

Postprint Version	1.0
Journal website	<a href="http://www.tandfonline.com/doi/full/10.1080/14992027.2016.1214757">http://www.tandfonline.com/doi/full/10.1080/14992027.2016.1214757</a>
Pubmed link	<a href="https://www.ncbi.nlm.nih.gov/pubmed/27686670">https://www.ncbi.nlm.nih.gov/pubmed/27686670</a>
DOI	10.1080/14992027.2016.1214757

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## Clients' perspective on quality of audiology care: Development of the Consumer Quality Index (CQI) 'Audiology Care' for measuring client experiences

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### ABSTRACT

**Objective:** Clients' perspective on the quality of audiology care has not been investigated thoroughly. Research has focused primarily on satisfaction with, and limitations of hearing aids. We developed a Consumer Quality Index (CQI) questionnaire 'Audiology Care' to systematically assess client experiences with audiology care. **Design:** The CQI Audiology Care was developed in three steps: (1) posing open-ended questions through e-mail (n=14), (2) two small-scale surveys assessing psychometric properties of the questionnaire (n=188) and importance of quality aspects (n=118), and (3) a large-scale survey (n=1793) assessing psychometric properties and discriminatory power of the questionnaire. **Study sample:** People with complex hearing impairments and/or balance and communicative disorders who visited an audiology care centre during the past year. **Results:** Important quality aspects were translated into seven reliable scales: accommodation and facilities, employees' conduct and expertise, arrangement of appointments, waiting times, client participation and effectiveness of treatment. Client experiences differed among the participating centres concerning accommodation and facilities, arrangement of appointments, waiting times and client participation. **Conclusion:** The CQI Audiology Care is a valid and reliable instrument to assess clients' experiences with audiology care. Future implementation will reveal whether results can be used to monitor and improve the quality of audiology care.

The number of people suffering from a hearing-related impairment is considerable. The proportion of people with a hearing impairment in the Western population is estimated at 16% (Hindhede, 2015). Some participation and activity limitations can easily be improved by amplification, e.g. limitations caused by mild hearing loss associated with aging (high frequency hearing loss) (Chisolm et al, 2007). However, other hearing impairments are more complex and/or severe, and present in children and (young) adults. In the Netherlands, the more complex cases are referred to a specialized audiology care centre or audiology department of a university medical centre by a general practitioner or medical specialist. This mainly involves

people with complex and/or severe hearing impairments, people with severe tinnitus and children with a hearing impairment. These audiology care centres are specialized in diagnostics and rehabilitation programmes for complex hearing impairments and balance and communicative disorders. A multidisciplinary staff is available, consisting of audiologists, speech therapists, psychologist, social workers and technicians. The care provided by the audiology care centres is reimbursed by the health insurer.

To achieve a high standard of quality of care a patient-centred approach is increasingly being advocated (Richardson et al, 2001; Meterko et al, 2010). This approach entails involving patients/ clients in their care and specifically in health decision making, or shared decision making (Mead & Bower, 2000). The impact of the physician–patient/client interaction on medical practice outcomes has been extensively studied in the medical field (Bensing, 1991; Stewart et al, 1999; Dasinger et al, 2001; Griffin et al, 2004; Dibbelt et al, 2009). Physician–patient/client communication is referred to as the most important aspect of health care (Silverman et al, 1998). Perceived quality of the physician–patient/client interaction correlates with long-term treatment results in rehabilitation (Dibbelt et al, 2009). A patient-centred approach, that bears in mind the client's active participation, could improve the quality of dispensing, fitting, and counselling practices with the end-goal to increase hearing aid benefit and satisfaction (Knudsen et al, 2013). When helping those with a hearing impairment to make optimal decisions, hearing care clinicians should offer intervention options and should discuss these with their client (Laplante-Levesque et al, 2012a). However, there is a lack of empirical evidence regarding the influence of the client–care clinician interaction on hearing aid uptake and use (Knudsen et al, 2010). Research on hearing aid uptake has focused primarily on satisfaction with, and the limitations of the hearing instruments themselves and mainly small-scale, qualitative studies have been performed. In the field of audiology care, patient-centred care is hardly investigated systematically (Grenness et al, 2014a).

