence of hearing impairment rises steeply with increasing age,[3] and is higher in people with a number of other morbidities. Hearing impairment has a profound effect on communication and social interaction and on the quality of life of an individual. Care homes have a higher concentration of people with hearing impairment than would normally be found elsewhere in the community (having a higher concentration of the very old and of those with other conditions).

The quality of life of people living in such homes could be materially improved by the provision of appropriate hearing aids (provided by audiology departments) and assistive listening devices (supplied by social work services or voluntary organisations).

Recommendation 24 Overall Impact * Implementation Time ***
NHS Boards should put in place validated information systems to manage data for all aspects of the patient's journey, assessment and management. A pre-requisite will be to agree common definitions and data reports to enable inter- and intra-service comparisons.

Rationale

The needs assessment uncovered a lack of management information about audiology departments and the services they provided, including the case mix of patients, and aspects of process and structure. Information on the quality of their services was effectively non-existent. All aspects of information about structure, process and outcome were deficient. As a result, much of the information which is reported has been specifically gathered for this process, and required a large amount of resources in terms

of time to collate the information from diverse paper records. Ongoing monitoring of the implementation of the recommendations of this report, the requirements of modernised audiology services which includes the recall of patients at appropriate intervals require that all audiology departments have computerised patient management systems which are validated for use in audiology patients. Such systems are available in use in the NHS elsewhere. Audiology services in Scotland have not invested in modern database and computing facilities.

To facilitate the transfer of comparative information between departments, it is essential that common definitions and data reports are agreed as the systems are set up. Such definitions have to be agreed by those who are using the systems in conjunction with those who will require information on a national basis. The process would best be mediated through the audiology managers group.

Independent of information sharing, no audiology manager can make rational investment or development decisions in the absence of accurate information.

STRUCTURES AND ORGANISATION

Recommendation 25 Overall Impact * Implementation Time *****
Each NHS Board in conjunction with Education, Social Work Services and Voluntary Organisations, should establish an Audiology Services Working Group to inform local policy and practice for adults and children, comprising input from NHS professionals, social work and education services, and representatives from voluntary organisations and service users.

Rationale

Paediatric audiology working groups are already operating for children's services in a number of areas. The value of such groups is established in promoting joint-working, agreeing developments and providing formal links between all of the various sectors and organisations who provide support and services to children with hearing impairment and their families.

The establishment of such groups covering all aspects of audiology services is an important step in formulating local policy, cementing joint-working and formalising links between these various organisations and agencies. This may either involve setting up of a separate group for adult's services, one group to cover both, or a main group with two subgroups (one for adults and one for children) dependant on local circumstances.

Whatever the mode of organisation the absence of an effective communication and planning medium will inevitably compromise service delivery.

Recommendation 26 Overall Impact ** Implementation Time *
NHS Boards should review the services and standards provided at base and, in particular, peripheral sites and their relative distribution in the light of population, transport and geography. Each NHS Board should develop and deliver services on

a series of "hub-and-spoke" models and establish an acceptable balance between centralisation and concentration of expertise, and accessibility of services and local demand.

Rationale

Many of audiology facilities in Scotland are unfit for the purpose for which they are used. For example, 84% of the rooms used for hearing testing in children are unfit for this purpose, as are 65% of those used for testing hearing in adults. There is a wide variation in the quality of such rooms across Scotland, with particular problems being observed in peripheral sites. In addition, some peripheral sites may have been developed for historical reasons which no longer apply. This is not an issue purely of geography. In context, access to more local clinics was one of the issues raised as a possible improvement to services by users in the surveys conducted as a part of this needs assessment process.

While it is important to retain a balance between equity of access and efficiency, the current and projected pressures identified in this report result in a need to review and revise services to ensure maximum efficiency within the constraints of ensuring adequate access. A first step in this process would be a review of current service provision, and explicit decisions about where services should be sited, which services can be provided from the available facilities, and which sites require to be improved to allow more extensive services to be provided. Such a review should include consideration of the current population, transport links and geography. There is no evidence that current provision has a planned basis.

The use of "hub and spoke" models, with specialist services requiring particular expertise or equipment concentrated at the hub(s) and those which require less specialist skills, equipment or facilities provided at the spokes (or peripheral clinics), is one which should be considered as a part of a comprehensive review of facilities and services. The distribution of such facilities is not simple and requires both local and national planning.

Recommendation 27 Overall Impact ** Implementation Time *

The accommodation and facilities available in peripheral sites and the potential patient pool will determine which services can be offered. In the light of the large number of inadequate facilities at sites serving remote and rural areas, NHS Boards responsible for the delivery of such services should ensure that any inadequacies do not compromise effective service delivery.

Rationale

The audit uncovered a large number of rooms, particularly (but not exclusively) in peripheral sites which were not fit for the purpose for which they were being used. It is not effective, efficient or equitable to provide services from facilities which compromise the effectiveness of the services which are offered. If the resources are not available to bring these facilities up an appropriate level then they should not be used for purposes for which they are not fit.

Recommendation 28 **Overall Impact **** **Implementation Time ***
NHS Boards should establish specialist centres or managed clinical networks to ensure the critical mass of expertise required for the development and delivery of specialist services such as aspects of paediatric audiology, the assessment and treatment of tinnitus and balance disorders, and bone-anchored hearing aids. Such arrangements may require consortia of NHS Boards to deliver effective services.

Rationale
Some NHS Boards may not have sufficient critical mass to provide the full range of specialisations required for paediatric audiology. Additionally, there are a number of conditions with very low prevalence whose assessment and management require specialist skills, expertise and equipment within audiology departments. Retention of such skills and ensuring a critical mass of staff with these skills requires a minimum number of patients to be seen each year. Some areas do not have large enough populations to ensure that local services could reach the critical mass required. For audiology these conditions would include: tinnitus and balance disorders; and patients who require BAHAs.

In other areas of health, these types of issues have been addressed using managed clinical networks, where patients requiring specialist skills are either managed directly from specialist centres, or their management is undertaken by local services and the quality of care is overseen by the network which includes specialists in the subject. These networks can and do transcend NHS Board areas where appropriate.

There are examples of smaller NHS Boards using adjacent Boards for the provision of some paediatric services (e.g. Borders and Lothian).

Recommendation 29 **Overall Impact *** **Implementation Time *****
Where an NHS Board offers specialist services for bone-anchored hearing aids, these should be funded separately from hearing aid services.

Rationale
Centres in Scotland report that there is no separate budget for BAHAs, and that the costs of these expensive devices are met from general hearing aid budgets. This results in deficits in the range of acoustical options which may be offered to other patients. Provision of a BAHA service can compromise the effectiveness of conventional hearing aid services for large numbers of people. As decision making regarding BAHA provision rests jointly with ENT and audiology separate budgetary arrangements from acoustic hearing aids are required.

Recommendation 30 **Overall Impact *** **Implementation Time *****
Audiology services and specialist centres for cochlear implantation should establish mechanisms for agreed referral criteria, responsibilities and information exchange.

