Defining Outcomes for the Hearing Services Program

Prepared by the National Acoustic Laboratories for the Department of Health

Acknowledgements

This project has been funded by the Australian Government Department of Health

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Executive Summary

To date, the primary measures of the Hearing Services Program are output-based (e.g. number of services delivered) rather than addressing client outcomes. This study took a mixed-methods, multi-stage approach to develop recommendations for the application of client-centred outcomes to the Hearing Services Program, with particular focus on the Voucher Scheme.

The specific objectives of the study were to:

1. seek views and consensus from a range of key stakeholders to define which standardised client-centred outcome measures should be used, when and how in the HSP.
2. identify current and future potential mechanisms and systems to standardise the collection of data and reporting of outcomes, which will enable comparison across clients and contracted service providers
3. scope the potential for a national outcomes database and its benefits
4. identify how the recommendations of this outcomes program need to be modified for other populations such Aboriginal and Torres Strait Islanders, adults with specialist hearing needs and children up to the age of 26 years.

Four scoping workshops were conducted with both professionals involved in the provision of hearing services in Australia and people receiving hearing rehabilitation in Australia. The findings from these workshops then fed into a Delphi review process, which in turn fed into a national survey of Qualified Practitioners working within the Hearing Services Program. The findings from the Delphi Reviews were then used as inputs into a Consensus Workshop that informed a set of recommendations. This work was supported by analysis of two large datasets of hearing rehabilitation outcomes, collected in Australia.

There was strong support for the move towards outcomes-based evaluation of the Voucher Scheme, among both professionals involved in the provision of hearing services and among consumers receiving hearing services in Australia. A variety of potential outcome domains were identified as likely relevant indicators of successful hearing rehabilitation. Several potential issues with the development of a national outcomes database/collection system were identified and prioritised. Relatively few outcome measures are currently being used by Australian clinicians, although there is widespread use of the COSI.

Final recommendations from this study were developed and are presented below.

Recommendations

The consensus process undertaken to address Objective 1 led to the identification of four key outcome domains that are recommended for targeted measurement within the Voucher Scheme. These are addressed in Recommendations 1, 2, 3, and 4, with recommendation 1 being the primary domain for earliest attention.

The outcome domains identified as part of this consensus process did not include measures such as speech testing, data logging, and hearing aid satisfaction that have traditionally been part of the assessment of device fittings. In the case of speech testing and data logging, this is likely due to the weak relationship between these clinically based measures and hearing disability in everyday life as reported by patients.

The seven recommendations that follow are categorised according the study objectives that each relates to.

Objective 1: Define which standardised client-centred outcome measures should be used

Recommendation 1: Target the outcome domain "communication ability"

- The ability for a person to engage in interpersonal communication was the most highly-ranked outcome domain.
- Measures selected for the assessment of communication ability (i.e. conversation) should assess at least the three areas identified by stakeholders: communication in general, communication with family, and communication in groups.

Recommendation 1a: Use Part 2 of the Glasgow Hearing Aid Benefit Profiles (GHABP) as a measure for communication ability

- Part 2 of the GHABP targets communication ability and has been validated for use in device-focused hearing rehabilitation. It also includes a measure of device satisfaction.
- NAL suggests that use of Part 2 of the four pre-specified situations of the GHABP will serve as an appropriate and relevant measure of communication ability in the Voucher Scheme.
- It should be noted that this measure is specific to the hearing device portion of the rehabilitation program. Should non-device related rehabilitation need to be assessed, a measure of communication ability will need to be developed and validated in non-device related rehabilitation.

Recommendation 2: Target the outcome domain "well-being"

- General well-being is likely to capture effects of hearing rehabilitation that may not be captured by other more specific measures of rehabilitation.
- The use of a standardised well-being measure will facilitate the comparison of the well-being of participants in the Hearing Services Program with that of Australians in general, and that of Australians receiving treatment for other health conditions.
- This will also facilitate the comparison of those clients who are fitted with hearing aids as part of their rehabilitation program with those who do not.

Recommendation 2a: Develop a short question set to assess well-being, and validate in hearing rehabilitation

- There is currently no clear measure of well-being that has been validated in hearing rehabilitation.
- NAL suggests that a short question set that assesses well-being should be developed and validated in hearing rehabilitation.
- The Warwick-Edinburgh Mental Well-Being Scale (WEMWBS) has been validated using robust psychometric methods in Australia and may serve as a useful starting point for this process. Targeting the short question set to hearing-specific well-being may also provide a more sensitive measure than a general well-being measure.

Recommendation 3: Target the outcome domain "personal relationships"

- Hearing loss has significant impacts on the ability for people with hearing difficulty to interact with others and can have substantial negative effects on interpersonal relationships.
- The impacts of hearing loss in personal relationships was highly ranked by professional stakeholders, and the impacts of hearing loss on family was highly ranked by consumers of hearing services.

Recommendation 3a: Develop and validate a measure of the impact of hearing interventions on personal relationships

- There is currently no good measure of the effects of hearing difficulty on personal relationships from the perspective of people with hearing difficulties.
- NAL suggests that a measure should be developed to allow the measurement of the impact of hearing loss on personal relationships.
- This may have the added benefit of being able to establish the effect of early rehabilitation on relationships, encouraging people experiencing hearing difficulties to seek early intervention and reducing ongoing disability.

Recommendation 4: Target the outcome domain "reduction of participation restrictions"

- The negative effects of hearing loss on people's ability to participate in society are well-documented.
- Increased participation in society has broad benefits both to society and to the individual.
- The reduction of participation restrictions due to hearing rehabilitation should be targeted as a measure of the benefit of hearing services to society

Recommendation 4a: Develop a short question set to assess reduction of participation restrictions, and validate in hearing rehabilitation

- Existing measures of participation among people receiving hearing rehabilitation, such as the Social Participation Restrictions Questionnaire (SPaRQ), focus strongly on social participation, and do not include all aspects of participation.
- NAL suggests that a short question set that assesses participation restriction should be developed and validated in hearing rehabilitation.
- The SPaRQ is a research-quality measure of social participation, which has been validated using robust psychometric methods in hearing rehabilitation and may serve as a useful starting point for this process. However, additional items that assess non-social aspects of participation will likely need to be added to it.

Objectives 2&3: Identify mechanisms and systems for reporting of outcomes, and scope the potential for a national outcomes database

Recommendation 5: Measure outcomes at baseline and then no earlier than three months following the conclusion of the rehabilitation program

- Obtaining outcomes at or before the fitting of hearing devices is likely to provide important information to support the rehabilitation process and establish the true impact of rehabilitation. A baseline measure should be established for clients of the Hearing Services Program receiving rehabilitation.
- There is evidence that hearing aid outcomes are likely to have stabilised by the three-month time point following rehabilitation. As a result, we recommend that outcomes following rehabilitation not be collected before this time point.
- There is little evidence currently available regarding the stability of outcomes of hearing rehabilitation other than hearing aid fitting.
- It is possible that some outcomes may take longer to stabilise for some people, and so ongoing review of the developed outcomes instruments should be conducted to ensure that they capture the effect of hearing rehabilitation programs.

Recommendation 6: Establish an independent body to develop a standardised outcomes instrument and mechanism for outcomes collection

- When asked who should collect outcomes, while there was very little agreement among professionals involved in the hearing industry, consumers had clear preference for collection and analysis of outcomes data to be conducted by a body perceived as independent from the hearing industry, such as universities, professional organisations, or the National Acoustic Laboratories.
- The establishment of an independent body to collect and analyse outcomes data has precedent in hearing rehabilitation in Sweden and in rehabilitation medicine in Australia.
- The independent body should receive client data from the Hearing Service Program and contact clients for outcomes collection directly.
- The independent body should be responsible for the ongoing development and management of an outcomes instrument to ensure that it is appropriately sensitive and specific while also minimising

the burden on clients being contacted for outcomes collection. This may include the selection of items from existing measures to facilitate their use as part of the outcomes instrument, as discussed in Recommendations 3a and 4a.
- The independent body should produce regular reports on client outcomes for the Department of Health, the public, and Contracted Service Providers.

Objective 4: Identify how the recommendations of this outcomes program need to be modified for other populations such Aboriginal and Torres Strait Islanders, adults with specialist hearing needs and children up to the age of 26 years

Recommendation 7: Conduct stakeholder engagement processes to explore and reach consensus on the application of outcomes among the client groups currently seen under the Community Service Obligation (CSO)

- The CSO provides hearing services to some of the most vulnerable Australians with hearing loss, including children, adults with complex needs, and Aboriginal and Torres Strait Islander Australians.
- The consensus process undertaken in the present study focused on the Voucher Scheme and identified outcome domains that are unlikely to be applicable in this population.
- Professionals involved in the delivery of the CSO identified significant issues that limit the applicability of the results of the present study to these populations.
- Conducting additional stakeholder engagement processes with people directly involved in the CSO will help ensure that outcome domains selected for use in these populations are appropriate, and that selected measures are applicable.
- This further stakeholder engagement should include but not be limited to parents of children with hearing loss, carers of adults with complex needs, and First Nations Australians living in remote communities.

Contents

Background

Hearing loss is a chronic condition that affects around 4 million adults in Australia, which represents 1 in 6 of the population (Access Economics Pty Ltd, 2015). In addition to being pervasive, hearing loss can have substantial negative consequences, including activity limitations, participation restrictions, stigmatisation, reduced quality of life, and third-party disability (A. B. Barker et al., 2017; Chia et al., 2007; Granberg, Möller, et al., 2014; Scarinci et al., 2012; Wallhagen, 2010). Furthermore, hearing loss has been associated with depression, cognitive decline, and dementia (Amieva et al., 2015; Dawes et al., 2015).

Auditory rehabilitation, which aims to address the negative impact of hearing loss, includes a range of interventions. The primary intervention is hearing aids, which have been shown to be clinically effective in a recent Cochrane Review in terms of listening ability, and hearing-related quality of life (i.e. participation) and health-related quality of life (Ferguson et al., 2017). There are other auditory rehabilitation interventions for adults with hearing loss, which include alternative listening devices such as hearables and PSAPs, auditory-cognitive training, and self-management systems (F. Barker et al., 2016; Ferguson et al., 2015; Henshaw & Ferguson, 2013; Lawrence et al., 2018; Maidment et al., 2016). However, systematic reviews on these interventions have identified a lack of high-quality evidence (Ferguson et al., 2017), in part due to a lack of a "gold standard" outcome measure (Hall et al., 2019).

In order to assess the effectiveness of interventions for patients and their communication partners, irrespective of the intervention type, it is essential to have appropriate and sensitive outcome measures that are relevant to the outcome domains that targeted for improvement by auditory rehabilitation (Ferguson et al., 2016; Ferguson & Henshaw, 2015).These are not only helpful but are essential to both measuring an individual's progress towards desired goals as well as evaluating the overall effectiveness of audiology services and providers of hearing healthcare. Careful consideration needs to be given to which outcome measures are most fit for purpose. A measure that asks only about specific pre-determined situations that may not be relevant to the individual, may not be compatible with a goal-setting approach to rehabilitation that is person-centred and focussed on the individual (Ferguson et al., 2016).

What are the problems with outcomes measurement?

One of the major problems with measuring outcomes within auditory rehabilitation is the large number of tools and instruments, including behavioural and self-report measures. In particular there are a huge number of self-report measures available, with one study identifying 139 hearing-specific questionnaires (Akeroyd et al., 2015). Another major problem is that there is no agreement amongst researchers and clinicians in the field regarding what outcomes should be measured and how they should be measured. A systematic review demonstrated the extent of this problem (Granberg, Dahlström, et al., 2014), identifying 51 self-report outcome measurement instruments used across 122 adult hearing loss studies. Of these 51, only 16 instruments had been used in more than one study. It is perhaps not surprising then that a scoping review uncovered considerable heterogeneity in outcome measurement in randomised controlled trials of adult auditory rehabilitation interventions (F. Barker, MacKenzie, et al., 2015).

Many of the measures used in hearing rehabilitation research measure similar outcome domains (a general description of the area in which we are looking for an outcome) including hearing device benefit, satisfaction, or social participation. However, even among domains that are in widespread use and seen to be important indicators of successful rehabilitation, such as hearing aid use, there is no consensus around which outcome measures should be used (Perez & Edmonds, 2012). Furthermore, there is an increasing awareness globally that outcome domains that that are not solely associated with hearing aid amplification and that address participation restrictions and psychosocial aspects should be prioritised, such as wellbeing, identity and emotion (Bennett et al., 2018, 2020; Heffernan et al., 2018).

The evidence is clear that auditory rehabilitation research lacks a single or even a few outcome measures that are widely used and accepted as being gold standard instruments. Furthermore, even though there is a large number and variety of measures out there, clinical trials of adult auditory rehabilitation interventions have overlooked outcomes such as adverse effects and quality of care that may be important to key stakeholders, especially patients, hearing healthcare professionals and commissioners of hearing healthcare (Ferguson et al., 2017). In fact, the involvement of these groups in the development of such tools is rarely used, as it has typically been researchers alone who have developed outcomes.

A major consequence of the ad hoc approach to outcome measurement within the field is that it makes comparison across different patient cohorts and services almost impossible. Similarly, within research, quality is reduced as it is very difficult to compare and combine the results of different trials that use different measures (for example in systematic reviews and meta-analyses), which results in reducing the relevance of the outcomes to key stakeholders, and increases the risk of outcome reporting bias (Ferguson et al., 2017).