Nowadays, the quality of care is often measured by asking people about their experiences with health care. In the Netherlands, patients' and clients' healthcare experiences are measured using Consumer Quality Index surveys (CQ-index or CQI). The CQI consists of a standardized method for developing questionnaires and for measuring, analysing and reporting experiences with health care (Koopman et al, 2011). This makes it possible to compare the care provided by different health care providers. The CQI is being promoted by the Ministry of Health and the Inspectorate for Health Care, and has been widely applied (Delnoij et al, 2010). An important strength of the CQI methodology is that all stakeholders including the patients/clients are involved in the development of the various CQI questionnaires. In this way all quality aspects that are important for patients/clients are incorporated into the questionnaire (Delnoij et al, 2010).

Many sector-specific and/or disease-specific CQI instruments have been developed, but so far none was available to measure experiences of audiology care clients. The aim of this study was to develop a valid and reliable CQI questionnaire to measure the experiences of clients with audiology care. The questionnaire should also be able to detect differences in client experiences among audiology care centres in the Netherlands (so-called discriminatory power). The resulting questionnaire will be able to measure the quality of audiology care from the clients' perspective and

compare the quality among audiology care centres. This should make feedback information available which audiology care centres can use to improve the care provided.

## **METHODS**

### **Study population**

Clients who visited an audiology care centre or audiology department in a university medical centre (hereafter referred to as audiology care centre). This group consisted of people with complex and/or severe hearing impairments, people with severe tinnitus, people with balance and communicative disorders and children with a hearing impairment.

Design The CQI Audiology Care was developed in three steps following the CQI methodology, see Figure 1 (Koopman et al, 2011). First, after assessing the literature, we asked a small group of clients which quality aspects they found important concerning the audiology care they received (qualitative phase). Based on the results we identified the quality aspects to be included in the questionnaire.

For these aspects we formulated questions according to the CQI methodology. Next, we performed two small-scale surveys.

### **[FIGURE 1]**

One group filled out the first version of the CQI Audiology care (version 1.0). Based on these results we assessed the psychometric properties and underlying constructs of the questionnaire. A second group indicated how important they evaluated the different quality aspects in the questionnaire by filling out the CQI Audiology Care importance questionnaire. After adjusting the CQI Audiology Care, a large-scale pilot among clients of 21 audiology care centres was set up to confirm the underlying constructs in the questionnaire and to determine the capacity of the questionnaire to measure differences among audiology care centres ('discriminatory power').

Ethical approval of the study was not required as research by means of surveys that are not taxing or hazardous for clients (i.e. the onceonly completion of a questionnaire containing questions that do not constitute a serious encroachment on the respondent) is not subject to the Dutch Medical Research Involving Human Subjects Act (WMO).

### **Qualitative phase**

Six audiology care centres invited clients who visited the care centre to participate in a focus group discussion. Clients were invited via a personal letter, a general letter distributed by front desk employees or poster announcements in the centre. However, people indicated they were not able to participate in a group discussion or telephone interview because of their hearing-related impairment.

This in spite of the facilities we offered (e.g. a hearing loop or deaf relay interpreter). As an alternative, people who indicated that they were willing to take part in the study, were asked to answer the following questions via e-mail: (1) Please describe (three) positive experiences you had concerning the care in the audiology care centre, (2) Which (three) negative experiences did you have concerning the care in the audiology care centre, and (3) In your opinion, what is good audiology care? How should the care in an audiology care centre be organized?

### **Small-scale pilot**

We formulated questions for each of the quality aspects that resulted from the qualitative phase, consistent with the CQI methodology (Koopman et al, 2011). This resulted in the first version of the CQI Audiology Care (version 1.0). The questionnaire consisted of 80 questions of which 59 questions evaluated clients' experiences with audiology care. These questions included six global ratings on a scale from 0 (extremely bad) to 10 (excellent), namely on the aspects: accessibility, accommodation, information and communication, expertise of employees, service and the audiology care centre as a whole. Participants were also asked two open questions on the general evaluation of the centre, ten health-related questions (for instance, the degree of hearing impairment) and 11 questions on demographic characteristics of both the person who received audiology care and the person who filled out the questionnaire.