Rationale
The audit of audiology services, and discussions with the specialist cochlear implant teams conducted as a part of the stakeholder consultation, found that

there was very little formal communication between these services. This had led to dissatisfaction on both sides on a number of fronts. Formal links between cochlear implant services and audiology managers have now been established, and work on establishing referral criteria, responsibilities and information exchange has started. This process should be encouraged to develop. In agreeing referral criteria to cochlear implant services, a balance has to be struck between ensuring that all those patients who could benefit from a cochlear implant are referred for formal assessment for entry into this programme, while ensuring that unrealistic expectations are not raised in people who do not meet the criteria for such a procedure. Additional issues concerning protocols for ongoing care still await resolution.

Recommendation 31 **Overall Impact ***** **Implementation Time ****
NHS Boards should cost and implement a plan for modernising adult hearing aid services via complete compliance with the Good Practice Guidance for Adult Hearing Aid Services. This will require significant investment in infrastructure (e.g. staff, equipment, accommodation) in addition to funding for hearing aids.

Rationale
The needs assessment has identified a number of streams of evidence that the services provided by Scottish departments are significantly inferior to those in comparable departments in England and Wales. This is evident both in terms of the hearing aids which are fitted and in the quality of the rehabilitative services which are offered (measured by a quality indicator derived for evaluation of the modernisation of audiology services in Wales and the Good Practice Guideline audits undertaken by the Needs Assessment Working Group).

There is evidence from the English modernisation programme that this has a detrimental effect on the use and the benefit derived from the hearing aids which are issued.

The good practice guidelines which were issued by the Scottish Executive in 2001[1] were designed to address the modernisation of hearing aid services, including the provision of adequate assessment, verification, rehabilitation and follow-up. Compliance with many aspects of the Good Practice Guidance is low. Improved compliance (which is not resource neutral) will have an immediate and sustained effect on the quality of life of adults with hearing impairment by maximising the effectiveness of their hearing aids.

Although only a single recommendation, given the existence of the HDL[1], this item represents a crucial element of a successful modernisation programme to deliver effective and cost effective services.

Recommendation 32 **Overall Impact **** **Implementation Time *****
The Scottish Executive Health Department and NHS Boards should develop a clear understanding, acceptance among professionals, and implementation of the differing roles of Audiology Services as both independent clinicians responsible for all aspects of a patient journey (as instanced by direct referral by GPs), and as providers of technical and diagnostic assessment information to medical specialists.

Rationale

Audiology developed as a sub-speciality whose main purpose was to provide ENT surgeons with information regarding hearing status, primarily for the purposes of either pre-or post-operative assessment. As such their role was, and in this context remains today, restricted to that of information provision with little or no interpretation, and no responsibility for management decisions or implementation. The range of assessments and tests which audiology now provides within this context has developed and increased.

The development of hearing aid services, and particularly the advent of direct referral (whereby patients meeting suitable criteria can access audiology services without first being referred to medical staff), has resulted in Audiology Services assuming the responsibility for the complete management of patients without any interaction with or responsibility to ENT surgeons. The current relationships and structures for audiology do not reflect these dual roles and lead to inconsistencies in the scientific, clinical, managerial and financial domains. There is not a clear understanding of the differing roles either by audiologists or by ENT specialists.

Recommendation 33 Overall Impact ** Implementation Time **

NHS Trusts should develop appropriate administrative structures for Audiology Services, which are managerially and financially distinct from ENT Departments, following the development of appropriate skills in audiology staff for their implementation.

Rationale

Many Audiology Services in Scotland remain either as sub-elements of an ENT organisation or within the same directorate as ENT, with varying degrees of devolved responsibility for budgets. Although managerial and leadership skills are under-developed in Audiology at present, following appropriate action, Audiology Services should become responsible for decision making regarding hearing aid management in all of its respects while of course retaining appropriate input from ENT clinicians. Clinical and budgetary responsibility should change in parallel.

As hearing aids and hearing aid services become technologically more complex and rehabilitatively more demanding, the skills to match patient requirements and characteristics to processing and fitting features will only be found in Audiology Services, and will be outwith the expertise of ENT surgeons. Responsibility for such decisions will reside clinically, scientifically and financially within the Audiology Service, which should be developed now to ensure that they are able to meet the challenges of the delivery of effective services in the future.

Recommendation 34 Overall Impact ** Implementation Time ***

ENT clinics should be configured and structured to maximise the efficient use of audiological resources in their provision of support to ENT services via the use of specialist outpatient clinics where geographical circumstances allow. Audiology services should be reconfigured to offer the most cost-effective service to ENT.

Rationale

Although sub-specialisation is becoming increasingly common in ENT Departments, there are still many examples of general ENT clinics for which Audiology resources are required (in their technical support rather than independent clinician role) to provide information regarding hearing status. Such clinics carry a variable and unpredictable workload for hearing testing and are perceived, both by Audiology and ENT, as inefficient use of Audiologists' time. Although due regard has to be paid to the unpredictable nature of referrals and clinical demands, particularly in peripheral sites, sub-specialisation into otology, rhinology and laryngology clinics will result in more efficient use of audiology time by a relative concentration on otology clinics as opposed to laryngology and rhinology. Given the substantial residual support role to ENT, audiology services should be re-configured to deliver services to ENT in the most cost-effective manner.

Recommendation 35 Overall Impact * Implementation Time ****

In view of current shortfalls in staff training and expertise, NHS Trusts should institute a process of in-service professional development and training to ensure competence in modern assessment, hearing aid fitting and evaluation, and other rehabilitative techniques as part of a comprehensive modernisation programme.

Rationale

The audits of current service provision and comparisons with the English and Welsh systems (both pre- and post- modernisation) as well as a number of good practice guidelines on staffing levels in audiology departments provided evidence of a lack of staff training and expertise in audiology staff. The skill-mix currently available within Scottish departments shows a much lower reliance on specialist and advanced grades such as audiological scientists and hearing therapists. In many areas there is no identifiable, established training and development budgets for audiology staff.

Experience elsewhere in the UK has shown that adequate training and development of staff is a prerequisite for the introduction of a modernised audiology service.

Recommendation 36 Overall Impact * Implementation Time ***

Each NHS Board should review its staffing levels, profile and inter-relationship for adult and children's services, and produce an overall investment plan for additional staff to deliver a modernised hearing aid service and the implementation of UNHS.

Rationale

Experience from the modernisation programmes in Wales and England suggests that delivery of an upgraded hearing aid service (excluding the implementation of UNHS) requires an increase in overall staffing levels of at least 33%. This would translate to some 57 new posts throughout Scotland. Implementation of such a strategy and an adjustment of the skill-mix to match the rest of the UK

implies the greatest proportional expansion in Clerical Support, Hearing Therapy and Audiological Scientist staff.

