

Hearing care in Finland



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Foreword

This report has been written by Member of the Board of the Finnish Audiological Society and professor, speech and language therapist Kerttu Huttunen (Abo Akademi University, University of Oulu and Oulu University Hospital). The Board of the Finnish Audiological Society sent it to NAS to describe the current state of hearing care in Finland. Special thanks to medical audiologist Antti Hyvärinen for the use of the data he collected concerning technical hearing care in the year 2013 in Finland. Additionally, medical audiologist Jukka Kokkonen, Head of the Board of the Finnish Audiological Society, is thanked for his calculation of indicators for technical audiology based on the survey of Antti Hyvärinen.

History of hearing care in Finland

In Finland, the first steps toward hearing care at a national level were taken in 1926 when the bilingual association *Huonokuuloisten Suojaamisyhdistys – Skyddföreningen för Lomhörda* was founded. Subsequently, another national association for Finnish speakers, *Suomen Huonokuuloisten Huoltoliitto* (later called *Kuulonhuoltoliitto* and currently called *Kuuloliitto; The Finnish Federation for Hard of Hearing*), was founded in 1930 (Kuuloliiton historia, 2009). A few years later, in 1935, a hearing aid ambulatory was established at the Clinic of Otorhinolaryngology at the University of Helsinki (it was in operation until 1956). In the same year, a national hearing screening of 400 000 school-age children was conducted. The same procedures that were used in that screening were also applied to screen for hearing impairment among soldiers who took part in World War II. In 1944, nearly all soldiers who experienced hearing impairment due to noise exposure during the war were examined and registered.

The Second World War hampered the importing of hearing aids to Finland, and the same import difficulty persisted after the end of the war. A law regarding care of the disabled was passed in 1946 (Invaliidihuoltolaki, 907/1946) to secure the economic situation of those who were handicapped during the war. This law also had wider effects as it improved the situation of persons with other disabilities. In 1951, a law (Invaliidirahalaki, 374/1951) that provided economic benefits to cover the expenses caused by disabilities was passed. After considerable technical developments in hearing instruments and the passing of a law concerning the (re)habilitation of the disabled, children's hearing aids and portable (body-worn) hearing aids became more generally available in the late 1940s. A gradual shift toward the use of behind-the-ear hearing aids took place during the 1970s.

The hearing centre at the Finnish Federation for Hard of Hearing was founded in 1956. The centre also had a technical laboratory, the operational model of which was adopted from Sweden and Denmark, and type approval and technical inspection of hearing aids were performed there (Kuuloliiton historia, 2009).

In the early 1960s, several associations for the parents of hearing-impaired children were founded to help the families learn to use signs and to enhance communication with each other. Since then, patient associations/user organisations have offered habilitation services, guidance and courses, information for parents and medical personnel, sign language courses and holiday activities. Many new services or intervention programmes have been imported to Finland by patient associations/user organisations, and this type of activity has supported the development of services that are provided by the public health care system (Linkola, 1991). During recent years, these support services have been gradually diminished or totally eliminated because the National

Slot Machine Association, which has financed and continues to finance many user organisations and other third-sector organisations, has reallocated the target areas of its financing.

During the 1970s, according to the model that had been previously adopted in Sweden and Denmark, a network of hearing centres located at university hospitals and the hearing units of regional hospitals was created. The Public Health Act of 1972 also enabled hospitals to provide short rehabilitation courses for the families of various patient groups. The first symposium on technical hearing care was organised in 1976.

The regional responsibilities and organisation of hearing care activities, including recognition of the need for technical and personnel resources, were defined in the recommendations (Kuulonhuolto, 1978) of the Working Group of the National Board of Health in 1978. These recommendations were updated in 1990. In the 1990s, restructuring of treatment responsibilities and a law related to the role of the *Social Insurance Institute of Finland* in financing rehabilitation moved the provision of speech and language therapy services mainly to primary health care (local health care centres) and private practitioners. The responsibility to coordinate children's habilitation has, however, remained at the specialised medical care level.

In Finland, the first cochlear implants were operated in the late 1980s. After a series of ten patients who received a single-channel implant in 1988, the first multi-channel cochlear implantations were performed in 1995 in adults and in 1996 in children with a profound prelingual hearing impairment.

The *Finnish Audiological Society* (Finlands audiologiska förening), which is a member organisation of the Nordic Audiological Society (home page www.say-ry.fi), was established in 1983 (Suomen audiologian yhdistys, 1993). It is the only multi-professional association for hearing care professionals in Finland. The first national multi-professional seminars in audiology and hearing care were started in 1980, before the official establishment of the Finnish Audiological Society, and since then, they have been run yearly in the form of national audiological seminars. In the 1990s seminars in technical audiology began, and the Finnish Audiological Society has also organised them on an annual or biannual basis. Many types of developmental and expert work have been carried out within the society. Additionally, the Finnish Audiological Society has actively interacted and cooperated with various constituents within the hearing care sector. It has also acted as an intermediary between hearing care providers and those responsible for organising the education of hearing care professionals in the state of Finland, the whole society, and internationally. Over the years, the number of members in the society has varied between approximately 220 and 250.

For audiometricians, there is one organisation (Audionomiyhdistys [Finlands hälsovårdarförbund FHVF rf/ Audionomförening rf] with 110 members (home page:). In the medical field, other expert/professional member organisations also exist. The members of these organisations include specialised and specialising physicians, such as the Otorhinolaryngological Society [Korva-, nenä- ja kurkkutaudit – pään ja kaulan kirurgia ry.], which has approximately 480 members (home page:

<http://www.orl.fi/>), the Finnish Audiological Physicians [Suomen audiologilääkärit ry.], Finland's phoniatricians [Suomen foniatriit – Finlands foniater ry.], which has 32 members (home page: <http://foniatriit.yhdistysvain.fi/>), and the Collegium ORL-HNS ry (no home page).

Current state of hearing care in Finland

Epidemiology

WHO defines hearing impairment as a $PTA_{0.5-4\text{ kHz}}$ (pure tone average over the frequencies of 0.5 to 4 kHz) of 25 dB or more in the better hearing ear. Permanent hearing impairment of 25 dB or more affects communication, working and other activities of daily living. However, the most commonly used definition of hearing impairment in Finnish health care and scientific research is currently that of the EU Working group (1996), which defines hearing impairment as a $PTA_{0.5-4\text{ kHz}}$ greater than 20 dB.

Based on the prevalence of hearing impairment that was found in a large population-based study (N = 3 518), approximately 15% of the Finnish population, that is, every seventh Finn, is estimated to have a $PTA_{0.5-4\text{ kHz}}$ of greater than 20 dB in the better hearing ear (Uimonen et al., 1999). Additionally, approximately 6% of those are estimated to require (re)habilitation with hearing instruments.