What are the specific problems within the Australian hearing health context?

Within the Australian hearing healthcare context, hearing services are provided free of charge to over one million people each year through the Hearing Service Program (HSP), primarily through the Voucher scheme at a cost of $590 million per annum (Commonwealth of Australia, 2019). Currently, within the Australia there are no national guidelines on what outcome measures should be used, when, how, why, and for which populations. This was highlighted in the recent Review of Services and Technology Supply in the HSP (PricewaterhouseCoopers Australia, 2017). Standardised use of patient-centred outcome measures is not prevalent in Australian hearing healthcare, and typically outputs such as hearing aid uptake are used to measure the success of hearing aids for both clients and service providers (PricewaterhouseCoopers Australia, 2017). Although the importance of measuring client outcomes is a component of the Hearing Rehabilitation Outcomes, typically the Australian-developed Client Orientated Scale of Improvement (COSI; Dillon et al., 1997) is used, the insensitivity of the COSI make it unsuitable for the measurement of service outcomes (Dillon et al., 1999).

The key findings from the Review of Services and Technology Supply in the Hearing Services Program were that although the majority of key healthcare stakeholders (i.e. Contracted Service Providers, Device Manufacturers, consumer groups, research organisations) who were consulted agreed that client outcomes were important, there was no consensus on how they should be measured. Four types of measurement methods were identified as in common use – the COSI, the International Outcome Inventory for Hearing Aids (IOI-HA), hearing aid datalogging, and speech testing – but none of these were used consistently. The recommendations were to (i) move quickly towards an outcomes-based model rather than an outputs-based model (i.e. focusing on the number of rehabilitation programs delivered and devices fitted), (ii) to consult with key stakeholders to achieve a consensus on which outcomes should be used and to standardise the approach to measuring these, and (iii) to identify how outcomes could be measured across service providers and client groups.

What is a proposed solution?

This project proposes to identify and standardise which outcome domains and measures should be used, when and how. This will facilitate the development of a core outcome set (COS) comprising one or more outcomes that key stakeholders agree are critically important when deciding whether an intervention has worked. Within hearing rehabilitation, a road map to develop a COS has been proposed for the standardisation of outcomes for tinnitus treatment. The roadmap stresses that a consensus is needed on what outcome domain should be measured, and then how this should be measured using an outcomes tool (Fackrell et al., 2017; Hall et al., 2015).

The development of COSs have grown in stature in recent years, and are now a recommended component of clinical trial protocols, Cochrane reviews, and government funding applications (Williamson & Clarke, 2012).

What are the benefits of standardised outcome measures in Australian Hearing Healthcare?

There are numerous benefits that would arise from this project, listed below.

1. Outcome measures to provide a means to assess client benefit and quality of service.
2. The identification of standardised client-centred outcome measures rather than ad hoc methods of determining client benefit.
3. Improved benefit and value for both the client and the service, as the use of client-centred outcomes provides important information that can be used to help ensure that hearing services are clinically- and cost-effective.
4. A national benchmark for benefit and value that enables comparison between different Australian service providers.

Study objectives

The overall aim of this research is to develop and deliver recommendations on evidence-based outcome measures for implementation of a client outcomes-focussed program for those receiving hearing devices in order to measure the success and cost effectiveness of the Hearing Services Program.

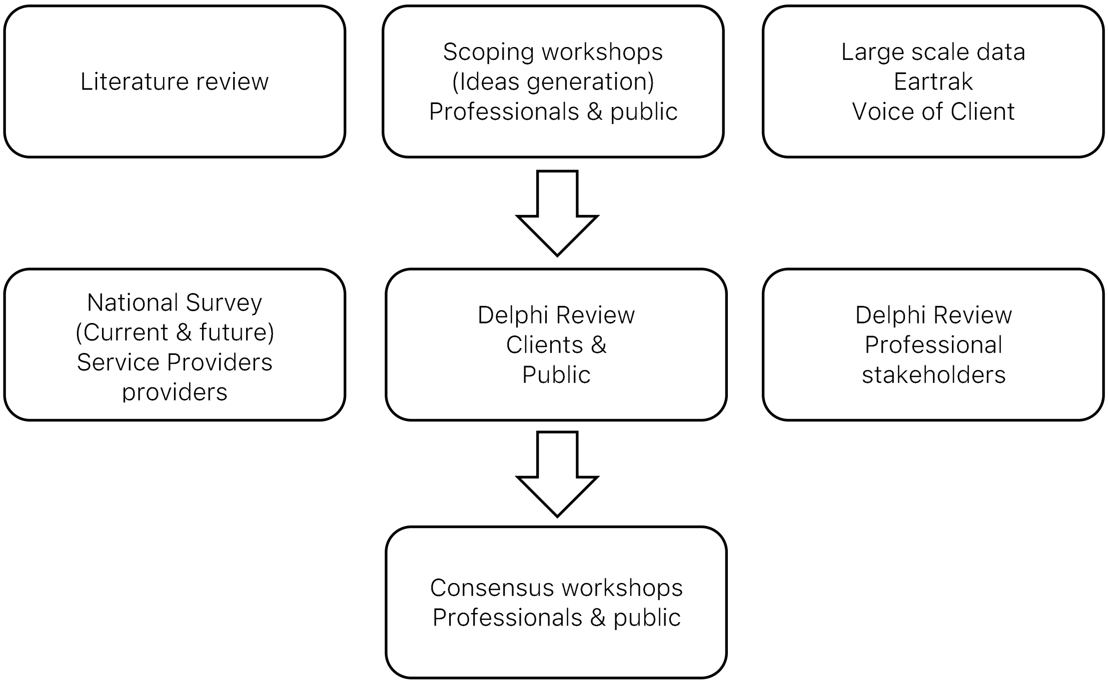
The specific objectives are to:

1. seek views and consensus from a range of key stakeholders to define which standardised client-centred outcome measures should be used, when and how in the HSP.
2. identify current and future potential mechanisms and systems to standardise the collection of data and reporting of outcomes, which will enable comparison across clients and contracted service providers
3. scope the potential for a national outcomes database and its benefits
4. identify how the recommendations of this outcomes program need to be modified for other populations such Aboriginal and Torres Strait Islanders, adults with specialist hearing needs and children up to the age of 26 years.

Project methods

This work took a multi-stage, mixed methods approach, outlined in Figure 1.

Figure 1: Structure of the present study



Based on design thinking principles, the initial discovery phase involved a literature review to identify and locate self-report outcome measures used in the research literature, a series of scoping workshops with both professionals involved in the delivery of hearing services and consumers of hearing services in Australia were convened. Additionally, two large sets of outcomes data incorporating the International Outcomes Inventory for Hearing Aids (IOI-HA) were also obtained and analysed.

Following this discovery work, the define and create phase involved a Delphi review conducted with a broader set of professional and consumer stakeholders to obtain a consensus on why client-centred outcomes of hearing rehabilitation should be measured, what outcome domains should be measured in the Voucher Scheme, when and by whom these should be collected, and the potential for a national outcomes database. Simultaneous with the Delphi review, a survey of Qualified Practitioners working within the Voucher Scheme was conducted to determine the current clinical landscape in terms of what outcomes they measured and what outcome measures they used in their regular practice.

The results of the Delphi reviews were then used as input into a final consensus workshop to decide on a final set of outcome domains to form the basis of recommendations.

The draft recommendations were also presented to a group of specialist clinical managers responsible for the delivery of the Community Service Obligation portion of the Hearing Services Program to address objective 4 and identify particular issues that may arise should the recommended outcome domains be applied outside of the Voucher Scheme.

Ethical approval was obtained from the Hearing Australia Human Research Ethics Committee.

Scoping workshops

The aim of the workshops was to scope key aspects relating to outcomes measurement from Australian stakeholders and subject experts to inform later stages of the research (e.g. what domains are important, what outcomes should be used or need to be developed, when outcomes should be used, how outcomes can be collected and reported more widely, and what are the barriers and facilitators to the collection of outcomes with specific focus on the potential value of a national outcomes database).

Three scoping interviews and workshops were conducted in Sydney, Brisbane and Melbourne in December 2019. These comprised (i) professional stakeholders to ensure a broad range of industry, clinical and research representation, and (ii) consumers and advocacy groups to ensure that the client voice was represented, which has been lacking in most of the outcomes research to date. Professional stakeholders were invited from a list of 59 professional stakeholders identified by the research team. Consumers were identified by consumer advocacy groups, who were invited to identify representatives to attend the workshop. Consumer representatives were brought to the National Acoustic Laboratories in Sydney at the cost of the project.

Professional Stakeholders

Initially, interviews were conducted with four key opinion leaders on hearing rehabilitation and outcomes within the Australian hearing healthcare community (Prof Robert Cowan, Dr Harvey Dillon, Prof Louise Hickson, and Prof Anthony Hogan). The aim was to scope both historical and current clinical and research aspects of outcome measurement in Australia to inform the scoping workshops. These interviews were undertaken by Melanie Ferguson, with assistance by David Allen.

Of 59 potential participants originally invited to take part in three workshops, 20 attended, as shown in Table 1. The distribution of invited stakeholder types is presented in Table 2. Note that due to some participants identifying themselves as a part of more than one group, the total sum is greater than the totals in the previous table.

Table 1: Selection of participants for scoping workshops

	N
Initial invites	59
Invite response	43 (73%)
Workshop invite	37 (86%)
- Sydney	11
- Brisbane	13
- Melbourne	13
Workshop attendance	20 (54%)
- Sydney	6
- Brisbane	7

- Melbourne	7

Scoping workshop formats were designed in collaboration with two design thinking consultants. Design thinking is an approach to research and innovation that seeks to understand the needs of users of a service or product as a first step (in this case, professional stakeholders involved with the Australian hearing industry) rather than beginning from assumptions from research or experience. Each workshop began with an introduction, in which the project and team was introduced, definitions of important concepts were clarified, and informed consent was obtained. Then, a series of idea generation activities were conducted. In the first idea generation activity within each workshop, participants identified outcome domains that they thought were relevant as measures of successful hearing rehabilitation and discussed why they felt that these were valuable to measure. To help generate a wide variety of outcome domains, the New South Wales Human Services Outcomes Framework was used as a prompt. This framework identifies seven potential areas in which outcomes of a social or health intervention might be found, including Home, Safety, Empowerment, Health, Economic, Social & Community, and Education & Skills (Routledge, 2017).

Table 2: Groups of participants invited to and attending the professional stakeholder scoping workshops

	Invited	Attended
Clinicians	24	7
Consumers	8	2
Device manufacturers	8	4
Professional organisations	8	8
Client advocacy groups	3	3
Researchers	11	4
Policy makers	1	1

In the first workshop, participants were then asked to identify extant outcome measures to measure the identified outcome domains. As it became apparent that this was an area where many participants could not contribute, in the second and third workshops participants were instead asked about the likely benefits, beneficiaries, and risks of a national outcomes database.

All workshops were audio-recorded and transcripts and written materials generated as part of these scoping workshops were analysed using qualitative content analysis to identify potential outcome domains that were identified by participants. In total, 63 potential outcome domains were identified, and are listed in Table 3.

These outcome domains were then used as a starting point for the Delphi Review of professional stakeholders that is discussed in Section 5. Fourteen organisations and groups were identified as potentially benefiting from the establishment of a national database for hearing rehabilitation outcomes and are listed in Table 4. These potential beneficiaries were incorporated into the analysis of Round 1 of the Delphi Review of professional stakeholders discussed in Section 5.

Table 3: Outcome domains identified during the scoping workshops

Improved access to leisure activities
Improved access to media
Improved community engagement
Improved participation in activities
Improved social engagement
Reduced costs to the community
Improved efficacy in employment
Improved income
Improved opportunities in employment
Improved safety in employment
Improved ability to communicate about healthcare
Improved ability to communicate about safety
Improved access to education
Improved access to employment
Improved self-management ability
Improved sense of control over own health
Improved sense of control over own life
Increased ability to self-advocate
Increased ability to support others
Increased access to support groups
Increased stability of employment
Reduced costs to the workplace
Reduced reliance on others
Improved cognitive function
Improved general (non-hearing) health
Improved mental health
Improved situational awareness
Reduced exposure to dangerous noise levels
Reduced falls incidence
Reduced reliance on medical support
Improved ability to use the telephone
Improved hearing sensitivity
Improved level of voice required
Improved communication ability
Improved communication in groups
Improved communication skills
Improved communication with family
Improved personal relationships
Reduced social isolation|
Reduced third-party disability
Feelings of life success
Improved ability to pursue personal goals
Improved confidence
Improved enjoyment of music
Improved feelings of being valued
Improved feelings of belonging
Improved feelings of equality
Improved feelings of safety
Improved privacy
Improved relationship satisfaction
Improved satisfaction with employment
Improved satisfaction with family life
Improved satisfaction with social life
Improved well-being
Increased hope for the future
Reduced experience of stigma
Reduced fatigue
Reduced loneliness
Access to intervention options
Functionality of devices
Improved device-related self-efficacy
Increased use of hearing aids
Service satisfaction

Table 4: List of potential beneficiaries of a national outcomes database

Advocacy Organisations
Audiology Professional Bodies
Hearing Clinicians
Device Manufacturers
Educators
General Public
Government
Hearing Service Providers
Insurers
Journalists
Non-hearing Clinicians
Other health practitioners
People with hearing loss
Researchers

Consumers

An additional workshop was held with a group of seven representatives of consumer and advocacy organisations. All participants identified as people with hearing loss, and held various positions within the organisations, including board members, presidents, and volunteers.

