

Hearing for nursing home residents: Study protocol for development and testing of improved care and hearing aid provision in nursing care homes in Germany (zusammenHÖREN)

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Abstract

Background: Adequate hearing is an important component of quality of life due to its role in social interaction and community participation. Current evidence suggests that nursing home residents' quality of life is significantly impacted by impaired sensory functions including hearing. The aim of the study is to improve hearing health of nursing home residents by creating effective structures of cooperation and clearly defined processes.

Methods: We perform an analyzation of residents' hearing status and all care processes around hearing aids. Each resident will be physically examined by an ear, nose and throat specialist. Subjective and objective hearing tests will be carried out. The residents will also participate in a questionnaire-based survey. Interviews and focus group discussions with residents, relatives, nursing home staff and hearing experts will add qualitative data.

Discussion: The aim of this project is to identify and define personal and structural factors that impede optimal hearing care, concentrating on three focus groups: residents, caregivers (relatives, nursing home staff) and health care providers (audiologists, doctors). Within the project several approaches to solve smaller issues in the given setting / structure of the German health care system will be developed and tested. However, creating long-lasting, large-scale improvements of the hearing status in nursing homes will still require a lot of political effort.

Trial registration: Deutsches Register Klinischer Studien (DRKS00026809) "Untersuchung der Hörfähigkeit und dementieller Entwicklung von Personen in ausgewählten stationären Pflegeeinrichtungen in Niedersachsen/ Investigation on Hearing and Dementia in selected Nursing Homes in and around Hannover/Lower Saxony."

Background

Adequate hearing is an important component of quality of life due to its role in social interaction and community participation. Hearing is essential throughout a human's lifetime. Not being able to hear sufficiently can lead to exclusion due to the difficulties in communicating with other people. Furthermore, hearing loss is associated with an increased risk of conditions including dementia (1) and depression (2), which is in part related to the withdrawal from activities and less social commitment due to communication difficulties. Often, feelings of shame, frustration, anger and aggression may increase while the quality of life and cognitive abilities decrease (3, 4).

Hearing loss in general is a complex disease in which both the diagnosis and the determination of the therapy are the responsibility of competent experts. Germany already has excellent hearing care, so that hearing aids, hearing implants and other therapeutic approaches can compensate for reduced hearing and a suitable type of care and treatment path can be offered for almost every type of hearing impairment. While different pathologies in the field of hearing loss call for varying therapy options

including specific patients, actors and treatment paths, this study protocol and the underlying project focus on the treatment form of hearing aids.

The market for hearing aids is quite broad and regulated in Germany. Around 15.000 hearing aid specialists offer their services in about 7.000 shops (5) and the number of ENT doctors who make diagnoses and prescribe the devices is also in the same range (6). The products and models of the manufacturers are diverse and individual so that the different needs of patients can be addressed.

The provision of hearing aids in Germany is regulated under the aids guideline of the Joint Federal Committee (7). This guideline is underpinned by the agreement on quality assurance measures in accordance with § 135 paragraph 2 SGB V for the provision of hearing aids by the National Association of Statutory Health Insurance Physicians (8) as well as by the DIN standard EN 15927 which summarizes the services in regard to hearing aids (9).

However, especially elderly patients often perceive sensory impairment as a an inevitable part of aging, rather than an issue that can be positively influenced through medical examination and support (10). One of the reasons for this may lay in the fact that hearing loss occurs gradually and is accompanied by a long-term weaning of hearing abilities (11). Furthermore, impaired cognitive function can make it difficult to detect and treat hearing loss by impeding standard examinations and rendering the use of hearing aids more complex (12). While studies show that only 12% of 71 to 80 year olds and 2% of 81 to 99 year old persons are able to hear well (13), only 15% of the aged population is equipped with hearing aids, and just 7% of them in a satisfactory way (13, 14).

Another factor determining the hearing care situation, moreover, is that a large proportion of the already prescribed hearing aids are assumed to be used insufficiently or not at all (15). Those patients might be confronted with the mentioned negative consequences due to their non-compliance, without possibly being able to identify a causal connection by themselves. Contemplating all of this it is assumed that the supply situation is not optimal, with oversupply, undersupply or incorrect supply occurring frequently. This is especially relevant for the Statutory Health Insurances whose spending on hearing aids from hearing aid acousticians reached 1 billion in 2020 (16).

A central challenge affecting all of these inadequacies is to provide a suitable treatment path for people living in nursing homes. 16% (0.79 millions) of the persons needing care live in one of currently 16.100 nursing homes in Germany (17). Especially in smaller nursing homes, there is no sufficient standard procedure involving medical specialists that address the needs of health situations with high complexity and multimorbidity. This is partly due to limited opportunities for residents to visit medical practices independently. For these environments, the prior depicted issues concerning hearing loss and its treatment are especially true since the maintenance and overall handling of the hearing aids might be impeded due to limited fine motor skills.