In Finland, one out of approximately every 1 000 newborns has at least a moderate hearing impairment (Karikoski & Marttila, 1995; Mäki-Torkko et al., 1998; Vartiainen et al., 1997). Genetic reasons are the most common cause of the impaired hearing. With the annual birth rate of approximately 60 000, one thousandth corresponds to 50 to 60 children. Based on the statistics of school authorities, approximately 3 000 children under 16 years of age or younger receive special education or special support for their learning because of a hearing impairment.

In adolescents, the most common cause of hearing impairments is noise exposure during leisure time. In a recent study (Savolainen et al., 2008), almost every fifth (19%) Finnish conscript examined (N = 1 213) had a hearing thresholds over 20 dB for at least one frequency, and 8% had tinnitus that was related to noise exposure. Hearing impairments in the working-age population are usually hereditary or are caused by noise exposure, diseases such as otosclerosis and Meniere's disease, or infections. The prevalence of Meniere's disease is estimated to be at least 43 cases per 100 000, with an average annual incidence of 4.3 per 100 000 in Finland (Kotimäki, 2003).

Hearing impairments are most prevalent among the elderly. In the sample of Uimonen et al. (1999), for example, two thirds of the hearing impairments were found in the oldest age group (55 years of age and older). More specifically, in a random cross-sectional sample derived from the population register, the prevalence of at least a mild hearing impairment was 7% among 45-year-olds (+/- 2 years), 16% among 55-year-olds (+/- 2 years), 37% among 65-year-olds (+/- 2 years),

and 65% among 75-year-olds (+/- 2 years) (Uimonen et al., 1999). In a sample of 54- to 66-year-old Finns (N = 850) who were also selected randomly from the population register, Hannula (2011) found that the prevalence of impaired hearing in the better ear was 27% (37% among males and 18% among females). Dual impairment (impairment of both vision and hearing) is also fairly prevalent among the elderly (Lupsakko, 2004). For example, out of the 601 persons who were 75 years of age or older in the city of Kuopio, 13% had functional visual impairment, 20% had functional hearing impairment and seven percent had impairments of both vision and hearing. Dual impairment was especially common among those over 85 years of age.

In Finland, there are no national registers from which to collect data regarding the overall prevalence of hearing impairment. However, some legislative-based registers continuously accumulate relevant information, such as reports of newborn anomalies and annual occupational noise-induced hearing impairment.

According to estimates and working conditions surveys, some 200 000–300 000 Finns, that is, approximately 25% of all workers, are exposed to sound levels of 80 dB(A) or more at work. The 80 dB(A) criterion corresponds to the lower safety limit of the European Noise Directive (2003). Among the noise-exposed workers, approximately 50 000 are exposed to impulse noise. The Finnish Institute of Occupational Health keeps a Finnish Register of Occupational Diseases (FROD). With an average of 1 000 new cases per year, noise-induced hearing impairment is the most common cause of recognised occupational diseases that are reported to this register. Approximately 50 to 70% of the suspected occupational noise-induced hearing impairments are confirmed (that is, recognised/verified to be caused by noise). Noise-induced hearing impairments are most prevalent among workers who participate in the manufacturing of pulp, paper, paper products and vehicles (Oksa et al., 2012). Due to a diminishing number of work places with high noise levels and better and more regular hearing protection, the number of new suspected and recognised occupational noise-induced hearing impairment cases has sunk to half of the numbers of 20 years ago. In 2010, a total of 1 546 cases of noise-induced hearing loss were suspected; this number is 8% less than that in 2009.

Tinnitus is often an unreported problem in cases of occupational hearing impairment. When a subgroup of 43% (N = 366) of the registered cases of occupational hearing impairment in the year 2000 filled out a self-report questionnaire, 87% of the respondents reported having tinnitus (Mrena et al., 2007).

Organisation of hearing care

According to legislation, the public health care sector is primarily responsible for hearing care, which mostly consists of specialised medical care in Finland. Approximately 200 different Finnish laws and acts regulate the provision of different services, rights and benefits for persons with

different health impairments, including impaired hearing. The relevant laws and regulations are highly distributed and therefore difficult for the patient/user of the services, his/her significant other, and health care and social work professionals to follow.

In providing rehabilitation services, the Finnish health and social care sectors are simultaneously multifaceted and fragmented. In Table 1, the main responsibilities of different sectors that provide rehabilitation services for adults are presented.

Table 1. Sectors and their roles in the Finnish rehabilitation system for adults (adapted from Paatero, Kivekäs & Vilkkumaa, 2001 and Rissanen & Järvisalo, 2001).

Organised by	Target group	Type of rehabilitation	Central content of rehabilitation
Public health care	Whole population	Medical	Assessment of the ability to function; rehabilitation assessment; assistive devices; rehabilitation guidance and courses; various therapies
Public social services	Whole population	Social	Support for housing, mobility and obtaining information; personal assistant services; social rehabilitation; recreation
Social Insurance Institute	Working-age population; those with severe limitations in participation; < 65 years of age and outside the labour market; long-term unemployed	Vocational, medical	Assessment of the need for rehabilitation; work experiments; rehabilitation provided in institutes; rehabilitation aimed at supporting the ability to work; assistive devices for studying and work; rehabilitation provided in and outside institutes for those with severe limitations in participation; vocational re-education; recreation
Accident and traffic insurance companies	Persons who are injured or disabled due to industrial accident or occupational disease or accident	Vocational, medical	Rehabilitation assessment; work and education experiments; vocational re-education; support for independent living and social activities for those with severe limitations in participation (e.g., assistive devices, dwelling repairs); support for the self-employed
Employee pension scheme	Retired persons; persons at risk of an incapacity to work	Vocational	Vocational rehabilitation (assessment, training and re-education)
Employment administration	Working-age population; those with severe limitations in participation who are within the labour market	Vocational	Career counselling; education and work experiments; financial support for employment; continuing education
State Treasury	Veterans with severe	Medical	Rehabilitation provided in and outside

	limitations in participation and their spouses		institutes
Public education system	Working-age youth with severe limitations in participation	Educational	Re-education; continuing education

In the public sector, fewer than 40 units provide hearing aid fitting. Among these, 25 are hearing centres or hearing stations; the rest are smaller units with, for example, only one otorhinolaryngologist. Cochlear implants are currently inserted and programmed only at university hospitals. However, because of the ever increasing patient pool, in some hospital districts, programming after the initial phases is slowly being partially moved to central and/or local hospitals. Table 2 summarises the main actors responsible for providing services to persons in need of hearing rehabilitation.

Table 2. Health care actors and their roles in Finnish hearing care for adults.