Two audiology care centres (one audiology care centre and one university medical centre) each randomly selected 450 clients among the clients that visited their centre in the last 12 months (September 2010–September 2011). People who visited the centre only for an audiogram were excluded as they received too little care to be able to answer the questions. We used no criteria for minimum age. For children below 18 we asked the parents or caregivers to fill out the questionnaire. Per audiology care centre, 300 clients received the first version of CQI Audiology Care. Data were gathered using a 'mixed mode' strategy. Clients received a letter with a personal link to a website, asking them to fill out the questionnaire online. After one week, a thank you or reminder card was sent to all clients. Three weeks later, those who had not responded yet received a reminder letter with a paper version of the questionnaire, followed by a final reminder letter two weeks later (Dillman et al, 2010).

A second questionnaire was developed to assess the importance people attribute to each quality aspect addressed in the CQI Audiology Care. This questionnaire was sent to the remaining 150 clients of the two participating audiology care centres. A paper version of the importance questionnaire was sent to all selected individuals, and they received up to three postal reminders (Dillman et al, 2010).

### **Large-scale pilot**

Based on the results of the small-scale pilot the CQI Audiology Care was adjusted and tested again among clients of audiology care centres. The revised questionnaire (version 2.0) consisted of 69 questions of which 46 questions evaluated clients' experiences with audiology care.

We approached 25 Dutch audiology care centres for this largescale pilot. Twenty-one centres agreed to participate; these included three university medical centres and 18 audiology care centres that partly belonged to one of three umbrella organizations. The four centres that declined participation were all university medical centres and the main reason not to participate was lack of time.

Based on their electronic records, each centre randomly selected 300 clients among the clients who visited their care centre during the last 12 months (April 2011–April 2012). Inclusion and exclusion criteria were identical to the small-scale pilot. The non-university audiology care centres all register their client data in the same administrative programme. In this programme a script was written via which they could automatically select the participants for this study. The university medical centres had to make the selection themselves. The revised questionnaire (version 2.0)

was sent to 5783 clients of 21 audiology care centres. The data were gathered using the same 'mixed mode' strategy as in the small-scale pilot.

### **Analyses**

Results are presented from the three different phases of the questionnaire development. In the qualitative phase, one researcher (JD) coded the open answers using CQI themes from previous studies. These were themes such as conduct of employees, communication and information, expertise of personnel, facilities and accessibility of care. Then, the researcher determined whether additional aspects were mentioned in the open answers. Based on the deducted themes and existing CQI questionnaires a first draft of the CQI Audiology Care was made.

Stata version 12 and MLwin were used to perform the quantitative analyses. In the small-scale pilot, we determined the underlying constructs in the CQI Audiology Care (version 1.0) by performing principal component factor analysis with oblique rotation on 48 experience questions. The six global ratings and questions on a nominal scale were not included. We recoded the answers to the questions to a 1 to 4 answer-scale where a higher score meant a more positive experience. Questions were included in a scale if the factor loading was 0.3 or higher for a certain factor (Floyd & Widaman, 1995) and if the factor loadings on the other factors were at least 0.1 lower. The reliability of the scales was then assessed with Cronbach's alpha. Based on the answers on the importance questionnaire, we calculated the mean importance score per quality aspect. This score could vary from 1 (not all important) to 4 (very important) and indicates which quality aspects were found most important by the respondents.

In the large-scale pilot, we again determined the underlying constructs in the CQI Audiology Care (version 2.0) using principal component factor analysis with oblique rotation. We did not perform a confirmatory factor analysis as the questionnaire changed too much (see Results). Here, 38 questions were included in the factor analyses. Next, we performed multilevel analyses (MLA) to assess the discriminatory power of the questionnaire, i.e. to what extent do clients' experiences with audiology care differ among audiology care centres. MLA takes into account that data are nested.

In this case, individual clients (level 1) were nested within audiology care centres (level 2). We calculated the intra-class correlation (ICC) for each of the scales identified. The ICC is an index of the ratio of the variation in the mean scores within and between audiology care centres. Values of the ICC could range between 0% and 100% with a higher ICC indicating larger differences among audiology care centres. Using the log likelihood test we determined whether the ICC differed significantly from zero, indicating that significant differences exist among audiology care centres. In the multilevel models we corrected for age, educational level and self-reported general health status of the respondents (sex appeared to be of negligible influence, data not shown).

To provide insight into the experiences of clients with audiology care, we report the mean scores on the scales and the global rating of the audiology care in total. With oneway ANOVA-analyses, we compared these scores for those who answered the questions for themselves and those who answered the questions for another person to determine whether it mattered if the client him/herself or a proxy reported the experiences.