The establishment in Scotland of a BSc in Audiology, in line with developments in England and Wales, would further establish the skill-base and capacity of the workforce. It is likely that implementation would require similar support for bursaries and placements that are to be provided by the Health Departments in England and Wales. While this report is not in a position to pass comment on the appropriate minimum qualifications for NHS Audiologists, it is inevitable that the establishment of a graduate entry in the rest of the UK will compromise the skill-base and workforce in Scotland if it adopts a lesser qualification.

UNHS will result in greater time and resources being required to assess and provide suitable audiological management to the tiny babies who fail the screening test. When UNHS was introduced in Highland, the screening programme was resourced. However, the additional assessment and management of young babies who failed the screen resulted in a large increase in the waiting list for adult services (from 650 to 1700 people).

Although some of the recommendations found in this report can be met by reorganisation of current services, others will require significant investment. It is important that these are costed, explicit decisions are made about implementation, and any such implementation is planned and financed as appropriate.

Recommendation 37 Overall Impact ** Implementation Time **

In parallel with longer-term increases in specialist (e.g. Audiological Scientist and Hearing Therapist) skills via new recruitment, NHS Trusts should develop and implement interim programmes of professional development to develop clinical, scientific, managerial and financial leadership in existing senior staff.

Rationale

Recent developments in the technology, equipment and rehabilitative techniques available to audiology staff have not been matched with adequate training to ensure that staff have the technical expertise to make full, effective use of the above. Only 7 out of 22 audiology units reported the existence of an established training budget.

There is a wide variation in knowledge and leadership skills in finance/business management and service development within audiology departments. Many audiology managers have had little or no experience of managing budgets. Some have control of their own budgets and are regularly involved in the production of business plans and business cases.

With the recommendation that audiology departments separate from their ENT colleagues, it is important that all senior audiology receive adequate training in and development of their managerial and financial competencies. It is likely that consortia of Trusts and NHS Boards will be required to deliver an effective programme.

Recommendation 38 Overall Impact * Implementation Time ****
NHS Boards should initiate the training and recruitment of additional Medical Technology Officer Audiologists and new specialist staff (e.g. Audiological Scientists and Hearing Therapists) as soon as possible to address medium and long term capacity deficits. In view of current shortfalls, additional Assistant Technical Officer and Clerical staff should be recruited as an immediate step to release trained staff for service development.

Rationale

Overall staffing levels for Audiology Services in Scotland are comparable to those in England and Wales prior to their investment in modernised services. Scotland as a whole has a relative under-investment in specialist Audiological Scientist and Hearing Therapy staff, and in Clerical Support staff. Staffing levels in Scotland fall short of the various recommendations for the delivery of good-practice modernised services. The modernisation of hearing aid services in Wales and England uncovered a shortage of trained audiology staff to meet the surge in demand which followed modernisation. Programmes must be put in place immediately to ensure that staff are available to meet the demands of a modernised service.

The comparative skill mix of Scottish and English centres indicated that Scotland had considerably fewer assistant technical officer and clerical grade staff than was found elsewhere. audiology staff in Scotland were thus spending a significant amount of time on tasks which could be conducted by staff on less skilled grades. In the short term, employment of additional staff on these grades would free audiology staff time to spend more time undertaking the more skilled aspects of their role.

Recommendation 39 Overall Impact * Implementation Time ****
NHS Quality Improvement Scotland should produce an agreed set of standards for audiology services, and conduct an assessment of the service's ability to meet these standards, taking into account established documents from voluntary bodies and professional organisations.

Rationale

Extraordinarily wide variation was observed in the level of investment and in the quality of services provided in different areas across Scotland, which in many areas fell below those observed in centres in England and Wales before the introduction of the modernisation programmes in these areas. NHS Quality Improvement Scotland can provide an effective approach to ensuring a consistent service which meets minimum standards across all areas. The addition of audiology services to the work programme of this organisation will also ensure that development of audiology gains a higher priority within Trusts and NHS Boards. Only a body with independence and external authority is in a position to provide the appropriate synthesis of information and opinion.

Recommendation 40 **Overall Impact **** **Implementation Time *****
The Scottish Executive should establish a formal Audiology Services Advisory Group with representation from NHS professions and Boards, education, social work, the hearing aid industry, and voluntary sectors representing and reflecting patients' interests, to inform and monitor the development of Audiology services in Scotland.

Rationale
This report is not an end in itself, but the first stage in a process which will result in the modernisation and improvement of the services provided by audiology departments. Implementation of this report, and ongoing modernisation of services will require central as well as local planning and monitoring. This report has argued consistently for integration of services for people who require audiological assessment or intervention. It is important that the advisory group has representatives from all of the various professions, organisations and sectors which provide such services as well as patient representatives to ensure that holistic and multi-disciplinary advice can be provided as required by the Scottish Executive.

The reference group which commissioned this needs assessment has representation from a number of, but not all of these areas. The consultations which have been undertaken by the needs assessment have uncovered a number of constituencies which felt excluded from the needs assessment process and from the work of the reference group.

The advisory group should be constituted to ensure that it is not perceived as under a purely health banner, but as a group which is owned by all of the members equally.

Recommendation 41 **Overall Impact **** **Implementation Time *****
The Scottish Executive Health Department should ensure that any new initiatives and resources flowing from the recommendations in this report are tied to an audit of the expenditure and its effectiveness.

Rationale
Audiology departments in many areas have suffered from chronic under-funding and lack of development. The services they provide have not historically had a high priority within Trusts and NHS Boards. This needs assessment has been based on evidence where this was available or where it could be obtained. It is important to ensure that implementation of recommendations from this report are adequately evaluated and that the effectiveness of any changes which are made are linked to expenditure.

Recommendation 42 **Overall Impact **** **Implementation Time ***
The Scottish Executive Health Department and NHS Boards should plan the future development of audiology in the light of current levels of un-met need and the projected increases in numbers of hearing-impaired people which will accompany future changes in the age profile of the population.

Rationale

In adults, the prevalence of hearing impairment rises steeply in older age groups. Even if the percentage of the population who come forward for assessment and management remains constant, the changing demographic composition of the population will result in a sharp increase in demand for services. In addition, published epidemiology studies in the UK have revealed high levels of unmet need for audiology services. As improvements in rehabilitation and in hearing aid technology result in an increased use and benefit within the population, there is a high probability that more people will come forward for assessment and management of their problems.

Recommendation 43 **Overall Impact *** **Implementation Time ***

In the light of the established un-met need in the population, the Scottish Executive Health Department should use the appropriate mechanisms to consider the evidence-base for the early identification and management of hearing-impaired adults in the over 50's.

Rationale

The prevalence of hearing impairment rises steeply in people over the age of 50. There is published evidence that patients who are fitted with hearing aids in their fifties gain more benefit from these aids and have better hearing levels in later life than those who are aided at a later stage. A prerequisite for the introduction of such a programme would be that there were links to services and resources available to ensure the adequate assessment and management of people who failed the screening test. The cost effectiveness of such programmes has yet to be established.