	Screening and prevention	Diagnostics	Care and (re)habilitation
Specialised medical care	Guidance and coordination of screening	Otological and audiological diagnostics	Medical, technical, social, psychological, audiopedagogical/ communication and vocational rehabilitation
Primary care	Performance of screening	Preliminary diagnostics	Primary otological care, communication therapy
Occupational health care	Performance of screening	Preliminary diagnostics	Primary otological care
Private sector		Otological and audiological diagnostics	Fitting of hearing aids and some assistive listening devices, communication therapy, occupational therapy, music therapy and physiotherapy
User/non-governmental organisations			Rehabilitation guidance and courses, peer group support

Hearing care professionals

Professionals who work in hearing care in Finland include medical audiologists, otorhinolaryngologists, phoniaticians, audiometricians, nurses, preparers of ear moulds, speech and language therapists, psychologists, rehabilitation counsellors/home habilitation workers, social workers, and (hospital) engineers and physicists.

Currently, there are approximately 340 (one per 16 200 inhabitants) otorhinolaryngologists, 20 (one per 273 600 inhabitants) medical audiologists, 25 (one per 218 900 inhabitants) phoniaticians, and 300 audiometricians who are of working age in Finland. Speech and language therapists (approximately 20–30), rehabilitation counsellors and social workers, and a small number of psychologists, engineers and physicists also work in hearing care.

Audiological physician (medical audiologist)

The subspecialty of audiology was established within the specialties of otorhinolaryngology and phoniatics in 1979. In 1990, an official board (Kuulonhuolto, 1990) estimated that there should be one medical audiologist at each central hospital to lead the hearing centre and that there should be one medical audiologist per 150 000 inhabitants. At the time, the calculated need for medical audiologists was 33. However, despite the clearly increased need for hearing care services, in Finland today, there are only approximately 20 medical audiologists who are currently of working age.

Medical audiology is a special competence, and in Finland, training in medical audiology involves all five medical faculties (a 5-year specialisation in Otorhinolaryngology or Phoniatics followed by 2+ years of specialisation in Audiology). In addition,

- the trainee needs to be a specialist in Otorhinolaryngology or Phoniatics; and
- the training must take place in the hearing (or hearing and balance) centre of a university hospital.

The structure and content of the programme are as follows:

- clinical training: minimum of 1½ years of full-day work in audiology, and ½ year of work as a phoniatician or otorhinolaryngologist;
- in-house theoretical education: several types of regular in-house meetings and consultation meetings with specialists;
- theoretical courses (in, e.g., medicine and technological audiology) provided by national and international professional and scientific societies: minimum of 60 hours; and

- written examination (the textbooks and scientific journals listed need to be read for the examination).

Medical audiologists are responsible for the diagnosis and (re)habilitation of patients with hearing impairment, tinnitus and vertigo. They also perform various expert work assignments. They design the audiological rehabilitation plan, lead the rehabilitation teams, master preventive actions in hearing care, assess the effects of care and rehabilitation through scientifically based/evidence-based methods, and work in the field of planning and developing.

Audiometrician (audionom)

Audiometricians are trained at one of four universities of applied sciences according to the workforce needs of public hearing care units and private companies. The training, which leads to a certificate, has not been organised on a regular basis. Part-time specialised studies of hearing care are spread over three semesters and consist of 60 ECTS points. The entrance qualifications include a Bachelor's degree in nursing or public health nursing from a higher vocational institute or university of applied sciences and two years of working experience as a nurse. The training consists of studies in nursing science, medicine, and technology and includes both theoretical and practical periods as well as a development project. Assessing hearing and balance, fitting hearing aids and some assistive listening devices, preparing ear moulds, some hearing aid repair, counselling, and providing information and rehabilitation follow-up are the central elements of an audiometrician's work.

Attempts to increase the training of audiometricians have been ongoing for more than a decade without positive outcomes despite frequent negotiations with the Ministry of Education and Culture, universities of applied sciences, and other institutions.

Most audiometricians work in public health care (in primary care in university and central hospitals), but they may also in rehabilitation and research institutes, private clinics, third-sector organisations, hearing aid retailers and as sole traders.

Speech and language therapists

Speech and language therapists have been educated at universities in Finland since 1948, but communication therapy services were not widely available before the 1970s. Since 1980, the education of speech therapists has included a higher university degree (Master of Arts degree; 300 ECTS points) and takes five to six years to complete. In total, 11 speech and language therapists specialised in audiology in 1975 by taking a one-year course. No formal training programmes have been available since then, although legislation has also allowed specialisation in auditory disorders for approximately 15 years. The (theoretical) possibility for speech and language therapists in the hearing sector to specialise in this manner is no longer available due to significant legislative

changes concerning many types of specialisations obtained in university and university of applied sciences programmes that took effect January 1, 2015.

Today, only approximately 20 to 30 Finnish speech and language therapists concentrate almost exclusively on persons with hearing impairment in their work. These professionals work at university and central hospitals, day-care centres that serve both hearing children and children with hearing impairments, and schools for children with communication and hearing impairments as well as in non-governmental or user organisations (Linkola 1991). The number of speech and language professionals who work with persons with hearing impairment on a daily basis is notably small in Finland compared to the number of experts, such as hearing pedagogues, in, e.g., Sweden and Norway. Only a fraction of adults with hearing impairment receive speech therapy services at the level of specialised medical care (Huttunen, 2010), and very few receive services at the primary or secondary level. At the specialised medical care level, speech therapists, audiometricians and habilitation workers have attempted to collaborate in a multi-professional effort to provide adults with information on how to ease communication.

Rehabilitation workers/counsellors

Rehabilitation counsellors are educated at universities of applied sciences and at one Finnish university. If they do not have the education of a rehabilitation worker, they are typically nurses, audiometricians, or social workers or have some other education within health or social care. There are no specialised programs of study on hearing care for rehabilitation counsellors.

Children's home habilitation counsellors (usually qualified nurses or pre-school teachers who specialise in hearing impairments) who provide regional habilitation guidance have been employed since 1966. Currently, rehabilitation counsellors work for either hospitals or third-sector organisations. Before the enactment of the law concerning rehabilitation guidance in 1984, activities were run only by third-sector organisations. Subsequently, the Finnish public health care system has been responsible for organising the counselling, guidance and promotion of the social functioning of the hearing impaired.

The rehabilitation counsellor is a member of the university or central hospital team who coordinates the rehabilitation of the patient/client and who serves as a link between the patient/client and their significant others and the employer, employment authorities, social sector, municipality of residence, Social Insurance Institute, and (re)habilitation and educational systems for children and students. Rehabilitation counsellors, of which there are approximately 20 to 30 in Finnish hearing care, make home, day care, school and work place visits; assess the need for and fit assistive listening devices; help improve acoustics if needed; assess hearing instrument users' ability to cope with/at work; provide information regarding education and financial support possibilities; educate employers about hearing- and noise-related issues; and lecture at

rehabilitation guidance courses (Kokko & Voltti, 2012). Because speech and language therapy services for adults have been very limited, the role of the rehabilitation counsellor has provided essential support to adults.