## **Stakeholder involvement**

The questionnaire was developed in close collaboration with key stakeholders, that is, representatives of audiology care centres, health insurers and a client organization for people with hearing impairments. Through this stakeholder involvement, we aimed to incorporate the information needs of the different parties. This makes it possible to collect information once and to use it for multiple purposes (Delnoij et al, 2010). In two meetings, the results of the small-scale and large-scale pilots were discussed with the stakeholders. The researchers made an overview of all questions that: (1) had a high percentage of missing values (45%), (2) had a highly skewed frequency distribution (490% gave the same answer), (3) had a high inter-item correlation (40.70), (4) did not belong to any of the scales (all factor loadings 50.30), and/or (5) was in the top 10 of most or least important items. This overview was then discussed with the different stakeholders. Consensus was reached concerning which questions to retain, revise or remove.

## **RESULTS**

### **Qualitative phase**

Fourteen clients responded to the questions via e-mail. Eight respondents were male and five female (of one sex was unknown).

The age of the respondents varied between 42 and 77. Three respondents were a parent of a child with a hearing impairment and of this group age was unknown. The following quality aspects were deduced from the responses: accessibility of the audiology care centre (by phone and getting there), the conduct of employees, communication and information, continuity of care, expertise of employees, waiting times, and flexibility around arranging appointments.

### **Respondents of the surveys**

A total of 118 (response rate 39.9%) respondents filled out the importance questionnaire. The first version of the CQI Audiology care was filled out by 188 (response rate 34.0%) respondents and the second version by 1793 (response rate 33.0%) respondents. For all three surveys, the majority of the respondents were middle-aged (between 35 and 64 years old; see Table 1). More than half were women and most people had a middle or high education level. Most respondents perceived their health as good to excellent.

### **Small-scale pilot**

The results of the importance questionnaire revealed that respondents found quality aspects concerning expertise and conduct of the employees very important (see Table 2). The top three most important aspects were: sufficient expertise of employees concerning the hearing impairment, being taken seriously, and getting matters explained in a clear and understandable way (see Table 2).

As can be seen in Table 2, the least important aspects mainly concerned the facilities present in the audiology care centre.

The factor analyses and subsequent reliability analyses in the small-scale pilot resulted in eight scales assessing the quality of audiology care: accommodation and facilities, conduct of employees, expertise of employees, arranging appointments, waiting times, client participation, effectiveness of treatment and information on test results (see Table 3). Cronbach's alpha varied from 0.60 to 0.89.

Based on the results and discussion with stakeholders, the questionnaire was revised. This led to the removal of 12 questions (including the global rating on accessibility) on client experiences.

One question on client experiences was revised and one question on the severity of the hearing impairment was split into two questions (one question about each ear). This resulted in a revised questionnaire (version 2.0) of 69 questions that was tested in the large-scale pilot.

#### [TABLE 1]

##### **Large-scale pilot**

Factor analyses and reliability analyses resulted in seven scales assessing the quality of audiology care: accommodation and facilities, conduct of employees, expertise of employees, arranging appointments, waiting times, client participation and effectiveness of treatment (see Table 3). Cronbach's alpha varied from 0.59 to 0.86. These scales were also found in the small-scale pilot with little variation in the questions that belonged to the different scales. Also, the factor loadings were overall comparable. The scale 'information on test results' could not be replicated in the largescale pilot, since two of the three items were removed from the questionnaire. Multilevel analyses on the results of the 21 audiology care centres revealed that the client experiences differed significantly among audiology care centres for the scales on accommodation and facilities, arranging appointments, waiting times and client participation (see Table 4).

In general, people reported positive experiences with the audiology care received in the centres. The mean scores on all seven scales was above 3 on a scale from 1 (negative experience) to 4 (positive experience) in the large-scale pilot. Respondents gave the highest scores for accommodation and facilities and conduct and expertise of employees. The lowest scores were given for waiting times and client participation, see Figure 2. Overall, the audiology care was rated with an 8.2 on a scale from 0 (extremely bad) to 10 (excellent).