11.1 Training and Development

The forty three recommendations in Section 10 of this report are diverse. They have a range of priorities both in terms of the speed with which they can be implemented and feed-through into the service and the relative eventual impact on the quality of services. Almost all of the recommendations require a cadre of staff to deliver their implementation. Many of the staff resources and skills are not in place and therefore issues arise concerning the timing and extent of implementation. As has been witnessed in the inappropriate implementation of UNHS in some parts of the UK and the under-appreciation of staff skills, resources, infrastructure and rehabilitative context to deliver modernised hearing-aid services in England, resources will not be used effectively or efficiently if the skill-base and skill-mix is not in place. High priority has to be given to recruitment and training of new staff, and cementing and developing the skill-base in existing staff.

11.2 Phasing

Even with the resources in place, effecting change on a broad front can be counter-productive. Again, some lessons can be learned from modernisation programmes elsewhere. The NHS in England targeted modernisation to particular sites with a subsequent roll-out. Within each modernised site though, the programme attempted to develop IT systems, improved process and protocols and implementation of new digital technology simultaneously. The services in England report substantial problems in effecting simultaneous change. In contrast, modernisation programmes in Wales adopted a more phased and serial approach with investment in accommodation and facilities, followed by the development of appropriate staff skills, process and protocols, and only then followed by phased introduction of technological developments. Careful consideration will need to be given at both national and NHS Board level to a development path for audiology services. Development paths will depend upon the existing base level at each NHS Board.

11.3 Costs

This section of the report attempts to identify the scale of the costs associated with the implementation of some of the major recommendations. Given the uncertainties over the detailed content of current services, these should be taken as indications only and no attempt is made to provide details for each NHS Board. Data are amalgamated across Scotland to reduce the implications of individual uncertainties. For each scenario the assumptions are described briefly here and are available in more detail in Appendix A10. Each estimate is associated with significant uncertainty. Estimates should be used to gauge the likely scale of investment required in relation to potential return, rather than providing definite lower or upper bounds.

Table 11.1

Expenditure and staff levels for NHS Audiology Services in Scotland (2000-2001).

	Current Audiology Resources For Scotland
Overall Expenditure	£7,140,000
Staff Expenditure	£3,310,000
Non-Staff Expenditure (includes new hearing aids)	£3,830,000
Expenditure on new hearing aids alone	£2,500,000
Population Served	5,100,000
Number of WTE Staff (Audiological and Clerical)	174

Table 11.1 contains information regarding expenditure on audiology resources by the NHS in Scotland (note that all values in this section of the report are rounded to three significant figures). This information has been derived from the individual NHS Trust Finance Offices, the audit of departments, and hearing aid returns. Overall expenditure on audiology services is some £7.1 million with a roughly equal split between staff and non-staff expenditure. The non-staff expenditure includes all accessories (e.g. batteries, earmoulds, adapters, etc), and repairs and maintenance in addition to new hearing aids. It also includes expenditure on BAHAs where appropriate. Expenditure on new hearing aids is some 65% of the non-staff expenditure. Table 11.1 also shows the population served and the number of audiology and clerical support staff currently in post.

11.3.1 Staffing

The staffing report identified two possible scenarios that might be required, were the NHS in Scotland to move to a modernised service and effect a change in skill mix. Experience in England and Wales suggests that implementation of a modernised hearing aid service (excluding any elements of UNHS and specialist services such as tinnitus and balance) would require at least a 33% increase in audiology and support staff. Roll-out of the modernised service in England suggest that the figure of 33% is likely to under-estimate the additional staff requirements. The two skill mix references are (i) that currently in place in England and (ii) that recommended by BAAP. See Appendix A9 for details.

Table 11.2

Additional staff costs for the two scenarios for increased staffing levels and adjusted skill-mix.

	Additional Annual Staff Costs for a Modernised Hearing Aid Service
English Skill-Mix and 33% increase	£1,270,000
BAAP Skill-Mix and 33% increase	£1,500,000

The data in Table 11.2 show that an increase in the staff budget of between £1.27 million and £1.50 million would be required on the current baseline of £3.31 million. These figures relate to a modernised hearing service only.

11.3.2 Staff Training and Development

Current returns from the audiology service suggests that continuing professional development of audiological staff is largely non-existent. The report attempts to give some estimate of the ongoing costs that would be required to put in place such a programme for audiologically-trained staff (the costings assume no continuing training for clerical and ATO staff). It should be noted that the early stages of a programme might require a more intensive investment.

Table 11.3

Projected costs for an annual programme of continuing professional development for audiology staff

	Travel & Courses	Additional Staffing	Total
Current Staffing Levels	£17,300	£102,600	£119,900
Staffing Scenario 1	£22,300	£140,800	£163,100
Staffing Scenario 2	£19,700	£147,800	£167,500

Table 11.3 shows the details of such a programme for the current staffing levels and for the 33% increase in staffing levels outlined above under Scenarios 1 and 2. The total is broken down into the expenditure that would be required for travel and course fees, and for the increased staff levels that would be required to maintain service delivery in the presence of such a continuing programme (using the assumptions that each trained staff member is entitled to six training days per year) with appropriate travel and course fees. For a modernised service, audiology would require an annual training budget of some £165,000 across the twelve NHS Boards.

11.3.3 Implementation of the Good Practice Guidance for Hearing Aid Fittings

Because of the absence of any detailed information regarding the protocols currently in place for matching hearing aid technology to need and detailed breakdown of hearing aid expenditure, a number of assumptions have to be made when attempting to cost the implementation of the hearing aid hardware costs of the Good Practice Guidance. Making some estimates (based on current research) of the proportion of patients who might require different hearing aid features, aligning those features to hearing aids on the Scottish Healthcare Supplies contract and conducting a sensitivity analysis around those assumptions leads to the estimates and their upper and lower bounds shown in Table 11.4. Details of the sensitivity analysis can be found in Appendix A10.

Table 11.4

Cost estimates (and ranges) for implementation of the hearing aid aspects of the Good Practice Guidance for Hearing Aid Fittings

	Cost of New Hearing Aids		
	Overall Cost		Increased Cost From Current Level
Implementation of Good Practice Guidance to match device to need	Estimate Lower Bound Upper Bound	£4,140,000 £3,610,000 £4,670,000	£1,640,000 £1,110,000 £2,170,000
Implementation of Good Practice Guidance as above, **and** offer bilateral fittings	Estimate Lower Bound Upper Bound	£6,290,000 £5,100,000 £8,000,000	£3,790,000 £2,610,000 £5,500,000
Implementation of Good Practice Guidance & offer bilateral fittings as above, **and** offer ITE	Estimate Lower Bound Upper Bound	£8,170,000 £6,640,000 £10,400,000	£5,680,000 £4,140,000 £7,910,000

The best estimate of the cost of implementing the Good Practice Guidance for device need is £4.14 million, with a range of £3.61-£4.67 million. The second numeric column of Table 11.4 shows the increase in the hearing aid budget that would be required over and above the baseline in Table 11.1. The implementation of the matching of hearing aid features to audiological need assumes the current penetration of bilateral fittings and the current available choice of an ITE as opposed to a BTE fitting.