Other professionals

Like speech and language therapists and rehabilitation counsellors, social workers, psychologists, engineers, and physicists do not have the ability to specialise in audiology/hearing care during their studies.

Hearing care of persons 18 years of age and older

Medical perspective

Screening is a function of hearing care. Universal neonatal hearing screens take place at all Finnish maternity hospitals, and hearing screenings of children younger than school age are conducted at nationally fixed intervals at well-baby clinics. School-aged children and adolescents also take part in a national hearing screening programme with fixed intervals at their school or place of study. Conscripts and those who are exposed to noise at work are also regularly screened according to a standard protocol (Närkiö-Mäkelä, 2011; Terveystarkastusohje, 2012). Persons with the so-called hearing class III (high-frequency hearing impairment that starts at 3 kHz) and those with a rapidly progressing or other atypical hearing impairment that differs from noise-induced hearing impairments are recommended to be examined by an otorhinolaryngologist. Rehabilitation is usually initiated only at an advanced age, when the effects of presbycusis and noise-induced hearing impairment are additive. However, the hearing of the elderly is not screened in Finland.

Since March 2005, Finnish legislation has included maximum wait times to access non-urgent health care. These limits were unified within the Health Care Act (Terveystarkastuslaki, 2010), which specifies that an individual with a non-urgent medical problem must have first contact with primary health care within three days, and a referral to specialised health care must be processed by the primary care provider within three weeks. Additionally, any examinations and consultations must be carried out within three months, and any necessary treatment must be initiated within six months. These time limits are closely followed by the state, and high monetary sanctions to medical care units follow if the limits cannot be kept.

Diagnostic examinations of noise-exposed workers take place either through public health care (at central and university hospitals) or through the private sector. For all patients, a physician's

referral from primary health care, accompanied by an audiogram, is required for further examinations through public specialised health care.

When the need for rehabilitation of a person with hearing impairment is assessed, pure tone and speech audiometry are performed. If amplification seems likely to be needed, loudness discomfort levels are also measured. If the patient is a student or an adult of working age, he/she always has the option to make an appointment with a physician at 20 of the 22 possible hospitals; appointments at the other two hospitals are available only if it is deemed necessary based on the referral. For retired persons, an appointment with a physician can always be obtained at 16 of the 22 hospitals (Hyvärinen, 2014).

Technical perspective

According to current Finnish recommendations, (Sosiaali- ja terveystieteiden ministeriö, 2005), an adult is eligible to be provided with (a) hearing aid(s) if he/she has a hearing impairment that causes functional limitations and if he/she is motivated to use (a) hearing instrument(s). The hearing impairment also must not be treatable with an operation or there must be a lack of motivation or sufficient grounds for an operation. Depending on the situation of the adult patient, the criterion for the recommendation for a hearing aid fitting is a better ear hearing level equal to or greater than 30 to 40 dB over the frequencies of 0.5–4 kHz (Sosiaali- ja terveystieteiden ministeriö, 2010), although there are indications that this criterion is too conservative (Hannula & Mäki-Torkko, 2013). In special situations, the worse ear hearing level can be used as the basis for hearing aid fitting. A lower limit (30 dB) is followed if the adult needs hearing aids for their studies or at work. The aim is to obtain binaural hearing (that is, to fit hearing aids bilaterally).

In 2013, approximately 28 000 persons were fitted with (a) hearing aid(s) in the public sector (Hyvärinen, 2014). These data are based on information obtained from 22 hospitals, but in many hospitals, it was not possible to obtain reliable figures; therefore, estimates were provided instead. Additionally, some hospitals answered only some of the questions that were asked. Among all of the types of hearing instruments that are fitted in Finland, instruments other than behind-the-ear hearing aids comprise less than one percent of all instruments fitted (Huttunen, 2015). According to the survey conducted by Hyvärinen (2014), a little over half (56%) of all fittings in 2013 involved first-time hearing aid users, and 44% were renewals. Students or adults of working age comprised one out of every five of all hearing aid fittings, while retired persons comprised four out of five. Out of the hearing aid fittings of students or adults of working age, an average of 67% were bilateral. Among the retired persons, an average of 31% received two hearing aids.

Hospitals can purchase hearing aids from three retailers (Hyvärinen, 2014). In some places, the most important models are available in the hospital for trials, and the hearing aids (almost exclusively those included in a contract that was signed after competitive bidding) are then ordered as needed from the retailers. In other places, certain models are ordered to fulfil the anticipated need over a time period ranging from two months to four years (Huttunen, 2015).

To control the quality of hearing aid fitting, 77% of the 22 hospitals reported using interviews; 27%, sound field measurements; 27%, Real Ear Measurements (REM), and 5%, a questionnaire. In 18% of the hearing care units, no system was used to evaluate the success of audiological management (Hyvärinen, 2014).

Those who receive (a) hearing aid(s) for the first time usually have three appointments (in few hospitals, only two), while those who are receiving hearing aid renewal have one or two appointments (Laitakari & Nuojua, 2011). The third appointment is usually a follow-up visit that is generally conducted one to two months after the fitting. There are no reliable data regarding the

number of appointments related to hearing aid fittings that occur each year in Finland. After the fitting process, it is the responsibility of the hearing instrument user to seek help if problems arise. Nearly all specialised medical care level hospitals have trained the local health care contact persons who provide primary care in their service area to provide basic information and help to hearing aid users. This has been one way of lowering the costs of specialised medical care.

Reliable data regarding the number of fittings for assistive listening devices fitted was not available. Altogether, 151 cochlear implants were inserted in Finland in 2013, but the hospitals did not specify how many were implanted in adults (Huttunen, 2015). However, approximately 20 to 30 children are known to receive cochlear implants each year in Finland, most of them bilaterally.

Communication and psycho-social perspective

Adults with impaired hearing receive notably limited speech and language therapy services in Finland. Services basically include assessment at the specialised medical care level. Those with a sudden hearing impairment and/or who received (a) cochlear implant(s) may also receive a very short period of therapy that is provided primarily through the private sector. According to a national survey (Huttunen, 2010), the most typical adults assessed are those whose hearing has degraded to the degree that speechreading is needed and those who are cochlear implant candidates or who have received one. Less than one-fifth of the working time of speech therapists at the specialised medical care level can be allocated to provide therapy for adults. A short therapy period is most commonly provided to those who received (a) cochlear implant(s) and to those who experienced a gradual or sudden impairment or loss of hearing and are not helped by hearing aid use or are unable to cope in their working life (Huttunen, 2010). Speech therapists also work at rehabilitation courses organised for adults with impaired hearing.