In this workshop, a series of fictional potential stakeholders was developed by the workshop, including consumers, family members, clinicians, and a policymaker. A persona for each fictional stakeholder, including hobbies, motivations, likes, and dislikes, was generated collaboratively by the workshop. For each stakeholder who was not themselves a person with hearing loss, their relationship to a person with hearing loss (e.g. spouse, grandparent, audiologist) was also defined. Attendees were then asked to identify what "successful" and "unsuccessful" hearing rehabilitation for the person with a hearing loss who they were related to, might look like from the perspective of each of these personas.

As an example, the persona for “Linda”, a spouse of a person with hearing loss, is shown in Table 5. For this persona, participants identified 15 traits denoting successful hearing rehabilitation, including “Not having to repeat myself to my husband all the time” and “My husband and I doing more things together”, and 11 traits of “unsuccessful” rehabilitation, including “Husband not wanting to socialise e.g. with grandchildren” and “Me getting frustrated by having to repeat things”.

Traits identified by participants across all fictional stakeholders were then combined and duplicates were removed. These were reworded into 48 individual statements in 8 categories: “Hearing aids”, “My hearing care”, “Activities”, “My listening experiences”, “General health”, “My social life”, “My family life”, and “Empowerment”. These statements were used as an input to the Delphi Review process that was conducted with Consumers of hearing services. The 48 statements are listed in Table 6.

Table 5 : Sample persona for fictional stakeholder "Linda"

<table>
<tr><td colspan="3"></td></tr>
<tr><td>Name
Linda</td><td>Gender
Female</td><td>Age
67</td></tr>
<tr><td>Relationship to the person with hearing loss
Wife</td><td>Likes
• being retired
• date nights
• spending time with grandchildren
• holidays, catch-ups with girl friends</td><td>Dislikes
• repeating myself
• negative people
• a messy house
• the game Monopoly
• a budget</td></tr>
<tr><td>Skills
• funny
• patience
• budgeting
• good social skills
• travel planning</td><td>Motivations
• my partner’s happiness
• being in charge
• planning my next adventure
• teasing my husband
• keeping fit
• philosophy classes</td><td>Hobbies
• spending time with the grandchildren
• going cruising
• girl time
• talking on the phone
• reading books to school children</td></tr>
</table>

Table 6: Statements developed for the Consumer Delphi Review

Hearing aids

- I use my hearing aids more
- I can afford the hearing care that I need
- I can use my hearing aids effectively
- My hearing aids are comfortable
- My hearing aids work effectively for my needs
- I was fitted with hearing aids

My hearing care

- I have a good relationship with my audiologist
- I am happy with the service that I receive from my audiologist
- I can access my audiologist whenever I want to
- My audiologist gives me options for managing my hearing
- I don't need to go back to my audiologist multiple times
- I understand my hearing and how it works
- I believe that audiology can help me
- I adjust to having a hearing loss

Activities

- I am able to do the things that I want to do
- I am able to get the work (paid/volunteer) that I want
- I enjoy my work (paid/volunteer)
- I am able to get the education that I want
- I am more effective at work (paid/volunteer)
- I earn more money
- I can use other support services in my community
- I have more time for the other things in my life

My Listening Experiences

- I can enjoy listening to music
- I can use the telephone effectively
- I can communicate effectively with people
- I have the skills I need to communicate

General Health

- I have better mental health
- I have better general health
- I feel happier with my life
- I feel less fatigue from listening

My social life

- I am not socially isolated
- I can communicate with people in groups
- I am able to participate in the social events that I want
- I enjoy going out socially
- I feel included by the people around me
- I feel equal to those around me
- I can access other people with hearing loss

My family life

- I can communicate well with my family
- My hearing impacts less on my family
- My family are involved in my hearing care
- I feel comfortable attending events with my family

Empowerment

- I have more control over my life
- I have more control over my hearing
- I feel more confident in myself
- I can access support groups in my community
- I feel that am able to succeed in my life
- I do not have to rely on others to communicate for me
- I feel empowered

Australian datasets

The International Outcomes Inventory for Hearing Aids (IOI-HA) was originally developed to be a standard outcome measure for people receiving hearing aids and is used for national outcomes collection as part of the Swedish Quality Registry for hearing rehabilitation. Two large Australian datasets including results of the IOI-HA were assessed to determine whether the IOI-HA had appropriate statistical properties to facilitate its use as a national outcomes measure in Australia.

Structure of the IOI-HA

The International Outcomes Inventory for Hearing Aids (IOI-HA) was originally developed to be a standard measure of hearing aid outcome for use in research and in the clinic (Cox et al., 2000). The IOI-HA asks seven questions, each expressed on a Likert-type scale. The seven items measure Use of hearing aids, Benefit of the hearing aids, Residual Difficulty following the fitting, whether the fitting was Worth the trouble, Residual Disability following the fitting, the Effect on Other People that any hearing difficulties have, and whether the hearing fitting has produced a Change in Enjoyment of Life. The IOI-HA questionnaire is included as Appendix B.

The IOI-HA was designed to measure seven aspects of hearing rehabilitation outcome, in a sufficiently general manner that a variety of different kinds of hearing rehabilitation research studies could be effectively compared. It has subsequently been translated into 32 different languages. However, work on the IOI-HA following its introduction raised concerns about its psychometric properties, particularly its dimensionality (i.e. whether or not the items are independent constructs; Cox & Alexander, 2002; Heuermann et al., 2005; Kramer et al., 2002). In addition, the development of the IOI-HA by a group of researchers means that its dimensions were selected without patient involvement.

Further investigation of the performance of the IOI-HA in an Australian context was conducted to determine whether it is appropriate for use as a general outcome measure for hearing rehabilitation in Australia. Results of the IOI-HA following hearing aid fitting were obtained from two large Australian datasets: one collected by EARtrak, and one collected by Hearing Australia.

EARtrak is a private company that provides hearing services providers with a third-party hearing aid and hearing service satisfaction survey. EARtrak data collection began prior to 2006 and includes data on more than 26,000 fittings at 93 different hearing services. Of these, 4,322 clients who were fitted under the Australian Government's Hearing Services Program and returned a survey were included in the analysed dataset.

Hearing Australia is an Australian Government-owned hearing services company. Hearing Australia data collection began in 2017, with an online survey sent out to all clients fitted with hearing aids. Of the whole dataset, only the 3,670 clients who were funded under the Australian Government's Hearing Services Program and returned a survey were included in the analysed dataset. Summary statistics for the two datasets are displayed in Table 7.

Table 7: Summary statistics of datasets

	EARtrak	Hearing Australia
N	4,322	3670
Male (%)	2429 (56%)	2164 (59%)
Age		
- 20-29	3	4
- 30-39	9	30
- 40-49	42	47
- 50-59	123	149
- 60-69	816	776
- 70-79	1706	1757
- 80-89	1399	816
- 90+	224	91
Fully subsidised device (%)	2977 (69%)	2579 (70%)
Binaural fitting	4244 (98%)	Not recorded

Polychoric factor analysis was used to find the factors underlying the IOI-HA data within each dataset and also to both datasets combined. Horn's method of parallel analysis was used to determine the optimum number of factors to extract (Horn, 1965). Obtained factor loadings were rotated using varimax rotation, selected to minimise the complexity of the resulting structure and increase the interpretability of the results. Factor extension (Dwyer, 1937) was used to determine the loadings of device pricing category (a measure of the influence of hearing device cost), gender and age on the existing factors identified in each dataset, and gender and age on the entire dataset. Device pricing category was not included in the extension of the full dataset due to incommensurable coding of this variable between the datasets.

Results

Parallel analysis suggested that, in the Hearing Australia dataset and the combined dataset, three factors would suffice, and that in the EARtrak dataset two factors would suffice, and so these values were used for the factor analyses.

Table 8: Factor Analysis of Hearing Australia data

	Self and Trouble	Others	Use
Use	.136		.602
Benefit	.868		.165
Residual Difficulty	.656	.336	-.141
Worth	.854	.120	.248
Residual Disability		.542	
Effect on Other People	.345	.534	-.114
Change in Enjoyment of Life	.812		.170
Device Pricing Category	-.152	-.060	.354
Age	-.091	-.032	.041
Gender	-.038	-.030	.006

Table 9: Factor Analysis of EARtrak data

	Self and Use	Trouble and Others
Use	.582	-.124
Benefit	.843	.255
Residual Difficulty	.256	.720
Worth	.858	.264
Residual Disability		.715
Effect on Other People		.674
Change in Enjoyment of Life	.816	.299
Device Pricing Category	.038	-.036
Age	-.048	-.105
Gender	-.069	-.068

Table 10: Factor Analysis of combined data

	Self and Use	Trouble	Others
Use	.523	-.124	
Benefit	.794	.398	
Residual Difficulty	.233	.741	.395
Worth	.841	.286	.185
Residual Disability			.630
Effect on Other People	.114	.311	.545
Change in Enjoyment of Life	.757	.306	.137
Age	-.055	-.133	-.057
Gender	-.075	-.053	-.095

The factor loadings are shown in Tables 8, 9, and 10. Loadings were remarkably similar, across the three datasets, although two of the factors were collapsed into one in the case of the EARtrak dataset.

In each case, a grouping, which we have labelled "Others", was seen in the combination of Residual Disability and Effect on Other People. These items measure the ability of the person with hearing aids to engage with the world around them, without causing burden to other people.

There was also a recurrent grouping labelled "Self", which includes Benefit, Worth, and Change in Enjoyment of Life. These items measure the impacts of the hearing device fitting on the person's hearing-related quality of life.

Residual Difficulty was most associated with different factors in the different analyses and has been denoted by the label "Trouble". This item measures difficulties performing communicative tasks, separate from the impact of this difficulty on others.

Use of hearing aids was a separate factor in both the Hearing Australia dataset and the combined dataset, suggesting that this is at least somewhat independent of the benefit that a person received from hearing aids. This factor was combined with the Self factor in the EARtrak dataset.

Device pricing category was associated with the Use factor in the Hearing Australia dataset. No other clear associations were observed.

Discussion

This analysis supports existing work on the IOI-HA that suggests there are no more than three factors that underlie the instrument, and that the separate items do not reflect independent constructs (Cox & Alexander, 2002; Heuermann et al., 2005; Kramer et al., 2002; Smith et al., 2009). It also supports their finding that use of hearing aids is largely separable from the effects of the hearing aid fitting on the person, suggesting that this question may be inappropriate where patient benefit is the focus. However, the complex interactions of the Trouble grouping with both Self and Others may suggest that this question may not have a stable meaning across different services within the Australian hearing industry.

The association of hearing device price with outcomes appears variable across different datasets, suggesting that this effect may be dependent on the hearing service investigated. Further work to determine the effect of client financial contributions and level of hearing device is required to determine whether the "Top Up" model used in Australia is effective in achieving optimum client outcomes.

The negative correlation of client age with use in the overall data set may be concerning, as this may suggest that older patients are not making effective use of their hearing devices. However, given the relatively large number of people of working age in the sample, it is also possible that usage naturally declines with age as the complexity of listening environments reduces following retirement. Further studies exploring the auditory ecology of Australians as they age, and the effectiveness and usage of hearing aids within these changing ecologies, may support clinicians to ensure that usage is effective to meet the individual patients′ needs.

This study has shown that, while the IOI-HA may be popular and commonly used, it does not reflect a comprehensive instrument that behaves predictably across different collection methods or service modalities. Further work is needed to develop outcomes instruments for hearing rehabilitation that are comprehensive and predictable. However, its ease of interpretability and administration mean that it may still be highly clinically useful.

Delphi Review

A Delphi review was conducted with two groups of participants (i) professional stakeholders, and (ii) (ii) consumers. A Delphi review is an iterative process in which respondents are asked to complete a series of questionnaires (rounds), with each including summary information about the responses to the previous round (Helmer, 1967). The Delphi technique is useful for building consensus among experts with regard to their areas of expertise (Hsu & Sandford, 2007), and has been used successfully in hearing healthcare (F. Barker, Munro, et al., 2015; Ferguson et al., 2018; Sereda et al., n.d.). In the present Delphi Review, each round was conducted via an online survey. Three rounds were conducted to allow for consensus to emerge.

The set of Professional Stakeholders identified as potential participants for the initial scoping workshop were invited to take part in the Professional Stakeholders arm of the Delphi review. Each round was sent to all potential participants. Of the 79 potential participants, 34 participants responded to round 1, 36 responded to round 2, and 30 responded to round 3.

A link inviting people to participate in the Consumer arm of the Delphi review was distributed to hearing advocacy organisations (Better Hearing Australia Brisbane, Better Hearing Australia Victoria, Hearing Matters Australia, and Deafness Forum), who then sent it to their membership lists inviting them to participate. A total of 64 participants responded to round 1, 61 responded to round 2, and 60 responded to round 3. There was a very low attrition rate in this group, particularly compared to the Professional Stakeholders group, potentially due to the self-selected nature of this cohort.