Table 11.4 also contains estimates for the cost implications of offering bilateral fittings to all patients. Current research suggests that in such a scenario 65% of patients will take up the offer. The sensitivity analysis encompasses a range from 50% to 80% for take-up.

Inspection of the data on the Scottish Healthcare Supplies contract suggests that, when matched feature-for-feature, ITE hearing aids have a cost penalty of some 30%. Thus, the data in Table 11.4 suggests that implementing the Good Practice Guidance for matching technology and offering bilateral fittings has an estimated increased cost of £3.79 million (with a range of £2.61-£5.5 million), and that complete implementation in the technological domain, including offering ITE hearing aids, has an increased cost estimate of £5.68 million.

The above figures refer only to new hearing aids. The repairs to existing aids form a part of the overall supplies budget (Table 11.1) and more expensive devices will

have greater repair costs. It is likely that the figures in Table 11.4 will under-estimate the implications of implementing these aspects of the Good Practice Guidance.

11.3.4 Information Technology Systems

There are two comprehensive information technology (IT) patient management systems available on the contract from Scottish Healthcare Supplies. Costs of the implementation for these are shown in Figure 11.5.

Table 11.5

Implementation and ongoing costs for IT facilities throughout Scotland under current staffing levels and for staffing Scenario 1 in Section 11.2.

		IT System 1	IT System 2
Current Staffing	Year 1 Costs	£989,000	£652,000
	Ongoing Costs	£220,000	£289,000
Staffing Scenario 1	Year 1 Costs	£1,156,000	£778,000
	Ongoing Costs	£254,000	£347,000

Assumptions underlying these costings include simultaneous access by each member of staff to the IT system, but take no account of access at base and peripheral sites. These two assumptions are in opposite directions, as not all staff will require simultaneous access, but some facilities will need to be duplicated when sites are geographically distributed. The range of data also take account of the 33% projected increase in staff levels required to deliver a modernised hearing aid service under Scenario 1. While the two IT systems have different cost structures for set-up and ongoing costs, over a five year period they both imply expenditure of approximately £1.9 million at current staffing levels and £2.2 million for staffing Scenario 1.

11.3.5 Equipment

The data in Table 11.6 show the investments that would be required to bring the equipment levels in Scotland up to those recommended by the BAAP.[5]

Table 11.6

Estimated costs to bring equipment levels in Scotland up to those recommended by BAAP.

Routine Audiological Equipment	£471,000
Specialised Diagnostic Equipment	£370,000
Video Otoscopy Equipment	£147,000
Total	£988,000

The data in Table 11.6 have been sub-divided into routine audiological equipment (audiometers, tympanometers, real ear measurement systems, etc), specialised diagnostic facilities (auditory brain stem response and oto-acoustic emission testing) and video otoscopy systems for the widespread implementation of direct referral. They do not include any of the BAAP recommendations associated with UNHS or tinnitus and balance services.

11.3.6 Universal Newborn Hearing Screening

The two pathfinder sites in Lothian and Tayside for UNHS have been used to project costs for the roll-out of UNHS to all of Scotland.

Table 11.7

Projected costs for the implementation of UNHS throughout Scotland.

	Universal Newborn Hearing Screening
Costs in Year 1	£3,280,000
Recurrent Costs	£1,690,000

The data include the set-up costs in terms of equipment and the additional staff levels that would be required to cope with the increased workload, as well as for staff to conduct the screening itself. It should be acknowledged that the two pathfinder sites probably start from a higher baseline of staffing and service provision than other children's services in Scotland. Therefore Table 11.7 will underestimate the eventual costs of implementation of UNHS throughout Scotland.

11.3.7 Services for Tinnitus and Balance Problems

As has been outlined in Section 6, services for balance problems elsewhere in the UK are being centralised in specialist centres. Population projections suggest that Scotland would require three centres to meet patient needs. First year and recurrent costs are shown in Table 11.8 (the table also includes figures for two and four centres throughout Scotland). The table includes additional diagnostic and therapeutic equipment as well as additional staff costs.

Table 11.8

Projected costs for specialist balance centres throughout Scotland

	Number of Specialist Balance Centres in Scotland		
	2 Centres	3 Centres	4 Centres
Costs in Year 1	£1,430,000	£2,140,000	£2,850,000
Recurrent Costs	£1,000,000	£1,500,000	£2,000,000

Table 11.8 contains estimates of the additional specialist and counselling staff to provide comprehensive tinnitus services throughout Scotland, either on the basis of specialist centres or via management clinical networks. These estimates take no account of geographical constraints.

Table 11.9

Projected costs for specialist tinnitus services throughout Scotland.

	Specialist Tinnitus Services for Scotland
Recurrent Costs	£222,000

11.4 Implications for Other Agencies

It has been noted that agencies other than NHS services make essential contributions to services for hearing-impaired people. Improvement in services will have inevitable resource consequences for these agencies. Those consequences will include both staff levels, staff skills and budgets. Although outwith the remit of this report, such consequences for social work and education services will be substantial.

11.5 Summary

This report has not attempted to provide any costing for the provision of adequate accommodation and test facilities for audiology in Scotland. Given the very large number of base, and particularly peripheral, sites this would necessitate a very comprehensive programme of site visits and project plans. However, given the inadequacies that have been identified, it can be confidently predicted that action to bring the accommodation facilities up to an appropriate standard will be substantial for each NHS Board. NHS Boards are recommended to review their current pattern of accommodation and facilities and therefore it would be premature to attach any particular costings at this stage.

Throughout this section, we have noted that all of the costing assumptions are likely to under-estimate the resource requirements for implementation. Nevertheless, integration across a five year period for all of the implementations yields an additional investment in audiology services ranging from £30 million to £50 million.

Overall, the costings in this section allow some appreciation of the likely financial implications of some of the major aspects of the report's recommendations. Clearly, issues of prioritisation and phasing will take into account both the costs, implementation difficulties and expected benefits.

Recommendation 41

The Scottish Executive Health Department should ensure that any new initiatives and resources flowing from the recommendations in this report are tied to an audit of the expenditure and its effectiveness.