Rehabilitation courses or information days for adults with impaired hearing are organised in 60–75% of the Finnish public hearing care units (Huttunen, 2010; Laitakari & Nuojua, 2011; Niemensivu, 2015). If a hospital is not able to organise a course of its own, hearing instrument users are encouraged to take part in courses organised by other hearing centres or third-sector organisations.

Based on clinical studies that included information on the possession of hearing aids, it has been estimated that only one percent of Finns had a hearing aid at the beginning of the millennium (Barton et al., 2001). According to a national health survey that also included the use of assistive devices among the elderly, 7% of men and 3% of women aged 65 to 74 years reported using a hearing instrument in 2011 in Finland (Hurnasti, Sainio, Aromaa & Koskinen, 2012). Among those aged 75 and older, the figures were 21% and 16%, respectively. Non-use of hearing aids threatens the efficacy of care and is often related to psycho-social aspects and the support received. Reports of the use and non-use of hearing aids have varied across Finnish studies. Differences in the results

may be caused by variation in the ages, hearing thresholds, types of hearing impairment of those included in the study samples as well as the level of technical features and usability of the hearing instruments. According to a report by Sorri, Luotonen & Laitakari (1984), in 1983, 57% of hearing aids, all analogous at that time, were used regularly two years after their fitting, but almost one-fourth of hearing aids (23%) were not used by the retired patients. However, in a study conducted approximately 20 years later with the same methodology and a similar target group, only 5% of the hearing aids were used only seldom or never, and 57% of the hearing devices were in regular use. In the latter study, the mean age of the patients (N = 150) was 74 years (min 46, max 91), and mean BEHL_{0.5-4 kHz} at the time of the hearing aid fitting was 41 dB (Vuorialho, 2006). The high rate of hearing aid use was related to an extra follow-up procedure (home visit) that was conducted six months after the hearing instrument fitting.

Other studies have reported higher rates of the non-use of hearing aids. For instance, Lupsakko, Kaukiainen and Sulkava (2005) studied 601 people who were 75 years of age or older and found that 25% of those interviewed by a nurse did not use their hearing aids at all. Non-use was associated with lower incomes, a decline in cognitive or functional capacity, and broken hearing aids. Patients who were unable to handle the device due to impaired vision and/or fine motor function were also less likely to use their hearing aids. Salonen et al. (2013) reported that total non-use was 11% among the elderly and that 20% of the hearing aids were used only seldom. Fit, comfort and difficulties in maintaining the hearing aid were the most common reasons for non-use. Kettunen (2013), who studied approximately 100 persons aged 65 and older who had received their first hearing aid(s) mon- or binaurally, obtained usage data directly from the hearing aids. He found that 22% of the participants used their hearing aid(s) at least eight hours a day, but 20% used it/them less than one hour per day. The mean duration of hearing aid use per day was approximately five hours. Those who identified themselves as hearing impaired used their devices more than others and also subjectively reported a greater benefit of their use. These figures provide a direction toward which to adjust Finnish hearing care practices and demonstrate the need for even stronger multi-professional teamwork.

Financing of hearing care

Employers are obliged to organise preventive occupational health services for their employees, and these services can be bought from both the public and private sector (Social Insurance Institution, 2014). Employers can pay for these services directly or by purchasing insurance from insurance companies. Diagnostic examinations of noise-exposed workers are also paid for by the employer's insurance company.

Everyone who is covered by the Finnish social security insurance can receive the rehabilitation that is offered by the public health care system free of charge or for nominal outpatient charges (Laki sosiaali- ja terveydenhuollon asiakasmaksuista, 1992). *The municipality of residence* finances hearing instruments and assistive listening devices (the device itself along with assessment of its need and fitting, guidance and repairs) for use at home and at the lower grades of school. These devices are free of charge and loaned to the user. When they are not needed anymore, the hearing instruments and assistive listening devices are expected to be returned to the health care unit where they were received. Housing, technical adjustments required for home mobility and assistive listening devices, habilitation guidance and courses, and a personal assistant are also provided by the municipality of residence. The principles applied in the granting of the assistive devices vary between hospitals and municipalities (Kentala, 2008).

Currently, due to a severe lack of hospital personnel resources, some hospitals need to buy a considerable number of audiometric examinations and adult hearing aid fittings from private companies. In such cases, the services are also paid for with tax revenues; that is, to buy the services they cannot provide themselves, hospitals use funds they obtain from the municipalities they serve. According to a national survey conducted by Hyvärinen (2014), today, every fourth adult fitted with (a) hearing aid(s) receives (a) hearing instrument(s) through the private sector, and public health care (that is, municipalities) pays for the expense.

The Social Insurance Institution provides financial support and covers the costs of interpretation services and of travelling between home and health care units as well as some rehabilitation costs (e.g., private speech and language therapy) for individuals with severe restrictions in activities and participation. For youth and adults, the Social Insurance Institute covers assistive listening devices that are needed for studies and at work and pays for re-education, especially for young students (Mustaniemi, 2012). The *employee pension scheme* also finances vocational re-education. Additionally, *employment authorities* may finance some assistive listening devices and technical changes in work facilities (Kentala, 2008).

In certain cases, the *State Treasury* and *insurance companies* may also pay for hearing aids (and hearing aid batteries) and assistive listening devices that are fitted either through public health care or in the private sector. In the case of accidents, for example, insurance companies cover the costs of vocational re-training (Mustaniemi, 2012) depending on an individual's work history.

An individual can also use the services of the private sector if s/he has insurance or is willing to *pay for services him/herself*. Private companies provide hearing aid fitting, and if the user chooses to use their services, he/she pays the full price of the hearing aid(s) along with any fitting/medical fees. He/she can obtain a refund from the state (Social Insurance Institute) for a portion of the medical fees but not for the hearing aid(s) itself.

The total expenditure on Finnish hearing services was estimated to be approximately 34 million € at around the year 2000 (Barton et al., 2001). As part of these hearing services, an adult hearing aid fitting in Finland was 38% more expensive than in Denmark and 212% more expensive than in

the United Kingdom (HIA, 2001) at the beginning of the present millennium. However, it is difficult to directly compare the estimated costs in the countries mentioned above. The number of hearing aids fitted in other Nordic countries and in the UK was up to 4-fold greater than that in Finland; approximately 3.5% of the UK and Danish population were estimated to have (a) hearing aid(s) at that time, while the percentage of Norwegians was approximately 3% and of Finns, only 1% (Barton et al., 2001).

In the study of Vuorialho (2006), which included one Finnish central hospital and one university hospital in the year 2000, the combined cost of a typical hearing aid and hearing aid fitting (N = 128) was reported to be approximately 900 €. Based on the number of hearing aids (15 000, that is, approximately 2.7 hearing aids per 100 000 inhabitants) that were fitted annually at the beginning of the present millennium in Finland, the direct costs of hearing aid fitting would have totalled approximately 14 million € at that time. Approximately 10–15 years ago, the price of a hearing aid accounted for slightly less than half of the total hospital costs in Finland, and the costs of the audiology personnel made up roughly one-third of the overall costs.