#### [TABLE 2]

#### [TABLE 3]

In 42% of the cases a proxy filled out the questionnaire for the client, mostly a parent for the child. These proxies reported less positive experiences than respondents who answered the questions regarding their own care when it came to accommodation and facilities ( $M=3.74$ ,  $SD=0.39$  versus  $M=3.80$ ,  $SD=0.35$ ;  $p<50.001$ ), waiting times ( $M=3.43$ ,  $SD=0.63$  versus  $M=3.55$ ,  $SD=0.60$ ;  $p<50.001$ ) and client participation ( $M=3.28$ ,  $SD=0.81$  versus  $M=3.41$ ,  $SD=0.86$ ;  $p<50.05$ ). The group of proxies also gave a significantly lower rating for the audiology care in general ( $M=8.06$ ,  $SD=1.25$  versus  $M=8.27$ ,  $SD=1.20$ ;  $p<0.001$ ).

Respondents in the large-scale pilot were also asked what could be improved in the audiology care centre in an open-ended question. Overall, 561 respondents gave one or more suggestions for improvement and this group scored significantly lower on all scale scores and the global rating (not in table,  $p's<50.001$ ). The suggestions mostly concerned the building of the audiology care centre (for instance, no day light, hinder of noise because of thin walls), followed by waiting times (for instance, time until

people got an appointment at the audiology care centre, waiting times between appointments), communication style of employees (mainly of front desk employees), how employees treated children with hearing impairments (for instance, little adjustment of language and few facilities specifically for children in the waiting rooms), and accessibility (for instance, accessibility by telephone and public transport). It should be noted that most of the aspects that should be improved according to the respondents were rated relatively low on importance in the importance questionnaire.

### **Final version of questionnaire**

Based on the results and discussion with stakeholders, the final version of the questionnaire was agreed upon. The discussion with the stakeholder group led to the removal of nine questions on client experiences of which four belonged to one of the scales. Cronbach's alpha for these scales did not change substantially with removal of the items. Also, four questions on client experiences were revised leading to the final questionnaire with 59 items (Booij et al, 2013).

These questions included 31 experience questions, five global ratings (accommodation, information and communication, expertise of employees, service and the audiology care centre as a whole), and two open questions on the general evaluation of the centre. In addition, the questionnaire contained 10 health-related questions (for instance, the degree of hearing impairment) and 11 questions on demographic characteristics of both the person who received audiology care and the person who filled out the questionnaire.

[TABLE 4]

[FIGURE 2]

### **DISCUSSION**

In order to systematically measure clients' perspective on the quality of audiology care, a Consumer Quality Index (CQindex or CQI) 'Audiology Care' questionnaire was developed following a strict methodology consisting of both qualitative and quantitative methods. The final CQI Audiology Care contains 59 questions measuring client experiences with audiology care and client characteristics, and was proven valid and reliable. The questionnaire consists of seven scales representing the quality aspects important to clients: accommodation and facilities, conduct of employees, expertise of employees, arranging appointments, waiting times, client participation and effectiveness of treatment. Our study adds to previous research that mainly focused on the dispensing and uptake of hearing aids in the elder population (e.g. Knudsen et al, 2010; Laplante-Levesque et al, 2012a) by including the younger population with more complex hearing-related impairments and by looking at the experiences with care provided in audiology care centres that entails more than just the process of hearing aid fitting.

The CQI methodology consists of a standardized method for developing questionnaires and for measuring, analysing and reporting patients' and clients' experiences with health care (Koopman et al, 2011). An important strength of the methodology is that (representatives of) clients receiving audiology care are involved in the development of the questionnaire. This improves the likelihood that all

relevant quality aspects are incorporated in the questionnaire. Respondents indicated that accessibility, conduct of employees, communication and information, continuity of care, expertise of the employees, waiting times, and flexibility concerning appointments were important quality aspects for them.

Quality aspects concerning the healthcare professionals in the audiology care centre were evaluated as most important, e.g. sufficient expertise, taking the client seriously and explaining things clearly. The results confirm the importance of providing patientcentred care and contribute to the conceptualization of patientcentred audiology care.

It has been shown that patient-centred care leads to better health outcomes. Patient-centred care has been associated with improved satisfaction, better treatment adherence, improved recovery and better health outcomes (Swenson et al, 2004; Hahn, 2009; Meterko et al, 2010; Groene, 2011). However, in the field of audiology care, patient-centredness is hardly investigated (Grenness et al, 2014a). In the current study, audiology care clients rated 'client participation' during audiology care the least positive. This implies that audiology care could be improved by taking the individual's needs, values and preferences better into account. This may not only improve the care provided, but also improve health outcomes. Systematically measuring client's experiences with audiology care might contribute to this. Measuring clients' experiences across different audiology care centres in a standardized way makes it possible to map differences among audiology centres. Our study showed that experiences with the accommodation and facilities, arranging appointments, waiting times for appointments and client participation differed significantly among the participating audiology care centres. For future research, it would be interesting to investigate whether client experiences differ depending on age, the type of diagnosis, reason for referral, and other relevant client characteristics. This was, however, outside the scope of this study.