For both arms of the Delphi review, the standard agreement rating item was a five-point Likert item with anchors Strongly agree, Agree, Neither agree nor disagree, Disagree, and Strongly disagree. The standard importance rating item was a five-point Likert item with anchors Very important, Important, Neither important nor unimportant, Unimportant, and Very unimportant.

Consensus throughout the Delphi review was defined as:

- for agreement ratings:
  - 80% of respondents rating a statement as Agree or Strongly Agree, or
  - 80% of respondents rating a statement as Disagree or Strongly disagree;
- for importance ratings:
  - 80% of respondents rating a statement as Very important or Important, or
  - 80% of respondents rating an item as Unimportant or Very unimportant.

Consensus rankings were determined using the Kemeny-Young method (Kemeny, 1959). This method generates, from a set of individual orderings, the ordering with the maximum likelihood of producing the provided individual orderings (the consensus ranking). It does this by minimising the number of pairwise disagreements between individual rankings and the consensus ranking.

What outcome domains should be measured as markers of success of hearing rehabilitation?

Professional Stakeholders

The 26 outcome domains identified by the Professional Stakeholder scoping workshops were used as input to this stage (see Table 3). In the first round, respondents were asked to rate the importance of measuring each outcome domain using the standard importance rating item and the question "Below are some potential outcome domains of hearing rehabilitation. On a scale of 1 (Very unimportant) to 5 (Very important), how Important do you think it is that we measure each one?" They were also asked in an open-ended question whether there were any additional outcome domains that they believed were important to measure.

After this round was returned, rated outcomes were ranked using the Kemeny-Young method, using the branch and bound algorithm (Emond & Mason, 2002). The top 13 items were retained based on this ranking.

The answers to the open-ended questions on additional outcome domains were collated and compared to the existing outcome domains. Only two additional outcome domains, "Increased independence" and "Reduced listening effort" were identified by participants, so these were also added to the list to give 15 outcome domains.

In Rounds 2 and 3, the 15 outcome domains were presented to participants, and they were again asked to rate the importance of measuring each one using the standard importance rating item and the question "For each of the outcome domains listed below, please indicate the extent to which it is important to measure." In Round 3, they were also shown the distribution of ratings by all participants in the previous round, displayed as a contingency table, following standard Delphi Review methodology. The purpose of Round 3 was to establish stability of the statement responses.

In Round 3, they were further asked to select, in ranked order, the top 5 most important outcome domains, which were again used to rank all fifteen outcome domains using the Kemeny-Young criterion. The question for this section was "If you could only select the 5 most important outcome domains from the list below, which would they be? Please select 1 for the most important outcome domain, 2 for the next most important, and so on up to 5. Select 5 options only."

There was consensus that the following outcome domains were important. The rank of each is given in parentheses after the outcome domain, along with the consensus percentage:

- Improved communication ability (1, 100%)
- Improved communication in groups (2, 97%)
- Improved personal relationships (3, 100%)
- Improved self-management ability (4, 87%)
- Improved well-being (5, 87%)
- Improved participation in activities (6, 97%)
- Improved social engagement (7, 90%)
- Increased independence (10, 87%)
- Reduced social isolation (11, 97%)
- Reduced loneliness (12, 83%)
- Reduced listening effort (13, 97%)

- Improved community engagement (=14, 83%)

There was no consensus that the following domains were important to measure. Again, the rank of each domain is given in parentheses after the outcome domain:

- Increased use of hearing aids (8, 77%)
- Improved sense of empowerment (9, 80%)
- Improved access to education (=14, 53%)

There were no domains where there was consensus that they were not important to measure.

Consumers

The 48 outcome domains identified by the Consumer scoping workshop were used as input to this stage (see Table 6). In the first round, respondents were asked to rate the importance of measuring each outcome domain using the standard importance rating item on the question "For each statement, how important do you think it is to measure this as an indication that hearing care has been effective? Remember that we are not asking about your own personal experiences, but want to know how important it would be to measure each statement." They were also asked in an open-ended question whether there were any additional outcome domains that they believed were important to measure.

Due to the large number of outcome domains identified, the FAST approximation to the branch and bound algorithm was used to perform the Kemeny-Young ranking (Amodio et al., 2016). Of the 48 outcome domains, the top 10 proceeded to the following stages. Responses to the open-ended questions were analysed using qualitative content analysis and an additional 5 outcome domains were identified, which were then added to the set of outcome domains for round 2. These were:

- I can live my life independently
- I hear clearly with my hearing aids
- I trust my hearing care professional
- I am better able to hear the TV as a result of my hearing care
- I am satisfied with the hearing care I receive

In round 2 there was consensus that all outcome domains were important, and so in round 3 participants were asked to rank their top five of the fifteen outcome domains using the question "If you could only select the 5 most important outcome areas from the list below, which would they be? Please select 1 for the most important outcome area, 2 for the next most important, and so on up to 5. Select 5 options only." These were then used to determine an overall ranking based on the Kemeny-Young criterion.

The outcome domains, in ranked order, are listed below. The rank of each is given in parentheses after the outcome domain, along with the consensus percentage:

- I can live my life independently (1, 90%)
- I can communicate well with my family (2, 100%)
- I can communicate effectively with people (3, 98%)
- I am able to do the things that I want to do (4, 95%)
- I hear clearly with my hearing aids (5, 95%)
- I can use my hearing aids effectively (6, 100%)
- My hearing impacts less on my family (7, 98%)
- I have the skills I need to communicate (8, 93%)
- I have more control over my hearing (9, 88%)
- I trust my hearing care professional (10, 93%)
- My hearing aids are comfortable (11, 95%)
- I can use the telephone effectively (12, 88%)
- I am better able to hear the TV as a result of my hearing care (13, 84%)
- I am able to participate in the social events that I want (14, 90%)
- I am satisfied with the hearing care I receive (15, 95%)

How should outcomes be collected?

Professional Stakeholders

The question of what methods could be used to collect outcomes was asked of respondents to the first round of the Professional Stakeholder Delphi Review, as two open ended questions: one asking about the methods themselves, and one asking about the benefits and drawbacks of these potential methods.

The responses to these two open-ended questions were synthesised using qualitative content analysis, and 11 potential methods were identified. In round 2, respondents were asked to rank the top five most important methods that they believed should be used to collect outcome measures.

Consumers

The methods of measurement identified by the first round of the professional stakeholders were presented to respondents to the first round of the Consumer Delphi Review. In this round, respondents were asked to rate how comfortable they would feel using each method of measurement using a five-point Likert item (Not at all comfortable, Slightly comfortable, Moderately comfortable, Comfortable, and Very comfortable). The question asked was "Below are several methods that might be used to collect outcomes after hearing care. For each one, how comfortable would you feel using it?" These were then used to generate a ranking using the Kemeny-Young criterion.

Final round

In round 3 of both Delphi Reviews, participants were again asked to rank the top five most important measurement methods but were provided with information about the consensus rankings generated in the round 2 of the Professional Stakeholder Delphi Review and round 1 of the Consumer Delphi Review as a contingency table. Due to differences in the wording between the statements presented in round 1 of the Consumer Delphi Review and round 2 of the Professional Stakeholder Delphi Review, the wording was harmonised between the Consumer and Professional Delphi Reviews.

For the Consumer group, the question asked was "In Round 1 of the Delphi review there was a question asking about methods that could be used to collect outcomes. We would like you to complete the question again as the wording of some of the statements has been changed. Below are some methods that might be used to collect outcomes after hearing care. If you could only select the 5 most important methods from the list below, which would they be? Please select 1 for the most important method, 2 for the next most important and so on up to 5."

For the Professional group, the question asked was "Previously in this section, you were asked to rank the top five methods by which outcomes should be collected. Below are the rankings generated from the Hearing Professional and Consumer stakeholder ratings. In each case, 1 is the most preferred method, 2 is the next-most preferred, and so on. After looking at the rankings, if you could only select the 5 most important methods from the list below, which would they be? Please select 1 for the most important method, 2 for the next most important, and so on up to 5. Select 5 options only."

Again, the consensus ranking was calculated using the Kemeny-Young criterion, and is shown in Table 11.

Table 11: Ranked methods of collecting outcomes

	Professional Ranking	Consumer Ranking
The hearing care professional fills out a questionnaire with the client face to face	1	1
The client fills out an online questionnaire that is emailed to them by their hearing care professional	7	2
The client fills out a paper questionnaire that is posted to them by their hearing care professional	2	=3
The client fills out a questionnaire (paper or electronic) with their GP	3	=3
The client fills out a paper questionnaire that is posted to them by their GP	4	=3
The client fills out a paper questionnaire (or electronically on a tablet) and returns it to their hearing care professional or the receptionist	5	=3

The hearing care professional fills out a questionnaire with the client over the telephone	6	=3
The client fills out an online questionnaire that is sent to them through the myGov portal	10	=3
The client fills out an online questionnaire that is emailed to them by the Government	11	=3
The client fills out a questionnaire via a smartphone app sent to them by the government or third party collection service	9	9
The client replies to SMS text messages sent to their mobile phone by the government or third party collection service	8	10

When should outcomes be collected?

This section was only conducted with professional stakeholders, and not with the consumer group as this was outside their scope of knowledge.

Respondents were asked as part of round 1 at what time points outcome measures should be collected, and the benefits and drawbacks of each of these times, in two open-ended questions. The responses were collated using qualitative content analysis.

The responses to these questions gave four specific timepoints and seven statements about the timing of outcomes collection, which were then presented as part of round 2. Respondents were asked to rank the four specific timepoints in order of importance ("There are many time points to measure outcomes. Please rank in the order of importance these time points in which to measure outcomes. Please select 1 for the most important method, 2 for the next most important, and so on up to 4."), and to rate their agreement with each of the seven statements using the standard agreement item ("With regard to the time points at which outcomes measures should be collected, please indicate the extent to which you agree or disagree with each statement."). The seven statements were then re-presented as part of round 3, along with the distribution of ratings by all participants in the previous round, displayed as a contingency table.

The four time points are, in consensus ranking order from most important to least important:

1. Outcome measures should be obtained at 3 months following the fitting
2. Outcome measures should be obtained at 6 months following the fitting
3. Outcome measures should be obtained at 12 months following the fitting
4. Outcome measures should be completed at the follow-up appointment

There was consensus that respondents agreed with the following statements. The consensus percentage is shown next to each statement:

- A baseline measure should be obtained at or prior to fitting of a device to help determine the course of treatment intervention (93%)
- A baseline measure should be obtained at or prior to fitting of a device to assess future progress (93%)
- The final outcome measure should not be collected any sooner than 3 months as clients may not have acclimatised to their devices (83%)

There was no consensus on the following statements. The consensus percentage is shown next to each statement:

- An outcome measure should be obtained at around the 3-month period, as clients struggle with device compliance around this period (50%)
- Outcome measures are likely to capture a more holistic view if conducted 6-months post fitting (47%)
- Outcome measures are likely to capture a more holistic view if conducted 12-months post fitting (50%)
- Outcome measures should be obtained multiple times during a year to assess the course of the rehabilitation intervention (77%)

There were no statements where there was consensus that respondents disagreed with the statement.

Who should collect outcome measures?

This section was only conducted with professional stakeholders, and not with the consumer group as this was outside their scope of knowledge. However, questions regarding who should hold and analyse patient outcomes data were asked in the section relating to the establishment of a national outcomes database, reported below.

Respondents to round 1 were asked who should collect outcome measures, and the benefits and drawbacks of each of these potential collectors of outcome measures, in two open-ended questions. The responses were collated using qualitative content analysis. This resulted in seven statements, which were then presented as part of round 2. Respondents were asked to rate their agreement with each of the seven statements using the standard agreement rating item ("Who should collect outcome measures? Please indicate the extent to which you agree or disagree with each statement."). The seven statements were then re-presented as part of round 3, along with information about the distribution of responses to the previous round, presented as a contingency table.

There was no consensus on any of the statements. The consensus percentage is shown next to each statement:

- Clients will be more honest if outcomes are collected by someone independent of their hearing care organisation (43%)
- Outcomes are best collected by the client's own hearing care professional because outstanding problems experienced by the client can be responded to more readily (60%)
- Outcomes are best collected by the client's own hearing care professional because the client is familiar with the hearing care professional and they are familiar with the client (33%)
- Outcome should be collected by a third party independent of the hearing care organisation to avoid the potential for bias (50%)
- A Government body e.g. the Hearing Services Program is the best placed group to collect outcomes (50%)
- Outcomes should be collected by hearing advocacy groups because they are less likely to show any bias (33%)
- Outcomes should be collected by hearing care professionals because they are less likely to show any bias (37%)

Why should outcome measures be collected?

This section was only conducted with professional stakeholders, and not with the consumer group, as it was considered to be outside their area of expertise.

Respondents to round 1 were asked why outcome measures should be collected in three open ended questions, asking them to identify reasons from the perspective of clinicians, hearing service providers, and Government. The responses were collated using qualitative content analysis. This resulted in fifteen statements, which were then presented as part of round 2. Respondents were asked to rate their agreement with each of the fifteen statements using the standard agreement rating item and the question "Please indicate the extent to which you agree or disagree with each statement". The fifteen statements were then re-presented as part of round 3, along with information about the distribution of responses to the previous round, presented as a contingency table.