The expenses associated with hearing aid fittings have, however, changed from those of approximately 15 years ago due to a reduction in the cost of hearing instruments. Hearing aids (including the cost of an ear mould) currently cost, on average, 200–300 € each (Huttunen, 2015; Hyvärinen, 2014). More sophisticated, and therefore more expensive, hearing aids are fitted if the user's work or school circumstances warrant such an upgrade.

Finnish legislation currently requires hospitals to participate in competitive bidding for the services and products they buy. The national electronic platform Hilma – julkiset hankinnat – is used to organise the competitive bidding (Hilma, 2015). Hearing aids are currently bought by coalitions of several larger hospitals or at the level of university hospital service areas. Competitive bidding has led to drastically lower hearing aid prices, up to 50% lower than the previous level. However, it may still be more expensive for the municipalities to buy the services from the private sector than to organise the audiological examinations and hearing aid fittings through public health care because the contracts may not include, for example, secretarial work (which the hospitals have to organise themselves) (Lohjan sairaanhoitoalueen lautakunta, 2012).

User organisations/third sector

The majority of the third-sector organisations are primarily financed by The National Slot Machine Association (RAY), but many also receive funding from municipal social services, various ministries, and the government-owned Finnish National Betting Agency.

Kuuloliitto (Finska hörsselförbundet rf; The Finnish Federation of Hard of Hearing), home page: <http://kuuloliitto.fi/>; approximately 16 000 members - member organisation of NAS. Serves both children and adults who have mild to profound hearing impairment. Is primarily focused on spoken language but also offers, for example, courses in sign-supported Finnish. Provides rehabilitation courses, peer support groups, rehabilitation guidance and information about the use of hearing instruments. Offers possibilities for recreation and supervises the interests of hearing instrument users.

Kuurojen liitto (Finlands dövas förbund rf; Finnish Association of the Deaf), home page: <http://www.kuurojenliitto.fi/>; approximately 4 100 members - member organisation of NAS. Represents sign language and Deaf culture, provides assistive devices, education and courses, information, recreation, cultural services and development projects.

Svenska hörsselförbundet rf, home page: <http://www.horsel.fi/start/>; approximately 3 400 members - member organisation of NAS. Provides information, courses and supervision of the interests of Swedish-speaking hearing instrument users in Finland.

Kuurosokeat ry (Dövblinda rf; The Finnish Deaf-Blind Association), home page: <http://www.kuurosokeat.fi/>; approximately 400 members - member organisation of NAS. Mainly sign language- and Deaf-blind-culture-oriented. Provides rehabilitation, communication, recreation and housing services for approximately 800 Deaf-blind persons.

Kuurojen palvelusäätiö (Dövas Servicestiftelse rf; The Service Foundation for the Deaf), home page: <http://www.kuurojenpalvelusaatio.fi/en/>; approximately 350 members and approximately 1 000 clients receiving services - member organisation of NAS. Supports the use of sign language in communication. Provides rehabilitation and housing services, home services in sign language, courses, recreation, preparation for work and work possibilities.

Hörseltjänst rf i Finland/Föreningen hörseltjänst rf, no home page - member organisation of NAS.

Future views

According to population forecasts in Finland, the proportion of persons aged 65 or over will increase from 18% in the year 2012 to 26% by the year 2030 and 28% by the year 2060 (Official Statistics of Finland, 2012). The number of potential hearing aid users will therefore increase by approximately seven-fold by the year 2020 compared that around the year 2000. At the same time, the dependency ratio will weaken; there will be more and more elderly citizens relative to the size of the working-age population.

Hearing is crucial in an information- and communication-based society, and hearing rehabilitation should be more highly prioritized than it is today. Already we have seen and will continue to see drastically more of the following in the near future:

- An increasing number of people, especially the elderly, in need of hearing care.
- The forthcoming new technical solutions in hearing care will most likely be more expensive than traditional ones, leading to additional increases in costs.
- Due to an increasing number of patients, there will be an increase in personnel costs, in the form of the need for more staff members in public health care that provide hearing services, and/or an increase in the costs of outsourcing services related to hearing aid fitting and other measures.
- Local personnel shortages are already currently severe, and due to retirement, personnel resources will diminish even more in the near future. There are not enough educated medical audiologists in Finland. Advances in both diagnostics and in the rehabilitation of hearing impairments require specialised knowledge in medical audiology, especially at the tertiary care level. The need for audiometricians in the public sector is especially high. According to a survey conducted by the Finnish Audiological Society in January 2013, every fourth audiometrician position in public hospitals was unfilled, and approximately 55 more audiometricians were estimated to retire from the public sector within the next 10 years. The education of audiometricians at some universities of applied sciences has compensated for the lack of workers in the field to some extent. However, organising hearing health care services for the increasing number of elderly requires a larger number of audiometricians than is currently found in Finland. The private sector is an increasingly growing area of employment for audiometricians.
- The education of audiometricians needs to be improved, in both depth and length. There have been several attempts to increase the education of audiometricians without success. The requirements of the work are continually increasing.
- Closer follow-up of users after hearing instrument fitting, especially of first-time hearing aid users, would likely improve outcomes, that is, increase the level of hearing aid use.
- Adults with a hearing impairment do not, in practice, obtain professional help for their communication difficulties (that is, speech and language therapy services) in Finland. With the increasing number of those in need of services, resources need to be allocated to communication guidance.
- According to forecasts, in 2015, the immigration of refugees and other individuals to Finland is expected to increase 10-fold over the 2014 level. Accordingly, approximately 35 000 immigrants are expected in 2015, and the annual figure will likely continue to increase over subsequent years. Rapidly increasing immigration to Finland, which has a population of 5 million, means more complex medical issues and an increased need for interpretation services in hearing care. Additionally, there is a need for greater foreign language proficiency with a more diverse set of languages and increased knowledge about cultural and diversity issues among hearing health care professionals.

- All of these points highlight a clear need for the allocation of additional funding for hearing health care.

References

Barton, G., Davis, A., Mair, I., Parving, A., Rosenhall, U., & Sorri, M. (2001). Provision of hearing aid services: A comparison between the Nordic countries and the United Kingdom. *Scandinavian Audiology, 30(Suppl 54)*, 16–20.