Further implementation of the final questionnaire will also reveal whether the results can be used by different stakeholders. Results of the questionnaire may be used by audiology care providers to get feedback information on client experiences, compare the quality of care among providers and to initiate quality improvements. Health insurers may use the information to contract health care providers and client organizations may use it for advocacy purposes. Moreover, CQI results could improve the transparency about the quality of audiology care, and help (future) clients choose the care that fits best to their personal preferences.

Multiple stakeholder meetings enabled that the information needs of these different stakeholders were incorporated into the questionnaire. This is another strong aspect of the CQI methodology (Delnoij et al, 2010).

Although 59 questions might appear long for a questionnaire, a previous study revealed that the length of CQI questionnaires was not associated with the response rate (Zuidgeest et al, 2008). The health-related questions and questions on demographic characteristics (21 questions) were added to enhance the interpretation and usability of the results. Health care providers in particular often want to know how different groups of people experience the care they provide.

A substantial proportion of the target population of the CQI Audiology Care are children, and young adults. In the current study, we asked parents or caregivers to fill out the questionnaire for immature clients (18 years and younger). However, it can be questioned whether the responses of parents and caregivers present the client's

experiences in a valid manner. The results showed that those who answered the questions on behalf of someone else, mostly a child, reported more negative experiences than those who answered the questions regarding the care they received themselves.

Based on the current study, we could not determine whether this was the result of a difference in point of view or that the care for children is actually less tuned to the children's needs. We therefore recommend the development of a questionnaire specifically aimed at children. There is evidence that children as young as 8 years old are capable of participating individually in a survey (Borgers et al, 2000; Lindeke et al, 2009).

### **Limitations of the study**

In contrast to other studies where focus group discussions and interviews were held with people with hearing impairments (mainly elderly people in need of hearing aids) (Laplante- Le´vesque et al, 2006; 2012b; Knudsen et al, 2013; Grenness et al, 2014b), we were not able to organize a focus group discussion or interviews with audiology care clients. A possible explanation may be that we focused upon clients who receive care from an audiology care centre that have more complex and/ or severe hearing-related impairments. They also might be more over sensitive for environmental sounds causing discomfort or pain, e.g. in the case of hyperacusis. This, however, does not explain why parents of children with hearing impairments did not participate in the study. The low response and the fact that respondents answered the questions via e-mail limited the richness of our data in the qualitative phase. However, the quality aspects that emerged correspond strongly with those in other CQI research (Boer et al, 2013). Especially, accessibility, conduct and expertise of health care professionals, communication and information are common CQI themes. The quality aspects also resembled those found in other audiology research (Poost-Foroosh et al, 2011; Grenness et al, 2014b). For instance, Grenness et al (2014b) interviewed adults of 60 years and older with hearing aids and found that the following aspects were central to patient-centred care: professionalism and communication of the audiologist, information provision and client participation. We are therefore confident that the CQI Audiology Care covers the most relevant quality aspects.

In the Netherlands, audiology care is provided in audiology care centres and in university medical centres. A limitation of the current study is that only three university medical centres participated in the current study making it impossible to compare the care provided in university medical centres and in audiology care centres. The university medical centres did not have a software programme at their disposal to randomly select clients making it more difficult and time consuming for them to select clients for our study. This was the main reason why a number of these centres declined participation. Most audiology care centres belonged to an umbrella organization. Because of the small number of umbrella organizations, we did not take this into account in the multilevel analyses.

### **CONCLUSION**

So far, no instrument was available to systematically measure the quality of audiology care from a client's perspective. The CQI Audiology Care has proven to be a reliable and valid instrument to assess clients' experiences with quality aspects important to the clients: accommodation and facilities, conduct of employees,

expertise of employees, arranging appointments, waiting times, client participation and the effectiveness of the audiology care provided in audiology care centres. Future implementation of the questionnaire will reveal whether the results can be used to monitor and improve the quality of audiology care. Though evaluated positive, it seems that audiology care can be improved concerning patient centeredness.