There was consensus that respondents agreed with the following statements. The consensus percentage is shown next to each statement:

- To enable hearing care organisations to monitor consistency of practice (90%)
- To ensure that hearing care professionals are providing appropriate hearing care services to their clients (94%)
- To help the Government and other funders target poorly performing hearing care organisations for auditing (81%)
- To provide an evidence base to help inform clinical decision-making (97%)
- To help promote a more holistic approach to hearing rehabilitation rather than focus solely on hearing aids (84%)
- To provide a benchmark against which clinical services can be measured (94%)
- To provide evidence for the effective use of government resources (84%)

- To demonstrate whether the Voucher Scheme is positively impacting clients (94%)
- To inform hearing care professionals as to the need for further interventions for their clients (97%)
- To ensure that services offered are providing benefit to clients (97%)
- To demonstrate the success of the rehabilitation program for the client (94%)
- To enable the hearing care professional to compare management approaches e.g. when trying a different rehabilitation option (84%)
- To help inform the client's rehabilitation journey and management plan (87%)

There was no consensus on the following items:

- To facilitate the identification of hearing care professionals within an organisation who require more training or assistance (77%)
- To provide population data to health researchers (74%)

There were no statements where there was consensus that respondents disagreed with the statement.

A National Outcomes Database

Professional stakeholder respondents to round 1 were asked about the potential stakeholders who would be involved in the development of a national database of outcomes collected from the Hearing Services program. They generated a list of potential stakeholders, which fell into six primary groups: Government, Professional organisations, the Public, Private industry, Researchers, and Health Professionals. The list of potential stakeholders identified is shown in Table 12.

They were further asked about potential purposes and drawbacks of the development of a national database of patient outcomes in two open-ended questions. The responses to these were collated using qualitative content analysis, resulting in 25 potential purposes for a national outcomes database, and 17 potential concerns that would need to be taken into account in the design of this system.

These statements were presented to rounds 2 of both Delphi Reviews, and respondents were asked to rate their importance using the standard importance rating item and the questions "A national outcomes database would have many potential purposes. Thinking about a national database of outcomes for people being seen under the Australian Government's Hearing Services Voucher Program, how important is each purpose listed below?" and "A national outcomes database also has some potential negative effects. Thinking about a national database of outcomes for people being seen under the Australian Government's Hearing Services Program, how important do you think each potential negative effect is to consider in the design of such a system?" The statements were then re-presented to rounds 3, along with information about the distribution of responses to the previous rounds in both groups, presented as a contingency table.

Table 12: The six groups of potential stakeholders who may be involved in a national outcomes database

Government	**Public**
Public Servants	Patients
Regulatory Bodies	Significant Others of Clients
Department of Health (Federal and State)	Potential Hearing Services Program Clients
Hearing Services Professionals	Elderly Australians
NDIS	First Nations Australians
Dept Aged Care	People of Working Age
OHS	Children and Teens
Health Planners	Patients who regularly travel
Funding Bodies	Patients in Remote Locations
Politicians	Taxpayers
Private Industry	**Researchers**
Hearing Aid Manufacturers	University Researchers
Hearing Service Providers/Centres	Private Hearing Research Centres (e.g. NAL)
Professional Organisations	**Health Professionals**
Audiology Australia	Hearing care professionals
The Profession of Audiology	General Practitioners
Community Peak Organisations	Ear, Nose, and Throat specialists
Deafness Forum of Australia	Other Medical Professionals
Advocacy Groups	Psychologists

There was consensus among both groups that the following potential purposes were important. The consensus percentage is shown next to each statement:

- To understand the impact of hearing loss on partners, family members and friends (C: 89%, P: 100%)
- To provide information to the public about expected results from hearing care intervention (C: 81, P: 93%)
- To promote person-centred hearing care (C: 93%, P: 100%)
- To help hearing care professionals recommend hearing care options to clients (C: 95%, P: 86%)
- To enable hearing care professionals to compare their performance with national standards (C: 86%, P: 93%)
- To help hearing care organisations know that they are providing high quality services (C: 86%, P: 93%)
- To help determine best practice in hearing care (C: 95%, P: 97%)
- To help doctors and other health professionals support people with hearing loss (C: 95%, P: 86%)
- To provide a national standard for effective hearing care services (C: 95%, P: 93%)
- To help the Government develop national hearing care policy (C: 98%, P: 90%)
- To help the Government target funding to hearing care services that achieve better outcomes (C: 89%, P: 86%)
- To provide evidence of the effective use of Government resources (C: 86%, P: 86%)
- To help researchers and hearing care professionals promote evidence-based hearing care (C: 95%, P: 93%)
- To help researchers better understand hearing loss and hearing care (C: 96%, P: 83%)
- To help identify future needs of people with hearing loss (C: 89%, P: 83%)

There was consensus among Consumers but not among Professional Stakeholders that the following purposes were important:

- To help clients understand the evidence for hearing care (C: 88%, P: 70%)
- To help clients choose a hearing care organisation (C: 89%, P: 73%)
- To help hearing care organisations identify which hearing care professionals are providing high quality services (C: 88%, P: 79%)
- To help Government and other funders identify and audit hearing care organisations that are achieving poor outcomes (C: 91%, P: 79%)
- To help researchers understand other medical conditions that are associated with hearing loss (C: 91% P: 69%)
- To help identify future trends in hearing science (C: 88%, P: 72%)

There was no consensus on the following statements:

- To enable a person with hearing loss to understand how their outcomes compare with outcomes of other people (C: 77%, P: 67%)
- To provide information about who in Australia has hearing loss (C: 72%, 66%)
- To identify populations at risk for hearing loss (C: 77%, P: 76%)
- To rank hearing care organisations based on their outcomes (C: 77%, P: 34%)

There was consensus among both groups that the following potential concerns were important:

- Measures used could be inaccurate or measure the wrong thing (C: 82%, P: 97%)
- Results could be misused by competitors to make other hearing care organisations appear unfavourable to potential clients (C: 82%, P: 90%)
- Hearing care professionals could tamper with the data for more favourable results (C: 89%, P: 93%)
- Hearing care organisations could tamper with the data for more favourable results (C: 89%, P: 97%)

There was consensus among Professional Stakeholders but not among Consumers that the following potential concerns were important:

- A data breach could result in the release of personal information (C: 75%, P: 90%)
- Poor outcome scores could be used to justify funding cuts (C: 75%, P: 90%)
- Poor outcomes could remain despite poor results in the database (C: 80%, P: 83%)

There was consensus among Consumers but not among Professional Stakeholders that the following potential concerns were important:

- Incomplete data could make the results unreliable (C: 89%, P: 76%)
- Data could be misinterpreted (C: 84%, P: 79%)

There was no consensus on the following statements:

- Hearing care organisations could incur administrative costs when collecting outcomes (C: 36%, P: 41%)
- Clients could be uncomfortable with being monitored (C: 41%, P: 55%)
- Results could reflect poorly on a hearing care professional (C: 57%, P: 69%)
- Results could reflect poorly on a hearing care organisation (C: 43%, P: 62%)
- Hearing care professionals could spend too much time collecting outcome information (C: 48%, P: 59%)
- Hearing care organisations could be ranked based on their outcomes (C: 50%, P: 55%)
- Smaller hearing care organisations could be at a disadvantage due to fewer outcome results reported (C: 63%, P: 79%)
- Funding used for the database could detract from the funding available for hearing care services (C: 70%, P: 79%)

There were no items in either section where there was consensus that the item was not important.

Respondents to round 1 of the Consumer Delphi Review were also asked how comfortable they would be with a range of different stakeholders running a national outcomes database, using a five-point Likert item with anchors Not at all comfortable, Slightly comfortable, Moderately comfortable, Comfortable, and Very comfortable. These responses were then used to generate a ranked list of preferred stakeholders, using the Kemeny-Young criterion.

The holders, in ranked order from most preferred to least preferred, were:

1. Independent Research Organisation (e.g. NAL, CSIRO)
2. Professional organisations for hearing services (e.g. Audiologist Australia, the Australian College of Audiology)
3. University Department
4. Australian Government
5. Hearing service companies
6. Hearing aid companies

National survey

To obtain an understanding of the kinds of outcomes currently being measured in Australian hearing services, as well as the outcome measures currently being used, a survey was developed and distributed via hearing professional organisations (The Australian College of Audiology, Audiology Australia, and the Hearing Aid Audiology Society of Australia) as well as via Independent Audiologists Australia.

Only participants who indicated that they were qualified practitioners who saw clients under the Hearing Services Program proceeded to begin the survey.

A total of 93 participants began the survey, although only 36 completed it in its entirety. As dropout during the survey was expected, the survey was designed in such a way that analysis could be conducted on each section in turn, making use of what responses were obtained.

What kind of people filled in the survey?

Of the 93 people who completed the first page of the survey, 35 indicated that they worked in independent practice, 34 that they worked in for a large (20 or more sites) private provider, 7 as a sole practitioner, 7 for a government-owned provider, 5 for a medium (5-19 sites) private provider, 3 for a small (fewer than 5 sites) private provider, and 1 in research.

What outcome domains are being measured in Australia?

In this section, participants were presented with the list of fifteen outcome domains presented to participants in Round 3 of the Professional Delphi Review. For each domain, participants were asked whether they personally measured it in all or some of their clients, or whether their clinic measured it in their clients. 51 participants began this section and 50 completed it. The results are shown in Table 13

Table 13: Outcome domains reported as being measures by survey respondents

Domain	I measure this in all (or most) of my clients	I measure this in some of my clients	My clinic measures this in my clients	I do not measure this
Improved communication ability	46	2	2	1
Increased use of hearing devices	40	7	2	1
Improved communication in groups	31	14	2	4
Improved social engagement	30	11	1	8
Improved participation in activities	26	14	0	10
Improved community engagement	21	17	2	11
Improved self-management ability	20	21	1	8
Improved personal relationships	20	18	0	12
Improved well-being	19	17	2	12
Reduced listening effort	19	16	1	14
Improved access to education	14	9	4	24
Increased independence	10	22	0	18
Reduced social isolation	8	18	1	23
Improved sense of empowerment	8	13	0	29
Reduced loneliness	4	15	1	30

The outcome domains most commonly reported as being measured – communication ability (both in general and in groups) and use of hearing devices – were reported by almost all participants.

Where an outcome domain was not measured, participants were asked why. The results for this question are shown in Table 14. For almost all outcome domains not measured, the most common reason was that there was not an applicable outcome measure or tool available. Very few participants reported that they believed that outcome measures were not important to measure, supporting the move towards consensus in the Delphi reviews.

In the "Other" category, the most common reasons given were that outcome domains were not hearing specific and could be confounded by other life changes, that they were not a common goal among patients, or that they were difficult or impossible to measure using currently available tools.

Table 14: Reasons for not measuring particular outcome domains

	I have not considered measuring this domain before	I don't have an applicable measurement tool/method to use	I do not think that it is important to measure	Other
Improved communication ability	0	0	0	1
Increased use of hearing devices	0	0	0	1
Improved communication in groups	1	2	0	1
Improved social engagement	3	4	1	1
Improved participation in activities	1	7	0	2
Improved community engagement	4	6	0	2
Improved self-management ability	4	2	1	1
Improved personal relationships	2	6	1	3
Improved well-being	3	7	0	2
Reduced listening effort	3	9	0	3
Improved access to education	14	8	2	4
Increased independence	6	12	0	2
Reduced social isolation	7	15	2	1
Improved sense of empowerment	11	13	2	4
Reduced loneliness	12	18	1	1

When participants were asked about how valuable they believed each outcome domain was as an indicator of the success of hearing rehabilitation, all domains were rated as highly valuable, as shown in Table 15. The perceived value of a domain tended to be higher among those participants who worked in clinics where it was measured (either by them themselves or by someone else in the clinic) than among those who worked in clinics where it was not measured.

Table 15: Ratings of valuableness of outcome domains

	Very valuable	Valuable	Moderately valuable	Slightly valuable	Not valuable
Improved communication ability	39	6	4	1	1
Increased use of hearing devices	31	16	1	1	1
Improved communication in groups	31	14	3	2	1
Improved social engagement	26	15	7	1	1
Improved participation in activities	25	18	4	2	1
Improved community engagement	24	19	7	0	1
Improved self-management ability	23	15	9	1	2
Improved personal relationships	28	13	6	1	2
Improved well-being	19	22	5	3	1
Reduced listening effort	22	21	6	1	0
Improved access to education	13	13	12	10	3
Increased independence	14	21	11	2	2
Reduced social isolation	22	17	6	4	1
Improved sense of empowerment	15	13	14	6	2
Reduced loneliness	18	16	11	2	3

What outcome measures are being used?

In this section, a range of existing outcome measures were presented to participants, who were asked about their use of them. 44 participants completed this section, the results of which are shown in Table 16.

The COSI was the most popular outcome measure, being used for all clients by nearly all participants. No other measure was reported as being used by a majority of participants.

Table 16: Reported usage of standardised outcome measures

	I use this for all (or most) of my clients	I use this for some of my clients	My clinic/organisation uses this outcome measure for clients that I see	I do not use this outcome measure and it is not used at my clinic/organisation
COSI	43	0	0	1
IOI-HA	10	11	0	23
APHAB	4	11	1	28
HAUQ	3	7	3	31
HHIE	2	8	1	33
EARtrak	2	0	1	41
SSQ	1	6	0	37
GHABP/GHADP	1	2	0	41
Generic Quality of Life Measure	0	1	0	43

For those measures that were only used for a selection of clients, the most common determinant of use was the client pathway, the client's cognitive ability, and the available time in the appointment, as shown in Table 17.