12. GLOSSARY OF TERMS

Acoustical hearing aid	A personal hearing aid which delivers amplified sound to the ear canal.
Acquired hearing loss	Hearing losses not present at birth.
Aetiology	The disease or condition which leads to a symptom.
Amplitude compression	Level dependent processing to amplify quiet sounds by more than loud sounds, and limit maximum output of a hearing aid.
Analogue hearing aids	Hearing aids whose electronics use conventional analogue processing and are not computer controlled in any way.
Assistive listening devices	Devices such as telephone amplifiers, television amplifiers, door bells etc to aid communication and alerting, other than personal hearing aids.
Audiogram	Clinical plot of threshold of hearing as a function of frequency to characterise hearing.
Audiometry	Testing to measure hearing thresholds.
Auditory Brainstem Evoked Response	Electrical responses arising from the auditory brainstem associated with sound stimulation. Used for assessing hearing in children and for neurological diagnosis.
Autosomal recessive	An inherited condition where the same abnormal gene carrying the mutation is inherited from both parents.
BAAP	British Association of Audiological Physicians
BAHA	Bone anchored hearing aid
BAHOH	British Association of the Hard of Hearing
Balance disorder	Symptoms of dizziness or unsteadiness often resulting from inner ear or other problems.
Behind-the-ear (BTE) hearing aid	Hearing aids which fit behind, rather than in the ear - sometimes referred to as post-aural.
Better ear hearing threshold average	Average hearing thresholds in the better ear over the frequencies 500, 1,000, 2,000 and 4,000 Hz.
Bilateral hearing aid fitting	Fitting of hearing aids to both ears of a patient.
Bone anchored hearing aid (BAHA)	Hearing aid which delivers mechanical vibrations direct to the skull via an embedded titanium screw.
British Sign Language (BSL)	Form of non-verbal communication appropriate for profound hearing losses.
BTE	Behind the ear (fitting of hearing aid)
CAPD	Central Auditory Processing Disorders
CIC	Completely in the canal (fitting of hearing aid)
Cochlear implant	Implanted device which with an external processor deliver electrical stimulation directly to the cochlea.
Cognitive behavioural therapy	A form of psychological therapy whereby the person's behaviour is modified as a result of understanding and positive thought.
Co-morbidity	Occurrence of more than one disease or condition at the same time.
Completely-in-the-canal hearing aid (CIC)	Hearing aids which are sufficiently small to fit in the external ear canal.

Conductive hearing loss	Hearing loss resulting from middle or external ear problems.
dB HL	Decibels hearing level – the clinical unit of hearing threshold.
Digital hearing aids	Hearing aids whose internal electronics represent sound in completely digital form.
Digitally programmable hearing aids	Analogue hearing aids which can be controlled by a digital computer.
Direct audio input	Bypassing of the microphone on a hearing aid by direct coupling to a device such as a television.
Direct referral	Referral by GPs direct to audiology departments without any intervening consultation with an ENT or other medical specialist.
Directional microphone	Microphones whose sensitivity is greater in one direction (usually straight ahead) than another.
Distraction test	A behavioural test of children's hearing suitable for babies of six to nine months of age.
Dynamic range	The range between threshold of hearing and threshold of uncomfortable listening. For sensorineural hearing losses usually smaller at high rather than low frequencies.
Earmould	A plastic structure for coupling a hearing aid to a patient's ear canal.
Electoacoustic testing of hearing aid	Standardised procedures for testing and representing the amplification characteristics of a hearing aid.
Electrophysiological assessment	Assessment of hearing function which uses recordings of electrical activity to represent and assess auditory capabilities.
ENT	Ear, Nose and Throat
Eustachian tube dysfunction	Blockage or malfunction of the Eustachian tube between the middle ear and vocal cavities.
External ear canal	The canal between the eardrum and the pinna.
Feedback	Leakage of sound from the output of a hearing aid to the microphone resulting in unstable oscillation (whistling).
FM technology	Radio technology to couple devices (e.g. remote microphones) to hearing aids.
GHABP	Glasgow Hearing Aid Benefit Profile
Glue ear	Common name for otitis media with effusion.
GP	General Practitioner
HDL	Health Department Letter
Hearing aid verification	A process to check that the predicted characteristics of a hearing aid do conform to what actually happens in a patient's ear.
Hereditary hearing impairment (HHI)	A hearing loss which is inherited from one or both parents. The parents may not be affected. The hearing loss may not be present at birth.

HUI3	Health Utilities Index Mark 3
Hyperacusis	The perception of quiet or moderately loud sounds as unpleasantly loud.
Hz	Unit of frequency.
IDT	Infant distraction test
Incidence	Occurrence of new cases in a given unit of time.
Inner ear	The structures of the ear beyond the middle ear including the cochlea.
In-the-ear or ITE hearing aid	A hearing aid which is located in the patient's ear canal rather than behind the ear.
IOI-HA	International Outcomes Inventory for Hearing Aids
IT	Information Technology
Laryngology	Study of disorders of the throat.
Lip reading	Understanding of speech by watching people's facial movements.
Lip speaking	Speaking in a manner that makes lip reading easier.
Loop system	A system to provide coupling via magnetic induction to a hearing aid rather than directly via a microphone.
Managed Clinical Networks	Systems whereby patients requiring specialist skills are either managed directly from specialist centres or their management is undertaken by local services and the quality of care is overseen by the network which includes specialists in the subject
Middle ear	The structures between the eardrum and inner ear.
Minimum masking level	The lowest level of a sound to mask out another sound.
Mixed hearing loss	Hearing loss involving contributions from both the middle and inner ear.
MRC	Medical Research Council
NDCS	National Deaf Children's Society
NHS	National Health Service
NHS Quality Improvement Scotland	A special Health Board formed in 2003 by the merger of 5 organisations including The Clinical Standards Board for Scotland.
Non-verbal communication	Communication by means other than spoken language.
NSD	National Services Division
Otitis media with effusion (OME)	Build up of fluid in the middle ear.
Otoacoustic emissions	Sounds measured in the ear canal as a result of an input sound as a method to assess cochlear function.
Otology	Study of the ear.
Otorhinolaryngogology	Study of the ear, nose and throat.
Otoscopy	Visual inspection of the external and middle ear.
Ototoxic drugs	Drugs affecting the function of the inner ear.
PASI	Paediatric Audiology Services Index
PCHI	Permanent childhood hearing impairment
Post-aural hearing aid	A hearing aid which is located behind the patient's ear.
Presbyacusis	Acquired hearing loss in older people.
Prevalence	Occurrence of a condition within a defined population.

Progressive hearing loss	Hearing loss which becomes worse with time.
PST	Persistent spontaneous tinnitus
Pure tone audiogram	Plot of hearing sensitivity as a function of frequency.
Real ear measurement	Measurement of the acoustical characteristics of hearing aids in patients' ears as opposed to standard acoustic couplers.
RHAD	Registered Hearing Aid Dispenser
Rhinology	Study of the nose.
RNID	Royal National Institute for Deaf People
RNTNE	Royal National Throat, Nose and Ear Hospital
SALT	Speech and Language Therapist
SCoD	Scottish Council on Deafness
Sense Scotland	Voluntary organisation which supports people with deaf blindness, sensory impairment, physical, learning or communication difficulties.
Sensorineural hearing loss	Hearing loss arising from defects in the inner ear, auditory nerve or brainstem.
SF-36	A generic quality of life questionnaire.
Social work services	Services for social care delivered by local authorities.
Targeted newborn hearing screening	Screening of hearing in newborn babies from at risk groups.
Threshold of uncomfortable listening	Lowest level sounds which cause discomfort.
Tinnitus	Sensation of buzzing or ringing noises in the head or ears
Tinnitus matching	Matching of an external sound to the perceived level and frequency of tinnitus.
TRT	Tinnitus retraining therapy
Tympanometer	Instrument for measuring the acoustical impedance of the middle ear.
UK	United Kingdom
UNHS	Universal Newborn Hearing Screening
Universal newborn hearing screening (UNHS)	Testing of all newborn babies for hearing problems.
Vestibular deficits	Deficits in the inner ear and central connections leading to balance problems
Vestibular function testing	Testing of the balance mechanisms in the inner ear and central connections.
Visual Reinforcement Audiometry (VRA)	Form of hearing testing for children which achieves co-operation by visual reward.
Watchful waiting	Monitoring of condition prior to intervention.
White noise generators	Noise generators used as part of tinnitus therapy.
WTE	Whole time equivalent