### **Acknowledgements**

Support for this study was provided by Fonds PGO, a department of the Dutch ministry of Health that finances projects of national client organisations. The current project was coordinated by the Centre for Consumer Experience in Healthcare (now part of Netherlands Institute for Health Care Quality) and the NVVS (Dutch client organization for people with hearing disabilities). Besides representatives of these two organizations, the following stakeholders were involved: Stichting Miletus (a foundation representing almost all Dutch health insurance companies concerning research on patient/client experiences with health care), FENAC (a sector association for audiology care centres), representatives of a few audiology care centres and representatives of a few health insurance companies. A total of 21 audiology care centres participated in the study and selected the respondents.

Declaration of interest: The authors report no conflicts of interest.

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TABLES AND FIGURES

**Table 1.** Characteristics of the respondents to the CQI Audiology Care importance questionnaire ( $N=118$ ), the CQI Audiology Care version 1.0 ( $N=188$ ), and the CQI Audiology Care version 2.0 ( $N=1793$ ).

	<i>Importance questionnaire</i>		<i>Version 1.0</i>		<i>Version 2.0</i>	
	<i>n</i>	<i>%<sup>a</sup></i>	<i>n</i>	<i>%<sup>a</sup></i>	<i>n</i>	<i>%<sup>a</sup></i>
<i>Age (years)</i>						
<18	1	0.8	8	4.3	39	2.2
18–24	3	2.4	2	1.1	31	1.8
25–34	14	11.1	25	13.3	183	10.4
35–44	23	18.3	36	19.2	434	24.7
45–54	13	10.3	25	13.3	301	17.1
55–64	23	18.3	36	19.2	293	16.7
65–74	20	15.9	28	14.9	261	14.9
75+	19	15.1	23	12.2	214	12.1
<i>Sex</i>						
Male	45	38.1	82	43.6	637	36.4
Female	70	59.3	101	53.7	1,111	63.5
<i>Education level</i>						
Low	25	21.1	22	11.7	318	18.4
Middle	44	37.4	78	42.6	803	46.6
High	40	33.9	69	36.7	566	32.8
<i>Self-reported health status</i>						
Excellent	20	17.0	24	12.8	186	10.6
Very good	34	28.8	35	18.6	405	23.0
Good	52	44.1	97	51.6	9,928	52.7
Fair	5	4.2	27	14.4	217	12.3
Bad	3	2.5	2	1.1	25	1.4

<sup>a</sup>Totals do not amount to 100% since not all respondents answered all the questions.

**Table 2.** Top 10 quality aspects with the highest mean importance score and top 10 quality aspects with the lowest mean importance score.

	<i>Mean importance score (SD)</i>
<i>Top 10 with highest importance score</i>	
Employees have expertise concerning the hearing impairment	3.82 (0.40)
Employees have expertise concerning the tests they take	3.80 (0.44)
Employees take the person seriously	3.78 (0.44)
Employees have expertise concerning the available hearing aids	3.77 (0.50)
Tests are taken with care	3.75 (0.48)
Employees explain matters in a clear and understandable manner	3.72 (0.49)
Employees listen carefully	3.72 (0.52)
Person can ask all his/her questions	3.70 (0.50)
Possibility to make an appointment at short notice in case of an acute problem	3.69 (0.60)
Information provided by the audiology care centre is easy to understand	3.67 (0.57)
<i>Top 10 with lowest importance score</i>	
The time between different appointments on one day is shorter than 15 minutes	2.69 (0.92)
The audiology care centre is easy to reach by car	2.99 (0.91)
There are enough facilities in the waiting room	3.00 (0.87)
There are enough playing materials for children in the waiting room	3.07 (0.79)
Person is seen within 15 minutes of the time of appointment	3.16 (0.90)
The audiology care centre looks clean	3.18 (0.71)
The audiology care centre is easy to reach by phone	3.20 (0.68)
Test results and treatment advice are also given in writing	3.21 (0.74)
Possibility to make an appointment at the audiology care centre	3.24 (0.68)
The audiology care centre is easy to reach by public transport	3.28 (0.82)
Tests and conversations are held in a separate room	3.50 (0.61)

**Table 3.** Scales resulting from the factor analyses and scale construction of the CQI Audiology Care, version 1.0 and version 2.0.