Table 17: Reasons for choosing to use standardised outcome measures

	Based on the client's preferred language	Based on the client's cognitive ability	Based on the available time in the appointment	The client can choose whether to respond	I use this only for certain client pathways	I use this only for specific client groups	We collect this for a sample of clients
IOI-HA	3	6	4	3	6	1	0
APHAB	1	3	3	1	5	1	1
HAUQ	0	4	1	0	6	0	0
HHIE	2	3	3	2	2	4	1
SSQ	1	3	0	0	5	2	0
GHABP/GHADP	0	0	0	1	2	1	0
Generic Quality of Life Measure	1	1	0	0	0	0	0

For those outcome measures that were not used at all, the most common reasons for not using them were burden on clients and a lack of awareness of the tool or a lack of availability within the participant's organisation. There were also privacy and cost concerns raised that were specific to the EARtrak system. Several participants raised that they did not use several of the measures because they measured outcomes using the COSI instead, and that therefore the specified measure would not add to patient care.

Table 18: Reasons for clinicians not using standardised outcome measures

	Too time consuming	Burden on clients	Limited or no additional value for client care	Other
COSI	0	0	0	1
IOI-HA	5	0	5	12
APHAB	6	3	9	14
HAUQ	3	1	9	16
HHIE	8	0	11	15
EARtrak	7	4	5	28
SSQ	4	1	6	25
GHABP/GHADP	9	2	13	19
Generic Quality of Life Measure	5	0	8	30

The most common time point at which outcome measures was completed was immediately following the hearing rehabilitation, with a drop off after then (see Table 19). However, there was an uptick in the use of several outcome measures between 3 and 6 months.

Table 19: Time points at which clinicians reported using standardised outcome measures

	At the time that the hearing rehabilitation is completed	Within the first month after the hearing rehabilitation is completed	1-2 months after the hearing rehabilitation	3-6 months after the hearing rehabilitation	7-12 months after the hearing rehabilitation
COSI	32	11	3	6	3
IOI-HA	8	5	3	5	5
APHAB	4	3	3	6	3
HAUQ	5	3	1	3	3
HHIE	4	2	1	4	3
EARtrak	1	1	1	1	0
SSQ	4	0	1	2	1
GHABP/GHADP	3	0	0	0	0
Generic Quality of Life Measure	1	0	0	0	0

The outcome measures that were used by participants were useful for a variety of purposes, as shown in Table 20. Many participants felt that completing the COSI was a requirement of the Hearing Services Program, however it was also used as an individual client monitoring and planning tool, and as a way to guide counselling.

Table 20: Reasons for using standardised outcome measures

	To help plan additional appointments	To enhance individual client care	To monitor client outcomes	To guide client counselling	To monitor and improve the service provided	To justify resource allocation	It is require by the Hearing Services Program	It is required by my employer
COSI	15	28	35	29	19	5	25	8
IOI-HA	10	19	18	16	12	2	2	1
APHAB	5	9	12	10	8	1	2	0
HAUQ	3	7	9	6	5	1	0	1
HHIE	4	5	7	4	3	1	2	0
EARtrak	1	2	2	2	2	2	1	2
SSQ	1	3	6	5	1	1	0	0
GHABP/GHADP	2	3	3	3	1	0	0	0
Generic Quality of Life Measure	0	1	1	1	0	0	0	0

How useful are available outcome measures at assessing client outcome?

In this final section, participants were asked how effective they felt the outcome measures that they used were at addressing different aspects of client outcomes. 36 participants completed this section of the survey, and the results are shown in Table 21.

In general, participants found that the outcome measures that they used were very helpful at assessing technological interventions such as hearing aids, although not as good at any of the other aspects presented. It is concerning that there were participants who felt that the outcome measures that they used were not at all helpful in assessing aspects of hearing rehabilitation.

Table 21: Helpfulness of available outcome measures at assessing parts of rehabilitation

	Very helpful	Helpful	Moderately helpful	Slightly helpful	Not at all helpful
Technological interventions	21	9	4	1	1
Communication abilities	10	14	9	1	2
Non-technological interventions	8	15	10	2	1
Impact on significant others	7	14	6	6	3
Participation restrictions	5	11	13	5	2
Psychosocial impact of hearing loss	4	14	10	6	2
Activity limitations	5	10	14	3	4

Discussion

The survey, although it had a low return rate and a large degree of dropout due to its length, included participants from a wide range of different types of hearing services. In general, participants agreed that the outcome domains highlighted by the Delphi Review of Professional Stakeholders were important to measure, although they themselves were measuring a relatively small set of domains.

While many participants reported measuring several of the outcome domains listed, very few identified outcome measures that could adequately be considered to actually measure those domains. This suggests that, rather than using a standardised or structured outcome measure, clinicians are assessing these domains using clinical interview.

Participants were more likely to report that they measured outcome domains that they felt were valuable markers of the success of hearing rehabilitation. This supports the need for clear articulation of the relevance of different outcome domains and measures should they be implemented.

There was overwhelming use of the COSI within the sample, and a significant number of participants highlighted other outcome measures as being unknown or inaccessible, or as placing a high burden on clients, suggesting that outcome measures implemented should be clearly identified to clinicians and hearing services, made freely available, and be as short as reasonably possible to facilitate their use with clients.

Participants reported that the outcome measures that they had available to them were reasonably good at assessing the impacts of technological interventions such as hearing aids, although not as good at assessing the impact of other interventions. Outcome measures chosen for implementation across the Hearing Services Program will need to be assessed to ensure that they are effectively addressing the different kinds of rehabilitation provided under the Program and also the various impacts that those different kinds of rehabilitation may be having.

Consensus workshops

To determine which outcome domains should be recommended from this project, a consensus workshop of participants in the Delphi Reviews was convened. Participants for this final consensus workshop were invited from the original list of people approached for involvement in the Delphi review, with a focus on representativeness across different kinds of organisations and on those who engaged in the three rounds of the Delphi review. Among the group, one was a person with hearing loss, two represented consumer advocacy organisations, and the remainder were professionals involved in the hearing industry. The participants are listed in Appendix A.

The top five outcome domains from the each of the two arms of the Delphi review were combined and reworded into seven outcome domains that were then presented to the workshop. The seven domains, the definition of each that was presented to the group, and a synthesis of discussion about each one as presented, is presented below.

Domains as presented to the group

Improved communication (with others, with family, in groups)

Original domains: “I can communicate effectively with people” (Consumer), “I can communicate well with my family” (Consumer), “Improved communication ability” (Professional), “Improved communication in groups” (Professional).

> This domain highlights the effect of hearing difficulty on the ability for a person to communicate effectively. Three different kinds of communication were highlighted by participants: communication with other people in general, communication specifically with family members, and communication in group situations. Importantly, these outcome domains focus on the ability to communicate in these situations, not on the effects that difficulty communicating may have on the person.

Very little discussion was had around this domain, although several participants highlighted that improved communication could be seen as a step along the path to other domains such as improved personal relationships, improved well-being, and improved participation. It was clear that the meaning of ‘communication’ referred to conversation between one or more people. Conversation breakdown is a commonly reported impact of hearing impairment and this was recognised by all consumer and professional participants.

Increased independence

Original domain: “I can live my life independently” (Consumer)

> Independence refers to the ability for people to live their lives not requiring or relying on others. This domain assumes that difficulty accessing sounds can require people with hearing difficulties to rely on others to support the activities of daily life. These support people may assist with things like interpersonal communication, accessing safety announcements, or environmental awareness. By improving access to the auditory environment, hearing rehabilitation can support people with hearing difficulties to live without requiring as much support from others.

There was again relatively little discussion of this domain, although one participant raised the strong linkage between independence and participation in the activities of life.

Improved perception of clarity

Original domain: “I hear clearly with my hearing aids” (Consumer)

> The clarity of delivered sound is a core part of the experience of hearing aids. If a person feels that the sound that they receive does not sound clear, even if it delivers improved speech recognition outcomes, the person may not be satisfied with the device fitting. This domain highlights the importance of a clear sound experience, independent of the functional effect of that sound.

This domain provoked a significant amount of discussion among the group. Several participants felt that the domain was difficult to operationalise clearly, as while “hearing clearly” was an important concept for recipients of hearing devices, it may be defined very differently by different people. The general agreement among the group was that this domain would be only appropriate for clients receiving hearing devices as a component of their hearing rehabilitation, and therefore should not be used.

Improved participation in activities

Original domain: “I am able to do the things that I want to do” (Consumer)

> Participation refers to “involvement in a life situation”, including social, vocational, and recreational activities. This domain focuses on the impacts that hearing difficulty can have on a person’s ability to do the things that they want to in their life. By improving access to the auditory world, this domain posits that the provision of effective hearing rehabilitation can improve people’s ability to participate in meaningful ways.

Much of the discussion of this domain centred around the long-standing and entrenched participation restrictions that may have affected a person with hearing difficulty, and the likelihood that this reduced participation will remain even following high-quality hearing rehabilitation. Participants expressed concern at measuring individuals' actual participation, as this may be strongly affected by age and other comorbidities.

The group decided during the discussion to reframe the domain to focus on "Reduced participation restrictions", to highlight the reduced experience of barriers to participation that may be expected to follow from high-quality hearing rehabilitation.

Improved personal relationships

Original domain: "Improved personal relationships" (Professional)

> This domain highlights the interpersonal interactions that people have, and the relationships that they develop as a result of those interactions. This domain assumes that hearing rehabilitation will make interpersonal communication easier, resulting in higher quality interpersonal interactions, and therefore improved relationships.

There was relatively little discussion of this domain, although it was highlighted as a potential precursor to social aspects of participation and the interactional portions of well-being.

Improved self-management ability

Original domain: "Improved self-management ability" (Professional)

> Self-management ability refers to an individual's capability to proactively maintain, monitor, and adjust their lives to ensure that they are functioning optimally. In hearing rehabilitation, we often refer to a person's device-related self-management ability (i.e. their ability to adjust and manage hearing devices). However, self-management of hearing difficulty may also include the ability for a person to make decisions about which communication strategies are likely to be beneficial to them in a particular situation.

There was relatively little discussion around this domain when it was presented, although the specification of this domain as applying beyond simply device-related self-management ability was well-received by the group.

Improved well-being

Original domain: "Improved well-being" (Professional)

> "There is no consensus around a single definition of well-being, but there is general agreement that at minimum, well-being includes the presence of positive emotions and moods, the absence of negative emotions, satisfaction with life, fulfillment and positive functioning. In simple terms, well-being can be described as judging life positively and feeling good." (Centres for Disease Control and Prevention, 2018)
>
> The domain of well-being highlights the varied effects that hearing rehabilitation can have on a person's life. By measuring a person's global well-being, this domain can capture benefits of hearing rehabilitation that may not be captured by more specific measures.

The consideration of well-being as a potential outcome domain was well-received by the group, although there was some concern that global well-being would not be a sufficiently specific or sensitive concept to capture the impacts of hearing rehabilitation. Several participants raised ongoing research work around the world that is aiming to conceptualise "hearing-related well-being" and develop measures of this concept.

Prioritisation and consensus

After presentation of the domains to the group, and discussion of their individual meaning, the full group split into two breakout groups to discuss the potential prioritisation of the outcome domains. Both breakout groups settled on Improved communication ability, Improved personal relationships, and Improved well-being as likely important.

Participants were then asked to individually rank the presented domains from most important (1) to least important (7). The combined rankings were then shown to the full group and a discussion-based consensus process was used to determine the domains that would form part of the final set. The number of people ranking each domain at each position is shown in Table 22.

Table 22: Rankings of individual domains obtained by participants

	1	2	3	4	5	6	7
Improved communication ability	10	0	1	0	0	0	0
Improved personal relationships	1	4	5	1	0	0	0
Improved well-being	0	5	0	3	0	0	1
Improved participation in activities	0	1	1	5	3	1	0
Increased independence	0	1	1	1	7	1	0
Improved perception of clarity	0	0	1	0	1	3	6
Improved self-management ability	0	0	0	1	0	6	4

There was broad agreement that Improved communication ability, Improved personal relationships, and Improved well-being should be included in the final set of recommended domains. With respect to Improved well-being, participants stressed the importance of future work to determine whether hearing-related well-being constructs and measures gave additional sensitivity and specificity over global well-being measures.

There was a further discussion about Improved participation in activities: The group decided that, rather that improved participation, this domain should focus on the reduction of barriers to participation, resulting in the reworded domain Reduced participation restrictions.

The final set of recommended domains agreed to by the workshop were:

- Improved communication ability
- Improved personal relationships
- Improved well-being
- Reduced participation restrictions

Following the discussion of which outcome domains should be measured following hearing rehabilitation, additional discussion was had regarding the time points at which outcomes should be measured, and which outcome measures should be used.

There was no decision made regarding a positive answer to either question, with most participants agreeing that these questions should be answered with reference to the research literature.