13. REFERENCES

1. Scottish Executive Health Department NHS HDL 19. 2001. Good practice guidance for adult hearing aid fitting and services.
2. Davis A. Epidemiology. *Adult Audiology*, London: Butterworth, 1996.
3. Davis A. Hearing in Adults. London: Whurr Publishers Ltd, 1995.
4. Government Actuarial Department. UK population 2002. www.gad.gov.uk/population/2000/scotland . 2002.
5. British Association of Audiological Physicians. Audiological medicine in the UK: A guide for users, commissioners and providers. 2002.
6. Fortnum H, Davis A. Epidemiology of permanent childhood impairment in the Trent Region, 1985-1993. *British Journal of Audiology* 1997;**31**:409-46.
7. Davis J, Elfenbein J, Schum R, Bentler R. Effects of mild and moderate hearing impairments on language, educational, and psychosocial behavior of children. *Journal of speech and hearing disorders* 1986;**51**:53-62.
8. Conrad R. The deaf schoolchild: language and cognitive function. London: Harper and Row, 1979.
9. Bamford J, Davis A. Conductive hearing loss associated with otitis media and it's sequelae. Hearing Screening. In David T, ed. *Recent advances in paediatrics* 17, pp 115-28. 1998.
10. Davis A, Wood S. The epidemiology of childhood hearing impairment: factors relevant to the planning of services. *British Journal of Audiology* 1992;**26**:77-90.
11. Browning G, Davis A. Clinical characterization of hearing of the adult British population. *Advances in Otorhinolaryngology* 1983;**31**:217-23.
12. Davis A. Epidemiological profile of hearing impairments: the scale and nature of the problem with special reference to the elderly. *Acta Oto-Laryngologica* 1991;**476**:23-31.
13. Davis A, Wood S, Healy R, Webb H, Rowe S. Risk factors for hearing disorders: epidemiologic evidence of change over time in the UK. *Journal of the American Academy of Audiology* 1995;**6**:365-70.
14. Haggard M, Gatehouse S. Candidature for hearing aids: justification for the concept and a two part audiological criterion. *British Journal of Audiology* 1993;**27**:303-18.
15. Gatehouse S. Glasgow hearing aid benefit profile: deprivation and validation of a client-centred outcome measure for hearing aid services. *Journal of the American Academy of Audiology* 1999;**10**:80-103.
16. Furlong W, Feeny D, Torrance G, Barr R. The Health Utilities Index (HUI) system for assessing health-related quality of life in clinical studies. *Annals of Medicine* 2001;**33**:375-84.
17. Barton G, Davis A. Hearing aid fitting: cost per QALY. Personal communication. 2001.

18. National Deaf Children's Society. Guidelines for the early identification and the audiological management of children with hearing loss. Volume IV, 1-24. 2000. London, NDCS. NDCS quality standards in paediatric audiology.

19. RNID. Best practice standards for adult audiology. 2002.

20. Moeller M. Early intervention and language development in children who are deaf and hear of hearing. *Paediatrics* 2000;**106**:E43.

21. Robinshaw H. Early intervention for hearing impairment: Differences in timing of communicative and linguistic development. *British Journal of Audiology* 1995;**29**:315-34.

22. Yoshinaga-Itano C. Benefits of early intervention for children with hearing loss. *Otolaryngologic Clinics of North America* 1999;**32**:1089-102.

23. Markides A. Age at fitting of hearing aids and speech intelligibility. *British Journal of Audiology* 1986;**20**:165-8.

24. Ramkalawan T, Davis A. The effects of hearing and age at intervention on some language metrics in a population of young hearing-impaired children. *British Journal of Audiology* 1992;**26**:97-107.

25. Armitage I, Burke J, Buffin J. Visual impairment in severe and profound sensorineural deafness. *Archives of Disease in Childhood* 1995;**73**:53-6.

26. SIGN. Diagnosis and management of childhood otitis media in primary care: a national clinical guideline. 2002.

27. Bamford J, Battersby C, Beresford D, Davis A, Gregory S, Hind S et al. Assessing service quality in paediatric audiology and early deaf education. *British Journal of Audiology* 2001;**35**:329-38.

28. Davis A, Bamford J, Wilson I, Ramkalawan T, Forshaw M, Wright S. A critical review of the role of neonatal hearing screening in the detection of congenital hearing impairment. *Heath Technology Assessment* 1997;**1**:1-125.

29. Dillon H. Hearing aids. New York: Thienne, 2001.

30. Gatehouse S. Electronic aids to hearing. *British Medical Bulletin* 2002;**63**:147-56.

31. Brooks D. Counselling and its effect on hearing aid use. *Scandinavian Audiology* 1976;**6**:101-7.

32. Davis A. Survey of hearing aid provision in England in 1997. 1998. Department of Health.

33. Technicians, Therapists and Scientist in Audiology. Criteria for direct referral. 1989.

34. Goldstein D, Stephens D. Audiological rehabilitation: management model. *International Audiology* 1981;**20**:432-52.

35. Stephens D. Rehabilitation and service needs. In Lutman M, Haggard M, eds. *Hearing Science and Hearing Disorders*, pp 283-324. London: Academic Press, 1983.

36. Cox R, Alexander G. The international outcome inventory for hearing aids (IOI-HA): psychometric properties of the English version. *International Journal of Audiology* 2002;**41**:30-5.

37. Kramer S, Goverts S, Dreschler W, Boymans M, Festen J. The international outcome inventory for hearing aids (IOI-HA): results from the Netherlands. *International Journal of Audiology* 2002;**41**:36-41.

38. Stephens D. The international outcome inventory for hearing aids (IOI-HA) and its relationship to the client oriented scale of improvement (COSI). *International Journal of Audiology* 2002;**41**:42-7.

39. Davis A, Stephens S, Rayment A, Thomas K. Hearing impairments in middle age: the acceptability, benefit and cost of detection (ABCD). *British Journal of Audiology* 1992;**26**:1-14.

40. Stephens S, Callaghan D, Hogan S, Meredith R, Rayment A, Davis A. Hearing disability in people aged 50-65: effectiveness and acceptability of early rehabilitative intervention. *British Medical Journal* 1990;**300**:511.