<i>Scale</i>	<i>Version 1.0</i>		<i>Version 2.0</i>		<i>Example item</i>
	<i>Number of items</i>	<i>Cronbach's alpha</i>	<i>Number of items</i>	<i>Cronbach's alpha</i>	
Accommodation and facilities	5	0.73	4	0.57	Were there enough facilities in the waiting room?
Conduct of employees	7	0.89	7	0.86	Did the employees of the audiology care centre listen carefully?
Expertise of employees	5	0.75	4	0.85	In your opinion, did the employees have expertise concerning your hearing impairment?
Arranging appointments	4	0.82	6	0.80	Was it possible to get an appointment at short notice in case of an acute problem?
Waiting times appointments	4	0.65	4	0.75	Were you seen within 15 minutes of the time of your appointment?
Client participation	4	0.69	3	0.64	Did employees involve you in decisions on the referral to another specialist?
Effectiveness of treatment	4	0.84	4	0.80	Was the advice given by the employees useful?
Information on test results	3	0.60	–	–	Did you receive test results and advices in writing?

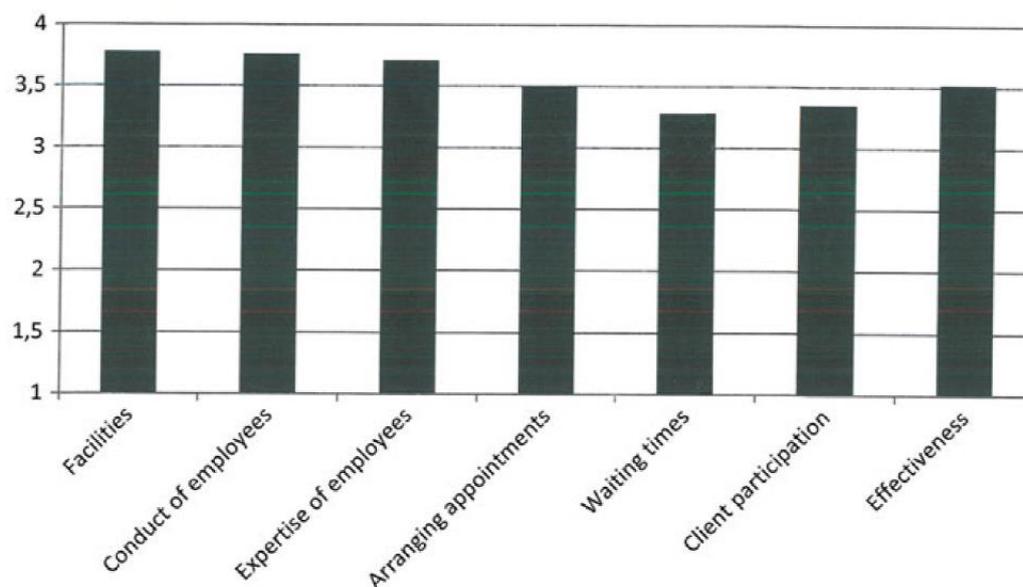
*Note.* In the small-scale pilot with version 1.0 of the questionnaire 12 (25%) of the 48 experience items could not be included in one of the scales. In the large-scale pilot with version 2.0, 6 (16%) of the 38 experience items could not be included in one of the scales. The items forming the scales differed somewhat between the two versions of the questionnaire. The example item given per scale is an overlapping item.

**Table 4.** Results of multilevel analyses comparing experiences among audiology care centres while controlling for age, education level and self-reported health status of the respondents.

<i>Scale</i>	<i>Number of cases</i>	<i>ICC in %</i>	$\chi^2$ ( <i>ldf</i> )	<i>Mean total group</i>	<i>Lowest and highest mean per centre</i>
Accommodation and facilities	1395	5.89	6.79**	3.77	3.56–3.87
Conduct of employees	1607	1.22	2.34	3.73	3.66–3.77
Expertise of employees	1560	0.35	0.44	3.70	3.67–3.71
Arranging appointments	1189	8.15	7.39**	3.53	2.95–3.73
Waiting times appointments	536	9.13	4.80*	3.36	3.09–3.61
Client participation	763	4.82	4.16*	3.33	3.04–3.57
Effectiveness of treatment	1336	0.00	0.00	3.51	3.51–3.51

\* $p < 0.05$ ; \*\* $p < 0.01$ .

ICC = Intra-class correlation.



**Figure 2.** Mean Scores (varying between 1 and 4) on scales of the CQI Audiology Care.