Extension to the CSO component of the HSP

A further workshop was convened to explore the applicability of the identified outcome domains to the Community Service Obligation (CSO) components of the HSP, to address objective 4. In attendance were four staff from Hearing Australia responsible for the delivery of the CSO: the Head of Specialist Clinical Services (Di Alcock), and the Principal Audiologists for the Paediatric (Alison King), Specialist Adult (Emma Scanlan), and Aboriginal and Torres Strait Islander (Sam Harkus) Services. The four identified outcome domains were presented to the group, and each person was asked to identify whether they felt that the outcome would be relevant to their particular segment of the CSO and any particular issues that might arise in the measurement of that outcome in their segment of the CSO. The Head of Specialist Clinical Services was able to provide a perspective on each individual program but also on the use of these outcomes within the CSO as a whole.

Participants highlighted the importance of a clear understanding of the change in outcomes with time independent of hearing rehabilitation, particularly among children and people with complex needs. For example, communication outcomes for children are likely to increase naturally with time, while adults with significant additional disabilities may experience a decline in well-being over time even with high-quality hearing rehabilitation.

Participants also discussed the importance of clear norms for outcomes of hearing rehabilitation. Among children with hearing loss, recent research from the Longitudinal Outcomes of Children with Hearing Impairment (LOCHI) study has shown that even with early hearing device fitting and intensive rehabilitation, language outcomes for children with hearing impairment may be expected to be poorer than those of their normally-hearing peers.

The potential for different definitions of individual outcome domains was also identified as a potential barrier to the translation of the present results to the populations covered by the CSO. Again, children were highlighted here, with the potential for productive language as an important component of communication being discussed. A clear exploration of the different aspects of outcomes considered important by stakeholders involved in these sub-programs would help ensure that they are relevant and comprehensive.

The large number of professionals involved in the management of both children and adults with complex needs may make it difficult to attribute changes in outcome directly to hearing rehabilitation. A reduction in participation restrictions for an older adult with additional disabilities, for example, may be in part due to the availability of hearing rehabilitation, but also due to the work of an occupational therapist also involved in care. Additional research work will be required to ensure that outcome measures used in these populations are sufficiently specific to hearing rehabilitation that they may appropriately be used as measures of the rehabilitation provided, rather than as global measures of the person's healthcare program.

The outcome domains identified in this project are largely best measured through self-report. This raised concerns among the participants regarding their application in populations who might be unable to complete measures themselves due to age, additional disability, or reduced access to written English. Participants stressed that a wide range of stakeholders should be involved in the design of any measures intended for implementation across Australia.

All participants in the meeting agreed that in order to move towards the implementation of patient-centred outcomes within the CSO a further stakeholder engagement process like that undertaken in the current study should be undertaken. Within the Paediatric portion of the CSO, this should involve parents and other family members, and for the Specialist Adult portion of the CSO this should involve carers of participants with additional disabilities. Any consultation should also ensure that Aboriginal and Torres Strait Islander people living in remote communities are involved.

Discussion

Many outcome measures used in hearing rehabilitation have been designed to be specific to hearing aids, while outcome measures designed to address alternative or non-technological interventions have not seen as much success (e.g., the IOI-AI; Noble, 2002). However, the Hearing Services Program defines rehabilitation more broadly, as only potentially including device fitting (Australian Government Department of Health, 2019). Ideally, outcome measures selected for use in the Hearing Services Program should be applicable to all rehabilitation services delivered under the Program, whether those services include device fitting or not. This was supported by participants in the Consensus Workshop, who emphasised the importance of outcome domains that are not specific to the provision of hearing devices.

For this reason, we recommend that outcome measures that are specific to device fitting be used to measure an outcome domain only where no measure that is not specific to device fitting exists. Further, in these cases, we recommend the development of outcome measures that do not make reference to hearing device fitting to facilitate their application to rehabilitation services more broadly. This will allow for broader comparison of outcomes across the Hearing Services Program, particularly between clients who receive hearing devices and clients who do not.

Self-report measures are by nature patient-centred, as they aim to explore and understand the experience of an intervention according to the person themselves. However, many self-report measures, while very useful for planning and assessing individual rehabilitation programs, cannot be used at a service evaluation level. A good example of this is the COSI, which is widely used for rehabilitation planning and evaluation in

Australia, but which has significant ceiling effects that make it difficult to use to compare services (Dillon et al., 1999). As a clinician-administered instrument, there are also significant concerns about observer bias.

While for most health conditions, particularly chronic conditions, there are only a few questionnaires used regularly, audiology has many self-report questionnaires available. However, there is no consensus about which should be used as a primary outcome measure (Granberg, Dahlström, et al., 2014). To be considered a gold standard outcome measure, a measure should have been validated in hearing rehabilitation, not be specific to device fitting, have a small number of items, be applicable to both patient-level and service-level assessment, be applicable to people from a wide range of Culturally and Linguistically Diverse (CaLD) backgrounds, allow for standardised scores, have been co-designed involving both adults with hearing loss and hearing healthcare professionals, and be developed using robust psychometric methods (for more information on the application of psychometrics in audiology, see Heffernan et al., 2019). For example, while the IOI-HA is available in a variety of languages and have been validated in hearing rehabilitation, it has poor psychometric properties. On the other hand, the SPaRQ is too long for use clinically and has not been validated in people from CaLD backgrounds.

The most obvious impact of hearing loss is increased difficulty in understanding spoken language, and it is the drive to reduce this difficulty that has underpinned much of the development of hearing rehabilitation. The assessment of improvements in communication function was highlighted by both Professionals and Consumers as an important marker of the success of a hearing rehabilitation program. Indeed, this was the only outcome domain that was described by both participant groups in the Delphi review process. , and it is for this reason, along with a unanimous decision that this was the most important outcome domain from the consensus workshop, that we recommend that communication ability be targeted as the primary outcome domain for the assessment of hearing rehabilitation. However, there was no single measure of communication ability that could be considered a gold standard outcome measure from our research. While the Self-Assessment of Communication assessed communication ability and has been well validated, it does not assess the individual areas of communication ability identified by participants (Hodes et al., 2009; Schow & Nerbonne, 1982).

The Glasgow Hearing Aid Benefit Profile (GHABP) was developed to be able to both facilitate counselling in individual hearing rehabilitation programs (e.g. by identifying a mismatch between reported disability and handicap, or mismatch in reported hearing difficulties and pure-tone hearing thresholds), and to provide measures of rehabilitation program outcome at the service level. It was validated at the time of its development, although this was prior to the widespread adoption of modern psychometric methods (Gatehouse, 1999). The GHABP is a standardised measure, that provides a measure of communication-related (dis)ability in four predefined situations, including in quiet and in group scenarios.

This measure was introduced into the Modernising Hearing Aid Services (MHAS) programme in the United Kingdom in 2000 and was the first outcome measure used to evaluate hearing aid-based rehabilitation services in that country. As in Australia, the United Kingdom has strong standards for the provision of Government-funded hearing rehabilitation services (National Institute for Health and Care Excellence (NICE), 2018; NHS England, 2016). As a result, in a 2016 survey of services in the NHS (to which 55% responded) 32% used the GHABP and 27% used the Glasgow Hearing Aid Difference Profile, a modification of the GHABP that targets the additional benefit provided by a change to hearing devices (Ferguson & Olsen, 2019). While the GHABP as a whole is designed to be applied by clinicians both before and after rehabilitation, Part 2 of the measure is applicable without clinician involvement and has been used in this way by NAL in recent clinical research.

There is an increasing requirement from policymakers in the United Kingdom to use outcome measures that assess how hearing loss impacts other factors and comorbidities such as social isolation, social engagement, and loneliness (NHS England, 2016). It was for this reason that the Social Isolation Measure (SIM) was originally developed (Heffernan et al., 2019), which is a measure of the Social Particiation Restrictions Questionnaire (SPaRQ). The negative effects of hearing loss on people's ability to participate in society are well-documented, and increased participation in society has broad benefits both to society and to the individual. Importantly, participation has been shown to be sensitive to hearing rehabilitation approaches that do not include device fitting (Öberg, 2017).

The SPaRQ is a research-quality measure of hearing-related participation restriction, has been validated in hearing rehabilitation, and is not specific to the provision of hearing devices. It was also developed by involving input from audiologists and adults with hearing loss (Heffernan et al., 2018). However, the SPaRQ is too long for inclusion in its entirety in an outcomes instrument. However, having been scaled using Item Response Theory (IRT), items on the SPaRQ may be selected to allow for estimation of the underlying trait to any required accuracy, similar to the approach used in Computer Adaptive Testing (Lunz et al., 1994). However, this approach relies on an understanding of the expected range of responses in the population. Application of the SPaRQ in a large sample of clients of the Hearing Services Program will facilitate the selection of items that give appropriate data to describe hearing-related participation restriction to an appropriate level of specificity. Alternatively, should an electronic method of data collection be used, Computer Adaptive Testing may be used directly to obtain more accurate measures of Social Participation.

While there is no single clear definition of well-being, it may be thought of as "judging life positively and feeling good" (Centres for Disease Control and Prevention, 2018). Other terms that may be used for subjective well-being are "life satisfaction" or "overall happiness" (Veenhoven, 2012). The assessment of general well-being in hearing rehabilitation is not widespread, although the Ryff Psychological Well-Being Scale has been used in studies of hearing rehabilitation in Australia (Hickson et al., 2008). However, it has not been validated using robust psychometric properties. The Warwick-Edinburgh Mental Well-Being Scale (WEMWBS), on the other hand, has been validated using IRT in an Australian population, making it more immediately applicable for similar reasons as the SPaRQ (Houghton et al., 2017). The WEMWBS has been used in a variety of research studies in Australia and worldwide, and so the use of this measure would facilitate the comparison of hearing rehabilitation with other datasets, including other health modalities.

However, there is concern that general measures of well-being may be too blunt to detect changes due to hearing rehabilitation. There is currently work ongoing to develop an understanding of hearing-specific of well-being, which could inform the basis of a hearing-specific well-being measure (Vercammen et al., 2020). This work should be assessed on an ongoing basis to determine whether the use of hearing-specific measures of well-being will add to the understandings provided by a more general well-being measure.

There is currently no good measure of the effects of hearing difficulty on personal relationships that focuses on the person with hearing difficulties themselves. The Significant Other Scale for Hearing Disability (SOS-HEAR) does assess the impact of hearing loss on relationships, but it was developed to be completed by the significant other (Scarinci et al., 2012). A patient self-report measure is necessary to allow the measurement of the impact of hearing loss on personal relationships from the perspective of the person with hearing loss. This may have the added benefit of being able to establish the effect of early rehabilitation on relationships, encouraging people experiencing hearing difficulties to seek early intervention and reducing ongoing disability.

There is long-standing evidence that hearing aid outcomes are likely to have stabilised by the three-month time point (Humes et al., 1996). There is little evidence currently available regarding the stability of outcomes of hearing rehabilitation other than hearing aid fitting. In general, consensus among professional stakeholders taking part in the Delphi review was that outcomes should not be collected immediately following the rehabilitation program (e.g. at the two-week follow-up appointment following device fitting) but should be delayed until the three-month period. It is possible that some outcomes may take longer to stabilise for some people (e.g. outcomes that measure psychosocial aspects and well-being), and so ongoing review of the developed outcomes instruments should be conducted to ensure that they capture the effect of hearing rehabilitation programs. In addition, there is little evidence available regarding the longer-term effects of hearing rehabilitation beyond 3-6 months post-fitting (F. Barker et al., 2016). Recent Cochrane reviews of hearing rehabilitation have recommended that studies of longer-term outcomes of hearing rehabilitation be conducted (Ferguson et al., 2017).

When exploring the potential for a national outcomes collection system, we identified two cases of national outcomes measurement, one within Australia and one within hearing rehabilitation. The Australasian Rehabilitations Outcomes Centre (AROC), run by the Australian Health Services Research Institute at the University of Wollongong, is the national clinical registry for rehabilitation medicine in Australia and New Zealand. It was established by the Australasian Faculty of Rehabilitation Medicine and is strongly supported by state and federal governments, industry organisations, and professional organisations in rehabilitation medicine. AROC aggregates standardised outcomes for patients undergoing medical rehabilitation, collected by service providers, and creates benchmarking reports that can be used by service providers for quality improvement. The data have also been used for large-scale research projects (Turner-Stokes et al., 2015).