EU Working Group on Genetics of Hearing Impairment. In Martini A. (Ed.) (1996). European Commission Directorate, Biomedical and Health Research Programme Hereditary Deafness, Epidemiology and Clinical Research (HEAR), *Infoletter, 2*, 8-9. Available on line at <http://audiology.unife.it/www.gendeaf.org/index.html>

Hannula, S. (2011). *Hearing among older adults – an epidemiological study*. Academic dissertation, Medica D 1132. University of Oulu, Faculty of Medicine, Institute of Clinical Medicine, Department of Otorhinolaryngology. Oulu: University of Oulu, Finland. Available on line at: <http://herkules.oulu.fi/isbn9789514298271/isbn9789514298271.pdf>

Hannula, S., & Mäki-Torkko, E. (2013). Ikäkuuloinen potilas perusterveydenhuollossa (Diagnosis of age related hearing impairment in primary health care). *Suomen Lääkärilehti, 68(35)*, 2123–2128.

Hearing Impairment Among Adults (HIA) – Report of a joint (Nordic – British) project (2001). DACEHTA, FinOHTA, SBU, SMM in collaboration with MRC. Helsinki: Edita. Available on line at: <https://www.julkari.fi/handle/10024/77618>

Hilma (2015). *HILMA – Julkiset hankinnat* (HILMA - Public purchases). Available on line at: <http://www.hankintailmoitukset.fi/fi/notice/search/?all=1>

Hurnasti, T., Sainio, P., Aromaa, A., & Koskinen, S. (2012). Apuvälineiden käyttö (Use of assistive devices). In S. Koskinen, A. Lundqvist, & N. Ristiluoma (Eds.), *Terveys, toimintakyky ja hyvinvointi Suomessa 2011* (p. 152–154). Available on line at: https://www.julkari.fi/bitstream/handle/10024/90832/Rap068_2012_netti.pdf?sequence=1

Huttunen, K. (2010). Erikoissairaanhoidon tarjoamat kuulovammaisten aikuisten puheterapiapalvelut (Speech therapy services in specialised medical care for adults with an impaired hearing). *Puheterapeutti, 2*, 16–20.

Huttunen, K. (2015). Survey on hearing care in Finland. Unpublished data.

Hyvärinen, A. (2014). Valtakunnallinen kysely kuulonkuntoutuksesta. In Hyvärinen, A. & Heimonen E. (Eds.) *Valtakunnalliset audiologian päivät, Kuopio 3.–4.4.2014* (p. 66–72). Helsinki: Suomen audiologian yhdistys.

Kansanterveyslaki (1972). *Kansanterveyslaki 28.1.1972/66* (The Public Health Act). Available on line at: <https://www.finlex.fi/fi/laki/ajantasa/1972/19720066>

Kentala, E. (2008). Mitä apuvälineitä annetaan julkisesta terveydenhuollosta? Indikaatiot? (What assistive devices are given by the public health care? Indications?). In R. Johansson (Ed.), *Sisäkorvaistutteen tänään, kuntoutusohjaus, uutta kuulontutkimuksista, kuulovammaisten apuvälineet. Valtakunnalliset audiologian päivät, Turku 3.–4.4.2008* (p. 98–100). Helsinki: Suomen audiologian yhdistys.

Kettunen, O. (2013). Kuulokojekuntoutuksen vaikuttavuus ja kuulokojeiden käyttöastetutkimus yli 65-vuotiailla (Effectiveness of rehabilitation with hearing aids and use of hearing aids among those over 65 years of age). In Hyvärinen, A. & Heimonen E. (Eds.), *Valtakunnalliset audiologian päivät, Kuopio 3.–4.4.2014* (p. 47–50). Helsinki: Suomen audiologian yhdistys.

Kokko, K., & Voltti, M. (2012). Aikuisten kuntoutusohjaajan rooli työkykyasioissa (Role of a rehabilitation counsellor in an adult's capability to work). In S. Mykkänen (Ed.), *Sisäkorvaistuttekokemuksia rutiinin ulkopuolelta, kuulovamma ja työkyky, korvan rakennepoikkeavuudet ja kuulo. Valtakunnalliset audiologian päivät Tampereella 29.–30.3.2012* (p. 45–48). Helsinki: Suomen audiologian yhdistys.

Kotimäki, J. (2003). *Meniere's disease in Finland: An epidemiological and clinical study on occurrence, clinical picture and policy*. Academic dissertation. Acta Universitatis Ouluensis D Medica 747. Oulu: University of Oulu.

Kuuloliiton historia (2009). *Kuuloliiton historia vaiheittain* (History of the Finnish Association for the Hard-of-Hearing phase by phase). Available on line at: <http://www.kuuloliitto.fi/fin/kuuloliitto/organisaatio/historiaa/>

Kuulonhuolto v. 1990 (1990). *Kuulonhuolto v. 1990. Asiantuntijatyöryhmän mietintö* (Hearing care. Report of an expert group). Lääkintöhallituksen työryhmien mietintöjä, Nro 1. Helsinki: Lääkintöhallitus.

Laitakari, J., & Nuojua, I. (2011). Kuulonkuntoutuksen käytännöt Suomessa -kysely (Survey on practises on hearing rehabilitation in Finland). In K. Laitakari & M. Luotonen (Eds.), *Valtakunnalliset audiologian päivät, Oulu 7.–8.4.2011* (p. 68–76). Helsinki: Suomen audiologian yhdistys.

Laki erikoissairaanhoidon muuttamisesta (2004). *Laki erikoissairaanhoidon muuttamisesta 856/2004* (Law on changing the Act on Specialised Medical Care). Available on line at: <http://www.finlex.fi/fi/laki/alkup/2004/20040856>

Laki sosiaali- ja terveydenhuollon asiakasmaksuista (1992). *Laki sosiaali- ja terveydenhuollon asiakasmaksuista 3.8.1992/734* (Act on Client Fees in Social Welfare and Health Care). Available on line at: <https://www.finlex.fi/fi/laki/ajantasa/1992/19920734>

Linkola, H. (1991). Kuulovammaisten hoidon kehityslinjat ja tulevaisuus (Developmental lines and future of the care of people with impaired hearing). In A. Kiesiläinen, A-M. Korpijaakko-Huuhka, & L. Salonen (Eds.), *Puheterapiakäytäntöjen juuret ja kehitys* (p. 70–79). Suomen Puheterapeuttiliitto, 18. Helsinki: Suomen Puheterapeuttiliitto.

Lohjan sairaanhoitoalueen lautakunta (2012). *Kuulontutkimustoiminta Lohjan sairaalassa* (Audiological examinations at the Lohja hospital). Lohjan sairaanhoitoalueen lautakunta. Pöytäkirja 30.8.2012. Available on line at: <http://hus01.tjhosting.com/kokous/20121509-3.HTM>

Lupsakko, T. (2004). *Functional visual and hearing impairment in a population aged 75 years and older in the city of Kuopio in Finland. Associations with mood and activities of daily living*. Doctoral dissertation. Publications of the University of Kuopio, Medicine, D: 342. University of Kuopio: Kuopio.

Lupsakko, T., Kautiainen, H., & Sulkava, R. (2005). The non-use of hearing aids in people aged 75 years and over in the city of Kuopio in Finland. *European Archives of Oto-Rhinolaryngology*, 123(3), 165–169.