41. Gianopoulos I, Stephens D, Davis A. Follow up of people fitted with hearing aids after adult hearing screening: the need for support after fitting. *British Medical Journal* 2002;**325**:471.

42. Coles R. Tinnitus. In Stephens D, ed. *Volume 2: Adult Audiology*, Chapter 18 pp 1-34. Oxford: Butterworth Heinemann, 1997.

43. Heller M, Bergman M. Tinnitus aurium in normally hearing persons. *Annals of Otology*, Rhinology and Laryngology 1953;**62**:72-83.

44. Davis A. The prevalence of deafness and hearing impairment. In Graham J, Martin M, eds. *Ballantyne's Deafness*, pp 10-25. London: Whurr Publishers Ltd, 2001.

45. Rubinstein B, Osterberg T, Rosenhall U, Johnasson U. Tinnitus and cranio-mandibular disorders in an elderly population. *Journal of Audiological Medicine* 1993;**2**:97-113.

46. Davis A. The prevalence of hearing impairment and reported hearing disability among adults in Great Britain. *International Journal of Epidemiology* 1989;**18**:911-7.

47. Scottish Executive. Population demographics. www.scotland.gov.org . 2002.

48. Davis AC, Roberts H. Tinnitus and health status: SF-36 profile and accident prevalence. Reich GE, Vernon JA. 1996. American Tinnitus Association. Proceedings of the fifth international tinnitus seminar.

49. MRC Institute of Hearing Research. Epidemiology of Tinnitus in Adults. In Hazell J, ed. *Tinnitus*, Edinburgh: Churchill Livingstone, 1987.

50. Coles R, Davis A, Smith P. Tinnitus: its epidemiology and management. JH Jansen Danavox Jubilee Foundation. pp 377-402. 1990. Copenhagen. Presbyacusis and other age related aspects. Proceedings of the 14th Danavox Symposium.

51. Snashall S, Stephens S D G, Irwin J, Adams D, Luxon L, Batchelor L. Audiological medicine in the UK 2001. Snashall, S. 1-35. 2001. Prepared by The British Association of Community Doctors in Audiology and the British Association of Audiological Physicians, British Association of Audiological Physicians.

52. Baguley D, Boss M, Brow M, Buffin T, Coles R, Grimes S, Howard B, Hughes K, McKinney C, Messham E, Price K, Trowsdale E. Update on the management of tinnitus by audiologists. Prepared by the Clinical Guidelines Working Group of the British Tinnitus Association. 1-19. 1999. British Tinnitus Association.

53. Jastreboff PJ. Tinnitus and hyperacusis center. http://www.tinnitus-pjj.com/ . 2000.

54. Hallam R, Jakes S, Chambers C, Hinchcliffe R. A comparison of different methods for assessing the intensity of tinnitus. *Acta Oto-Laryngologica* 1985;**99**:501-8.

55. Hallam R. Living with Tinnitus. Wellingborough: Thorsons, 1989.

56. Jakes S, Hallam R, Chambers C, Hinchcliffe R. Matched and self reported loudness and tinnitus. *Audiology* 1986;**25**:92-100.

57. Hazell JWPH. Tinnitus retraining therapy information for all. www.ucl.ac.uk/~rmjg101/tin2.html. 2002.

58. Jastreboff P. Phantom auditory perception (tinnitus): mechanisms of generation and perception. *Neuroscience Research* 1990;**8**:221-54.

59. Jastreboff P. A neurophysiological approach to tinnitus: clinical implications. *British Journal of Audiology* 1993;**27**:1-11.

60. BAHOH. Proposals relating to staffing levels and minimum working practices in NHS audiology. 1990. British Association of the Hard of Hearing.

61. Baloh R. Dizziness in older people. *Journal of the American Geriatric Society* 1992;**40**:713-21.

62. Kroenke K. Symptoms in medical patients: an intended field. *American Journal of Medicine* 1992;**92**:1A35-65.

63. Stephens S. Auditory and vestibular rehabilitation in the adult. *Horizons in Medicine* 1990;**2**:220-8.

64. Luxon L. Vertigo in old age. In Dix M, Hood J, eds. *Vertigo*, Chichester: Wiley, 1984.

65. Yardley L. Vertigo and dizziness. London & New York: Routledge, 1994.

66. Yardley L, Luxon L. Treating dizziness with vestibular rehabilitation. *British Medical Journal* 1994;**308**:1252-3.

67. Luxon L, Davies R. Handbook of vestibular rehabilitation. London: Whurr, 1997.

68. Jacobson G, Newman C. The development of the dizziness handicap inventory. *Archives of Otolaryngology, Head and Neck Surgery* 1990;**116**:424-7.

69. Yardley L, Masson E, Verschuur C, Haake N, Luxon L. Symptoms, anxiety and handicap in dizzy patients: development of the vertigo symptom scale. *Journal of Psychosomatic Research* 1992;**36**:731-41.

70. Yardley L. Outcome measures for dizzy patients. 1998. Reading, British Society of Audiology. Balance Interest Group Document.

71. Cawthorne T. Vestibular injuries. *Proceedings of the Royal Society of Medicine* 1945;**39**:270-3.

72. Cooksey F. Rehabilitation of vestibular injuries. Proceedings of the Royal Society of Medicine 1945;**39**:273-8.

73. Brandt T, Daroff R. Physical therapy for benign paroxysmal positional vertigo. *Archives of Otolaryngology* 1980;**106**:484-5.

74. Epley J. The canalith repositioning procedure: for treatment of benign paroxysmal positional vertigo. *Otolaryngology, Head and Neck Surgery* 1992;**107**:399-404.

75. Davies R. Setting up a service. In Luxon L, Davies R, eds. *Handbook of vestibular function*, pp 136-42. London: Whurr, 1997.

76. Flanagan T. Jump starting your balance center. www.onbalance.com . 2002. NeuroCom International, Oregon.

77. Hall, M. Building a balance centre. www.onbalance.com . 2002. NeuroCom International, Oregon.

78. Audit Commission. Fully equipped. The provision of equipment to older or disabled people by the NHS and social services in England and Wales. Audit Commission. pp 1-103. 2000. Promoting independence.

79. Summerfield AQ, Marshall DH. Cochlear implantation in the UK 1990-1994: Main report. 1995. London, HMSO Books.

80. Hearing Aid Council. Code of practice, examinations and registration. 1999. Central Milton Keynes, Hearing Aid Council.

81. Proops D. The Birmingham bone anchored hearing aid programme: surgical methods and complications. *Journal of Laryngology and Otology* 1996;**BAHA Supplement**:7-12.

82. MacNamara M, Phillips D, Proops D. The bone anchored hearing aid (BAHA) in chronic suppurative otitis media. *Journal of Laryngology and Otology* 1996;**BAHA Supplement** :38-40.

83. Fortnum H, Summerfield A, Marshall D, Davis A, Bamford J. Prevalence of permanent childhood hearing impairment in the United Kingdom and implications for universal neonatal hearing screening: questionnaire based ascertainment study. *British Medical Journal* 2001;323:536-40.