Current evidence suggests that nursing home residents' quality of life is significantly impacted by impaired sensory functions including hearing (18). Not only by the residents, but also by the nursing

home staff, age-related hearing loss is considered an unwelcome (if natural) development (4). Overall, these scenarios have significant impact on the care processes and amount of effort if there is no adequate verbal communication between the caregiver and the resident.

Andrusjak et al. (12) identified factors influencing the assessment of hearing (and vision) loss, as well as the management of sensory impairment in nursing homes. Evidence confirms that lack of knowledge among nursing home staff, poor management of assistive aids, unsuitable environments, lack of institutional connections with audiologists (and optometrists), underuse of effective screening tools, and the added complexity of assisting those with dementia are all barriers to effective practice. Conversely, flexible training programs, availability of a variety of assistive aids, the development and use of simple screening tools, and adaptations to the unique nursing home environment are effective facilitators for improved care. Overall, there is a heterogeneous level of knowledge and competencies among nursing home staff regarding how to behave in a supportive manner among residents with hearing impairment as well as handling hearing aids. Findings suggest this competence to be suboptimal (12) and in many cases insufficient (4). Even if nursing home staff are educated and trained, the majority do not feel adequately experienced. An English study shows that less than half of the nurses currently use available screening tools and the majority of staff report uncertainty in caring for people with sensory impairments (19). Such inexperience with handling sensory impairment could furthermore contribute to poor communication with hearing-impaired residents, leading to conflict, inappropriate interactions, and mistaken perception of dementia rather than hearing loss (4). Moreover, there is no treatment path involving external experts on a regular and structured basis. Instead, the quality of care and treatment often depends on the mobility of the resident, the involvement of relatives or on the individual commitment of the responsible nursing management.

To summarize, impaired hearing seems to be an undertreated topic among the elderly population and specifically in nursing care homes for myriad reasons, which has a negative impact on the quality of life and comorbidities of this aging population as well as the quality of supply and care that the nursing homes can provide. While authors like Andrusjak et al. (12) already identified underlying weaknesses that affect the care situation in nursing homes, little has been done to construct innovative care measures or to create new paths for its improvement which are the main goals of this study. The initial diagnosis or indication of the responsible specialists is not questioned and is not part of this research project. Instead, the aim is to analyze the care and process situation from the view of different groups (patients, nursing resident employees and hearing specialists), to investigate their demands and strengths and to derive fitted measures and processes. Without a scientifically sound approach that addresses the determinants leading up to an effective care path in which the patients benefit from an optimal hearing care and where they indeed use their already prescribed devices, technological progress will fall short of its potential.

Methods/Design

The aim of this study is to develop a workable, ideal process of care and hearing aid provision for nursing home residents. We seek to identify the opportunities and barriers to the creation, conceptualization,

testing, and modeling of a care process in three German nursing homes with more than 350 residents. Results will be adapted for a national concept of diagnosis, care, and follow-up management as well as roll-out for people requiring care in various clinical and ambulatory settings. This study comprises a two-year development phase followed by a phase of implementation. We plan consultation and adjustment of hearing aids. We will also include target-group orientated auditory training for residents. Nursing home staff will be trained in supporting residents with hearing impairments, especially in handling hearing aids. Ultimately, our goal is to improve hearing health of nursing home residents by creating effective structures of cooperation and clearly defined processes.

The research questions are:

- What is the hearing impairment of nursing home residents and how do they currently acquire hearing aids?
- What barriers in the current care environment impede optimal hearing aid access and use, and how can they be modified?
- What needs, expectations and wishes are identified regarding hearing and hearing aids from residents and nursing home staff?
- Which (innovative) measures can promote the care in nursing homes?
- Can individual new measures be formed into a process?
- To what extent does hearing influence quality of life and participation before and after modifying the process of care?
- Does a modified process of hearing care improve interaction between residents and nursing home staff or participation in nursing process?

The two-year study *zusammenHÖREN* is divided into eight work packages (WP). Residents, relatives, and nursing home staff will be educated about the study through information material and meetings (WP°1 "Information"). Ear, nose and throat specialists and hearing care professionals will be involved in the educational process. WP°2 "Current state" collects data about residents' hearing status and all processes around hearing aids. Each resident will be physically examined by an ear, nose and throat specialist. Subjective and objective hearing tests will be carried out depending on the residents' mobility: either in their own room, in a common room inside the nursing home, or in mobile testing units in front of the nursing homes. The residents will also participate in a questionnaire-based survey. Interviews and focus group discussions with residents, relatives, nursing home staff and hearing experts will add qualitative data. Month seven to eleven will build up an optimized process of hearing care (WP°3). Testing and modeling will be performed in WP°4 "Testing". Different sets of measurement-scenarios are developed and tested within the nursing homes over a six month phase, including evaluation and adjustment. Support of the nursing homes will be conducted until the end of the project period. Potentials of digital support e.g. specialist video consultations, online hearing aid fittings, digital hearing training as well as video tutorials will be discussed. "Evaluation" (WP°5) comprises re-evaluation of data about residents' hearing status as well as qualitative data of perspectives of residents, relatives and nursing home staff to

analyze the perception of modification. WP°6 will develop and define an optimized care process including data management in a participatory process with all stakeholders in nursing home care and health care. WP°7 includes continuous project management and quality control. WP°8 "Dissemination" addresses public relations and conferences to present the results.