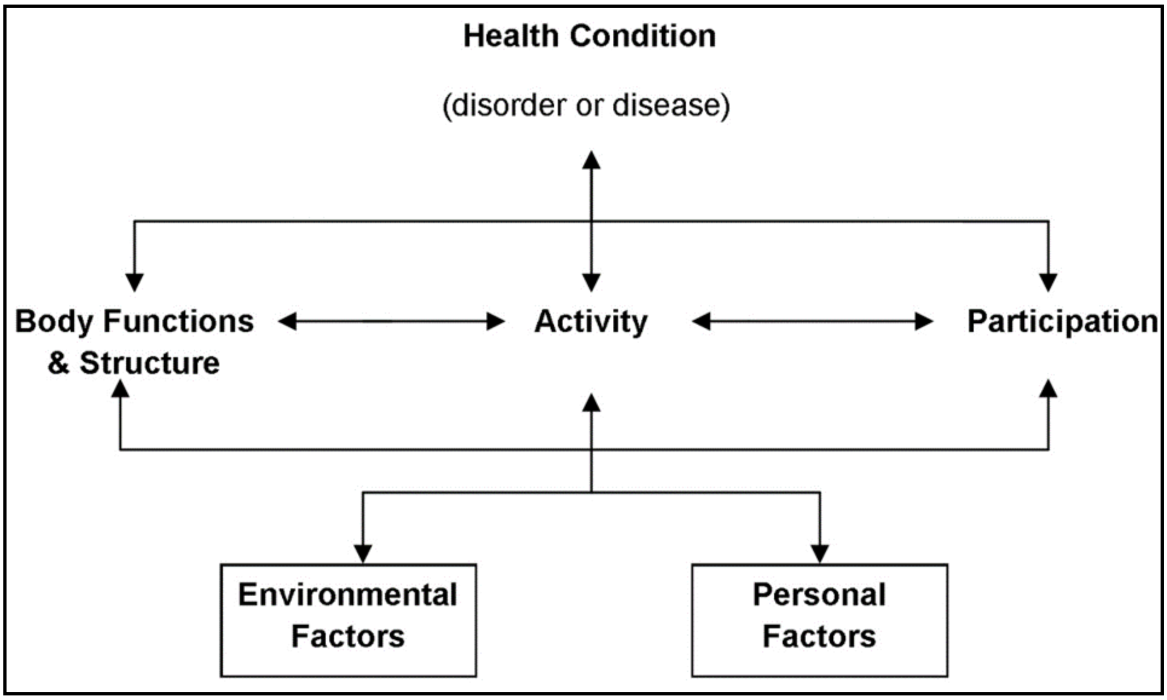
Hearing rehabilitation in Sweden is benchmarked by the Nationellt kvalitetsregister för hörselrehabilitering (National quality register for hearing rehabilitation), run by the Research Institute Hörselbron. It is owned by the Swedish National Association for the Hard of Hearing. Inclusion on the register is optional for hearing services, but approximately 70% of people fitted with hearing devices in Sweden are included. Similar to AROC, the Swedish quality register provides independent benchmarking reports to regions and clinics to facilitate service improvement. However, rather than aggregating data collected by services themselves, the Swedish quality register contacts people who have received hearing devices directly by post, with a response rate of approximately 50%.

When asked about the possibility of a national outcomes database/collection system, while there was very little agreement among professionals involved in the hearing industry, consumers had clear preference for collection and analysis of outcomes data to be conducted by a body perceived as independent from the hearing industry, such as universities, professional organisations, or the National Acoustic Laboratories. For this reason, we believe that an independent body should be established, to collect and analyse outcomes data and report on these to Government, service providers, and the public. This independent body would be particularly well-placed to undertake the additional research work required to develop and maintain an outcomes instrument discussed above. To ensure maximum data collection for clients of the Hearing Services Program, data for all clients undergoing a hearing rehabilitation service under the HSP should be made available to this body so that they may be directly contacted.

One limitation of this study was the lack of people with hearing loss in the final consensus workshop. This may have led to an over-representation of those outcome domains considered important by professionals working in hearing services in the final list of recommended outcome domains. Ongoing review of any outcomes instrument that is developed and used should be undertaken to ensure that it remains effective in addressing the benefits experienced by people receiving hearing rehabilitation through the Hearing Services Program.

Finally, there is value in considering how this research fits within a theoretical framework to link and support the results to existing theories and concepts included in the hearing healthcare field but also for healthcare field outside of hearing. The International Classification of Functioning, Disability and Health (ICF; World Health Organisation, 2001) is based on the Biopsychosocial Model that integrates biological, psychological and social aspects, and the ICF (see Figure 2) has been widely used within hearing research over the last two decades. The ICF is a standardised framework to describe health conditions to enable a better understanding of the complexities that contribute to health conditions, this case hearing loss (McMahon et al., submitted). Health conditions are described by comprehensive and brief ICF Core Sets. Within the field of hearing, these Core Sets (brief, n=27; comprehensive, n=117) have been described and mapped onto the ICF (Danermark et al., 2013)

Figure 2: Overview of the International Classification of Functioning, Disability and Health Framework (ICF)



For the four outcome domains that were identified as being important to measure the success of hearing rehabilitation, ICF categories and ICF codes from the Brief Core Set in the first instance have been mapped onto the domains:

- Communication in general
    - d310 Communicating with – receiving - spoken messages
    - d3503 Conversing with one person
- Communication with family
    - d760 Family relationships
    - d770 Intimate relationships
    - d310 Communicating with – receiving - spoken messages
    - d3503 Conversing with one person
- Communication in groups
    - d3504 Conversing with many people
    - d355 Discussion
    - d310 Communicating with – receiving - spoken messages
    - d310 Communicating with – receiving - spoken messages
- Participation restrictions
    - d710 Basic interpersonal interactions
    - d720 Complex interpersonal interactions
- Personal relationships
    - d760 Family relationships
    - d740 Formal relationships
    - d750 Informal social relationships
    - d760 Family relationships
    - d770 Intimate relationships

Notably, these are all categories are associated with Participation (coded by prefix d) in the ICF, and there is overlap of categories. There were no immediately relevant categories for well-being, primarily because well-being is a generic concept. Based on the early conceptualisation of hearing-related well-being currently being developed in ongoing research (Ferguson & Ali, 2019), some concepts would map onto other Core Sets. For example, mental healthcare has Core Sets for depression, schizophrenia and bipolar disorder. Examples of ICF categories would be emotional functions (b152: anxiety, distress), experience of self (b1800: identity) and handling stress and other psychological demands (d240: coping threshold). Here, ICF categories Body Structures and Function (coded by prefix b) are addressed. Currently, Personal Factors are not specifically coded into ICF categories.

Further work to develop this framework modelling would build on the Comprehensive Core Set for hearing, which includes Environment (e.g. e310 immediate family; e315 extended family; e465 societal norms, practices, and ideologies; e590 labour and employment services systems and policies).

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Appendix A: Participants

Scoping Workshops

Professional Stakeholders, Sydney 1/11/2019

- Leanne Babic – Connect Hearing
- Catherine Birman – SCIC
- Sue Cotton – Audika / Hearing Care Industry Association
- Christine Hunter – Hearing Matters Australia
- Janette Oliver – Cochlear
- Bettina Turnbull – Sonova

Professional Stakeholders, Brisbane 25/11/2019

- Olivia Bakiewicz – Blamey Saunders
- Jonathan Constantine – Oticon Australia
- Thomas Dahmen – Hearing Aid Audiology Society of Australia
- Tegan Keogh – IAA
- Barbra Timmer – The University of Queensland / Sonova Group
- Tony Whelan – Better Hearing Australia Brisbane/ National
- [name withheld]

Professional Stakeholders, Melbourne 9/12/2019

- Karen Barfoot – Hearing Care Industry Association
- Caitlin Barr – Better Hearing Australia Victoria
- Susan Clutterbuck – EarTrak
- Victoria Didenko – Better Hearing / Tinnitus Australia
- Jacy Fellows – Bloom
- Jason Ridgway – DVA
- Jessica Vitkovic – Audiology Australia

Consumers, Sydney 7/2/2020

- David Brady – Deafness Forum, Hear For You
- Alana Doyle – Better Hearing Australia Victoria
- Christine Hunter – Hearing Matters Australia
- Carol-Anne Greensill – Better Hearing Australia Brisbane
- Robert Loftus – Hearing Matters Australia
- Kevin Rabe – Hearing Matters Australia
- Raelene Walker – Shenton College Deaf Education Centre

Delphi Review: professional stakeholders

Round 1

- Dr Barbra Timmer
- Dr Rebecca Bennett
- Dr Andrea Simpson
- Assoc. Prof. Christopher Lind
- Mr Dave Soares Batalha da Silva
- Prof Cath McMahon
- Ms Christine Hunter
- Mr Grant Collins
- Mr David Brady
- Miss Nadine Currey
- Ms Jacy Fellows
- Ms Janette Oliver
- Ms Sarah Love
- Ms Catherine Hart
- Ms Susan Clutterbuck

- Mrs Brooke Milne
- Ms Emma Ramsay
- Mr Matthew Grounds
- Mr Chris Carlile
- Prof. Rob Briggs
- Prof. Elaine Saunders
- Mrs Karen Pedley
- Mrs Victoria Didenko
- Ms Leanne Babic
- Ms Heidi Limareff
- Prof Anthony Hogan
- Ms Tegan Keogh
- Mr Mark Paton

Round 2

- Dr Barbra Timmer
- Dr Rebecca Bennett
- Dr Caitlin Barr
- Mr Tony Whelan
- Prof. Cath McMahon
- Ms Christine Hunter
- Mr David Brady
- Ms Bettina Turnbull
- Ms Jacy Fellows
- Ms Sarah Love
- Ms Susan Clutterbuck
- Mr Matthew Grounds
- Prof. Rob Briggs
- Prof. Elaine Saunders
- Mrs Karen Pedley
- Mrs Victoria Didenko
- Ms Heidi Limareff
- Prof. Anthony Hogan
- Ms Tegan Keogh
- Mr Mark Paton
- Ms Anthea Arkcoll

Round 3

- Dr Rebecca Bennett
- Dr Caitlin Barr
- Mr Tony Whelan
- Ms Christine Hunter
- Mr David Brady
- Ms Jacy Fellows
- Ms Janette Oliver
- Ms Sarah Love
- Ms Catherine Hart
- Ms Susan Clutterbuck
- Mrs Brooke Milne
- Ms Emma Ramsay
- Mr Matthew Grounds
- Prof. Rob Briggs
- Mr Iain Summerlin
- Mrs Karen Pedley
- Mrs Victoria Didenko
- Ms Leanne Babic

- Ms Heidi Limareff
- Prof. Anthony Hogan
- Mr Mark Paton
- Ms Anthea Arkcoll

Delphi review: patients and family members

Note that all participants completed all three rounds except where indicated.

- Christine A Hunter – Hearing Matters Australia
- Robert Loftus – Hearing Matters Australia
- Deanna Connor
- Michael Fitjer
- Teerapol Jearapunpong (Round 1)
- Leandro Gambotto
- Ian Rimes – Better Hearing Australia Central Coast Inc.
- Sonia
- John Spresser
- John Campey (Round 1 and 3)
- Andrew Stewart – Hearing Connections
- Frances Wonsack (Round 1 and 2)
- Meredith Anderson
- Dawn Nettheim (Round 1 and 2)
- Beatrix Varga
- Garry Luscombe
- M. Brandl
- Reginald Blewitt
- Kevin Rabe
- Albert Pichler (Round 1)
- Morris Hinch
- Brian Donnelly
- Robert Barnes
- Jeffrey Willmott
- Richard Banner
- Keith Smith
- Donald Gillies
- Raelene Walker – Deafness Forum of Australia / Shenton College Deaf Education Centre, WA
- Roger Peffer – Better Hearing Australia (Sydney) Inc.
- Jon West
- Liz Burke
- Lance Harkus
- Gail Saxby
- Michele Nealon
- Chris Danckwerts – Hearing Matters Australia
- Malcolm Minter
- Murray Connor
- Christine Riley (Round 1 and 2)
- Katrina Sullivan
- John Campey
- Jill Lindley – Better Hearing Australia
- Vanessa Winship
- Gavin Ralston
- Steve Brady (Round 1)
- James Henderson
- Debra Jones (Round 1 and 2)
- Richard Brading – Hearing Matters Australia
- Didi Bower

- Lin Berriman
- Bob Ecclestone

Consensus workshop

- Caitlin Barr – Soundfair
- Sue Clutterbuck – EARtrak
- Jacy Fellows – Bloom Hearing
- Christine Hunter – Hearing Matters Australia
- Heidi Limareff – Can:Do Hearing
- Mark Paton – ACAud
- Karen Pedley – Attune
- Emma Scanlan – Hearing Australia
- Barbra Timmer – Audiology Australia / Sonova / The University of Queensland
- Tony Whelan – Better Hearing Australia Brisbane

Appendix B: International Outcomes Inventory for Hearing Aids (IOI-HA)

Think about how much you used your present hearing aid(s) over the past two weeks. On an average day, how many hours did you use the hearing aid(s)?				
None	Less than 1 hr/day	1-4 hr/day	4-8 hr/day	More than 8 hr/day
Think about the situation where you most wanted to hear better, before you got your present hearing aid(s). Over the past two weeks, how much has the hearing aid helped in that situation?				
Helped not at all	Helped slightly	Helped moderately	Helped quite a lot	Helped very much
Think again about the situation where you most wanted to hear better. When you use your present hearing aid(s), how much difficulty do you STILL have in that situation?				
Very much difficulty	Quite a lot of difficulty	Moderate difficulty	Slight difficulty	No difficulty
Considering everything, do you think your present hearing aid(s) is worth the trouble?				
Not at all worth it	Slightly worth it	Moderately worth it	Quite a lot worth it	Very much worth it
Over the past two weeks, with your present hearing aid(s), how much have your hearing difficulties affected the things you can do?				
Affected very much	Affected quite a lot	Affected moderately	Affected slightly	Affected not at all
Over the past two weeks, with your present hearing aid(s), how much do you think other people were bothered by your hearing difficulties?				
Bothered very much	Bothered quite a lot	Bothered moderately	Bothered slightly	Bothered not at all
Considering everything, how much has your present hearing aid(s) changed your enjoyment of life?				
Worse	No change	Slightly better	Quite a lot better	Very much better

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