Marttila, T., & Karikoski J. (1996). Identification of childhood hearing impairment in Uusimaa County, Finland. *International Journal of Paediatric Otorhinolaryngology*, 34(1–2), 45–51.

Mäki-Torkko, E., Lindholm, P., Väyrynen, M., Leisti, J., & Sorri, M. (1998). Epidemiology of moderate to profound childhood hearing impairments in Northern Finland. Any changes in ten years? *Scandinavian Audiology*, 27(2), 95–103. DOI: 10.1080/010503998420333

Mrena, R., Ylikoski, M., Mäkitie, A., Pirvola, U., & Ylikoski, J. (2007). Occupational noise-induced hearing loss reports and tinnitus in Finland. *Acta Oto-Laryngologica*, 127(7), 729–735.

Mustaniemi, M. (2012). Ammatillisen kuntoutuksen vaihtoehtoja (Choices for vocational re-education). In S. Mykkänen (Ed.), *Sisäkorvaistutetekemuksia rutiinin ulkopuolelta, kuulovamma ja työkyky, korvan rakennepoikkeavuudet ja kuulo. Valtakunnalliset audiologian päivät Tampereella 29.–30.3.2012* (p. 32–39). Helsinki: Suomen audiologian yhdistys.

Niemensivu, R. (2015). Valtakunnallinen kysely kuulokeskusten kurseista (National survey on courses organised by hearing centres). In Hyvärinen, A. & Heimonen E. (Eds.) *Valtakunnalliset audiologian päivät, Kuopio 3.–4.4.2014* (p. 30–31). Helsinki: Suomen audiologian yhdistys.

Noise directive (2003). *Directive 2003/10/EC on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (noise)*. Available on line at: <http://eur-lex.europa.eu/legal-content/FI/TXT/PDF/?uri=CELEX:32003L0010&from=EN>

Närkiö-Mäkelä, M. (2011). *Kuulonseulonnat Puolustusvoimissa*. (Hearing screening at the Defence Forces) Valtakunnalliset audiologian päivät Oulussa 7.–8.4.2011 (p. 30–31). Helsinki: Suomen audiologian yhdistys.

Official Statistics of Finland (OSF) (2012). *Population projection*. Helsinki: Statistics Finland [referred: 30.11.2014]. on line at: http://www.stat.fi/til/vaenn/2012/vaenn_2012_09-28_tie_001_en.html

Oksa, P., Palo, L., Saalo, A., Jolanki, R., Mäkinen, I., & Kauppinen T. (2012). *Ammattitaudit ja ammattitautiepäilyt 2010. Työperäisten sairauksien rekisteriin kirjatut uudet tapaukset* (Occupational diseases and suspected occupational diseases 2010. New cases registered in the Register of Occupational Diseases Finnish Institute of Occupational Health). Helsinki: Työterveyslaitos. http://www.ttl.fi/en/press/Pages/press51_2012.aspx

Paatero, H., Kivekäs, J., & Vilkkumaa, I. (2001). Kuntoutusjärjestelmä (Rehabilitation system). In T. Kallanranta, P. Rissanen, & I. Vilkkumaa (Eds.), *Kuntoutus* (Rehabilitation), (p. 108–126). Helsinki: Duodecim.

Rissanen, P., & Järvisalo, J. (2001). Kuntoutus ja työelämä (Rehabilitation and working life). In T. Kallanranta, P. Rissanen, & I. Vilkkumaa (Eds.), *Kuntoutus* (Rehabilitation), (p. 425–439). Helsinki: Duodecim.

Salonen, J., Johansson, R., Karjalainen, S., Vahlberg, T., Jero, J., & Isoaho, R. (2013). Hearing aid compliance in the elderly. *B-ENT*, 9(1), 23–28.

Savolainen, S., Pääkkönen, R., Jokitulppo, J., Toivonen, M., & Lehtomäki, K. (2008). Nuorten miesten kuulo ja korvien oireilu varusmiespalvelukseen astuessa (Hearing and auditory symptoms in young men beginning their military service). *Suomen Lääkärilehti*, 63(21), 1935–1939.

Social Insurance Institute (2015). *Usein kysytyt työterveyshuollon järjestämisestä* (Frequently asked questions about organising the occupational health care services). Available on line at: <http://www.kela.fi/usein-kysytyt>

Sorri, M., Luotonen, M., & Laitakari, K. (1984). Use and non-use of hearing aids. *British Journal of Audiology*, 18(3), 169–172.

Sosiaali- ja terveysministeriö (2005). *Yhtenäiset kiireettömän hoidon perusteet* (National criteria for non-emergency treatment). Sosiaali- ja terveysministeriön oppaita 2005:5. Helsinki: Sosiaali- ja terveysministeriö. Available on line at:

http://www.julkari.fi/bitstream/handle/10024/116682/URN_ISBN_978-952-00-3520-4.pdf?sequence=1

The part concerning hearing care is also available on line at: <http://www.say-ry.fi/kojekuntoutus.htm>

Suomen Audiologian Yhdistys (1993). *Suomen Audiologian Yhdistys r.y. 1983–1993* (Finnish Audiological Society 1983–1993). Helsinki: Suomen audiologian yhdistys.

Terveystarkastuslaki (2010). *Terveystarkastuslaki* 30.12.2010/1326 (Health Care Act). Available on line at: <https://www.finlex.fi/fi/laki/ajantasa/2010/20101326>

Terveystarkastusohje (2012). *Puolustusvoimien terveystarkastusohje* (Guide to health checks in Finnish Defence Forces). Available on line at: <http://www.puolustusvoimat.fi/wcm/01d5110044572c03b23cbbb3db8f19ec/Terveystarkastusohje±TTO±2012.pdf?MOD=AJPERES>

Uimonen, S., Huttunen, K., Jounio-Ervasti, K., & Sorri, M. (1999). Do we know the real need for hearing rehabilitation at the population level? Hearing impairments in the 5- to 75-year-old cross-sectional Finnish population. *British Journal of Audiology*, 33(1), 53–59.

Valtioneuvoston asetus työntekijöiden suojelemisesta melusta aiheutuvilta vaaroilta, 26.1.2006/85 (Act on protecting workers from dangers caused by noise). <http://www.finlex.fi/fi/laki/ajantasa/2006/20060085>

Vartiainen, E., Kemppinen, P. & Karjalainen, S. (1997.) Prevalence and aetiology of bilateral sensorineural hearing impairment in a Finnish childhood population. *International Journal of Paediatric Otorhinolaryngology*, 41, 175–185.

Vuorialho, A. (2006). *Costs and effectiveness of hearing aid rehabilitation in the elderly*. Doctoral Dissertation. Acta Universitatis Ouluensis D, Medic, 896. University of Oulu: Oulu.