The collaborative research project *zusammenHÖREN* is coordinated by Gesundheitswirtschaft Hannover e.V.. Three partners contribute to the study: Faculty V Department of Nursing and Health, (University of Applied Science, Hannover), Department of Otorhinolaryngology, Head and Neck Surgery (Nordstadt Clinic, Academic Hospital, Hannover), Department of Otorhinolaryngology and Institute for Epidemiology, Social Medicine and Health Systems Research (Hannover Medical School). The study will be performed in Hannover and Greater Hannover region (1.1 Million inhabitants), Lower Saxony, Germany. Participants will be recruited via the nursing homes.

The subproject of Hannover University of Applied Sciences focuses on the needs, expectations and wishes perceived by residents, relatives as well as nursing home staff. Little is known about this subjective view. To understand the perspective of these three groups an exploratory qualitative approach is employed. According to Breuer "phenomena, problems and processes as well as their individual expressions, perspectives and negotiation of the persons [are] involved" (20) in the study. In health-related research and especially in nursing science, qualitative methods are well established, which is reflected in the increasing variety of methods, integration into university teaching and the publication landscape (21).

We intend to conduct guided interviews with residents as well as relatives before and after testing the process. We also target guided focus groups with nursing home staff. The sample includes five residents per nursing home (a total of 15, twice), five relatives per nursing home (a total of 15, twice) and two focus groups with seven staff members per nursing home (a total of 21 participants, twice each), considering that saturation might be achieved significantly earlier or later. Participants of the interviews and focus group receive 15€ incentive. Interviews and focus groups will be recorded and transcribed verbatim. Data analysis follows the principals of content analysis (22). Concepts are developed from data and put into categories. Quality criteria of qualitative research such as process documentation, interpretation assurance, rule guidance, communicative validation and triangulation ensure quality of analysis (22).

In the subproject of the Hannover Medical School, a process for optimal hearing aid care in inpatient facilities is being developed on the basis of a critical analysis of the current care process. A special focus is on the integration of relevant interfaces as well as cooperation for an effective and efficient process. In guided interviews with hearing specialists (ENT-doctors and acousticians/audiologists), experiences with nursing homes and proposals for improvement are collected. The primary goal is to understand the care process with its weaknesses and its strengths and, if necessary, to determine different perspectives. Taking into account the evaluation method, it is planned to interview around 10–12 experts, with the final number being determined during the course of the work package. Randomized recruiting of the experts will be ensured by sending post-letters with information about the project and an inquiry for participation to all ENT-doctors and audiologist shops in Hannover. The interviews will be recorded after the experts

give their informed consent and will have a duration of approximately 30–60 minutes. The evaluation of the text material (interview transcripts) is carried out by content analysis. First, two scientists will encode the texts computer-aided (MAXQDA) in repeated exchange. The development of the basic category system is based on the questions of the study (deductive category development), complemented by aspects that result from the material (inductive category development). This is followed by another critical review and, if necessary, modification of the original categories. In a second step, the compacted material is analyzed.

The subproject of KRH Nordstadt Clinic focuses on recording the hearing ability of the residents and their supply situation with hearing aids. For this purpose, the residents first receive a German translation of the NHHI questionnaire (Nursing Home Hearing Handicap Index) by Schow and Nerbonne, which was developed for the self-assessment of hearing loss in elderly nursing homes residents. Additionally, the questionnaire will cover questions about hearing aid fitting (and barriers thereof), hearing aid use (and barriers thereof), hearing aid-related quality of life, and risk factors for hearing loss. Furthermore, residents can participate in audiometric measurements (pure tone audiogram, speech audiogram, otoacoustic emissions) and tests of cognitive impairment (Mini Mental Status Test and Clock Completion Test). After these tests, each participant will receive individual counseling on current hearing and potential for improvement. After modifying the process of care, the above-mentioned items will be re-evaluated, to determine to what extent the compensation of hearing loss has an influence on the quality of life, the subjective hearing improvement and the score of cognitive impairment.

Discussion

The aim of the study *zusammenHÖREN* is to improve hearing health of nursing home residents by creating effective structures of cooperation and clearly defined processes. We expect to be able to transfer these structures and processes to other nursing homes, regions or settings of care for the elderly.

Access to participants can be difficult, so that reaching the number of cases can represent a methodological challenge. This is true for all target audiences as well as for all stages of the study. This challenge is partly addressed by the involvement of cooperation partners who can support the project team with recruitment right from the start, which makes it realistically feasible to achieve the number of cases. Nevertheless, restricted time resources of the involved geriatric nurses, audiologists and ENT-doctors are a factor that might impede both the data collection phase as well as the later conceptual phase in which new measures and processes are tested.

Furthermore, working with nursing home residents provides a special challenging collective for this study, due to the advanced age of the participants. The study teams have to be aware of a multitude of comorbidities, have to respect reduced mobility, and possibly have to work with impaired cognitive capacity. Several measures will be taken in order not to overburden the home residents: The information and study consent will be sent to the residents in advance, so that they can read and understand it with sufficient time and note down any queries. Age-appropriate, understandable, short sentences and a

clearly legible font will be used for any information. If the home residents are unable to read the documents independently (e.g. due to visual impairment), the subject information and consent form can be read to them by a member of the study team. The physical examination, the questionnaires, the interviews, the dementia tests and the audiometric measurements will take place on separate days, to avoid excessive demands on the residents. All study team members have to be aware of verbal and especially non-verbal signs of overload/exertion during the examination/interview, so that the examination/interview can be paused. If signs persist, study participation should be discontinued.

Reduced mobility will be a barrier especially for audiometric testing, which usually requires a soundproof room. Given that such a room does not conform to the typical nursing home layout, the study team will have to work around this. Several options will be tested: 1) portable audiometers to perform the tests in the residents' rooms (knowing they are not soundproof), 2) using a barrier free quiet room within the nursing home, 3) using a mobile testing unit in front of the nursing homes (two steps have to be climbed to get into the mobile testing room).

Since the present study did not include any direct diagnostic or therapeutic measures on patients and the participation in the study does not result in any direct changes in care or the care situation, no risk is to be expected for the participating patients. It is therefore assumed that the hurdle to participate in the different studies will not be high. It is not to be expected that the experts in the field will encounter rejection either, since a scientific study of adherence provides important insights for all the stakeholders involved.

The success of the project in the long run and on a large scale will hinge on several external factors: Firstly, the will of the residents. If a large proportion of the residents decides they do not want improved hearing – even after being informed about all the subsequent problems and medical issues (e.g. social deprivation, depression, cognitive decline) – or if – after having tested some of the approaches for improvement (e.g. communication tactics, hearing training, hearing aids) – they decide that the effort is not worth the gain, one should not force them into structures or behaviors they do not want for themselves. Secondly, in Germany the nursing home sector suffers from a vast shortage of manpower and a high personnel turnover, which may complicate long lasting implementation of additional time-consuming services or behaviors (e.g. switching of the radio before talking, speaking slowly, checking hearing aids for batteries). Thirdly, although the German health care system is highly developed, specialists struggle with an overload of patients and they are forced to think and act economically (especially time-wise but also financially). Therefore, there is little incentive for them (except for good will) to take care of the often complex, multimorbid nursing home residents, because this is a very time-consuming task. In conclusion, this project will surely be able to identify personal and structural factors that impede optimal hearing and within the project several approaches to solve smaller issues will be tested, but creating long-lasting, large-scale changes will require a lot of political effort as well.

Abbreviations

BMBF	German Federal Ministry of Education and Research
DIN	German Institute for Standardization
DRKS	German Clinical Trials Register
e.G.	for example
ENT	Ear Nose Throat
e.V.	Registered association
NHHI	Nursing Home Hearing Handicap Index
SGB	Social Security Code
WP	Work package

Declarations

Ethics approval and consent to participate

Ethics approval was given by “Kommission für Transparenz und Ethik in der Forschung der Hochschule Hannover” in March 2022 and by “Ethikkommission der Ärztekammer Niedersachsen“ in August 2021. All participants will be informed orally and by written information. Informed consent is taken in a written form before data collection. Data will be stored with regard to data protection and data security guidelines based on a data protection agreement between research partners.

Consent for publication

Not applicable

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request. Due to the partly proprietary nature of WP² (sensitive medical information data about residents’ hearing status), this specific supporting data cannot be made openly available.

Competing interests

The authors declare that they have no competing interests.

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the design of the study and collection, analysis, and interpretation of data and in writing the manuscript.

Authors' contributions

AB, NF, MW, HJW, AP, ALS and KH conceived the study design in a joint venture. All authors substantially contributed to the implementation of the study and have given relevant intellectual input. AB, NF, MW, MB, JB, AP, ALS, VA and SS wrote the manuscript. All authors revised the manuscript critically for important intellectual content and agreed on the final version.

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