Does clinician continuity influence hearing aid outcomes?

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Key Words: hearing aid, outcomes, clinician continuity, interpersonal continuity, relational continuity, continuity of care.

Abbreviations: IOI-HA: International Outcomes Inventory for Hearing Aids; HAUQ: Hearing Aid Users Questionnaire; PHAST: Practical Hearing Aid Skills Test; SD: Standard Deviations.

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ABSTRACT

Objective: To evaluate whether clinician continuity is associated with successful hearing aid outcomes.

Design: A prospective cohort study. Clinician continuity was defined as occurring when a patient was cared for by the same clinician for the hearing assessment, hearing aid selection process, hearing aid fitting and programming, and subsequent hearing aid fine tuning appointments. The hearing aid outcome measures included self-reported hearing aid use, benefit and satisfaction as well as self-reported handling skills and problems experienced with hearing aids.

Study Sample: Four hundred and sixty-eight adult hearing aid users (mean age 73.9 years ± 10.9) and 26 qualified audiologists (mean age 34 years ± 6.34) recruited from a single hearing clinic in Perth, Western Australia.

Results: There were no significant differences in hearing aid outcomes between participants who experienced clinician continuity and those who did not.

Conclusions: Within a controlled practice setting, hearing aid outcomes may not be adversely effected if services are provided by more than one clinician.

INTRODUCTION

Despite the benefits associated with hearing aid use (Chisolm et al., 2007), many adult hearing aid owners either do not complete rehabilitation programs or they use hearing aids less than the recommended four hours per day, with up to 30% abandoning use of hearing aids altogether (Kochkin, 2000; Smeeth et al., 2002; Bertoli et al., 2009; Hartley et al., 2010; Hickson et al., 2010; Schneider et al., 2010; Dillon, 2012). Despite seeking aural rehabilitation, these people are living in the community with unaddressed hearing and communication difficulties.

Recent studies have explored the nature of the patient-clinician interaction to better understand these inconsistencies in client outcomes (Poost-Foroosh et al., 2011; Kochkin et al., 2012; Laplante-Lévesque et al., 2012; Ekberg et al., 2014; Grenness et al., 2015; Grenness et al., 2015). The personal relationship that develops between the patient and clinician is termed the therapeutic relationship, and in the case of aural rehabilitation it is fostered by trust and loyalty (Grenness et al., 2014). Important aspects of the therapeutic relationship in audiology, as described by patients and clinicians, include: understanding and meeting patient needs, acknowledging the patient as an individual, establishing patient readiness, supporting choice, and shared decision making (Poost-Foroosh, Jennings et al., 2011). The development of a therapeutic relationship between the patient and clinician would likely be facilitated by clinician continuity.

Clinician continuity, also referred to as interpersonal continuity or relational continuity, describes a situation where a patient receives care from the same clinician during the course of their treatment (Saultz & Albedaiwi, 2004; Haggerty et al., 2013). Haggerty et al (2013) conducted a metasummary of qualitative studies of patients'

experiences with health care (including general medicine, oncology, psychology, and hospital and at-home care among others) to identify patients' beliefs and experiences with continuity of care. Participants consistently highlighted the importance of building a continuous relationship with one individual clinician over the course of time. This relationship was described as being characterized by "trust", and developed as the clinician gained comprehensive knowledge of the patient as a whole person and used this knowledge to engage with the patient in managing their health condition (Haggerty, Roberge et al., 2013).

Medical studies have shown that clinician continuity positively influences patient satisfaction (Freeman & Hjortdahl, 1997; Saultz & Albedaiwi, 2004; Fan et al., 2005), treatment adherence (Parchman et al., 2002; Kerse et al., 2004), the use of preventative services (O'Malley et al., 1997), and rates of rehospitalisation (Mainous 3rd & Gill, 1998). However, the effect of clinician continuity on outcomes in aural rehabilitation is poorly understood, with no published studies specifically investigating this interaction.

Accordingly, the primary purpose of this study was to investigate the association between clinician continuity and hearing aid outcomes, including: use, perceived benefit, satisfaction, and success with hearing aids. Clinician continuity is defined here as occurring when a patient is cared for by the same clinician for the hearing assessment, hearing aid selection process, hearing aid fitting and programming, and subsequent hearing aid fine tuning appointments. Our hypothesis was that hearing aid owners who received rehabilitation services from a single clinician (clinician continuity) would achieve better hearing aid outcomes than those who had received services from two or more clinicians.

METHODS

Participants

Hearing aid owners were recruited using purposive sampling from a large audiology clinic in Perth, Western Australia. In 2011, all patients aged 18 years or older who had been provided with hearing aids between November 2008 and November 2010 were invited to participate in the study. Patients who decided not to obtain hearing aids or who had undergone surgery for implantable devices were excluded from the study.

All clinicians providing hearing aid services at the time of data collection were included in this study. No clinicians were excluded. Twenty-six clinicians ranging in age from 26 to 50 years (mean 34 ± 6.34) participated in this study, and the majority were female (92.3%). All clinicians held university level qualifications for audiology obtained from various institutions around the world (Australia, New Zealand, South Africa and Iran) and current Qualified Clinician certification from the Audiological Society of Australia. The clinicians' years of experience at the time of the study ranged from 3 to 27 years (mean 9.38 ± 6.21).

Clinicians involved in this study were recruited from the same hearing clinic, thus, all worked for the same organisation and thus used the same equipment, software programs and patient information booklets during the appointments and were allocated the same time for appointments. All clinicians participated in ongoing continued professional development activities, as is industry standard. All clinicians attended bimonthly clinical meetings, hosted by their employer to promote inter-colleague communication, case discussion and group training sessions. One such training session focussed on patient centred care, specifically 'breaking bad news' and 'focusing on the patient as a person'. Patient files were audited annually to ensure individual clinicians adhered to clinic protocols

and to identify those staff that required additional training. File audits were conducted by investigating whether files adequately documented evidence for inclusion of predefined criteria, such as establishing client motivation, description of personalised and attainable goals, and use of real ear insertion gain to verify fittings. All clinicians reported to the same manager, worked with the same patient-focused organisational values, and none of the clinicians had sales targets or worked on commission.

Materials

Participants were asked to complete a survey set comprising items from three published surveys and additional individual questions (described below). To increase the participant response rate we wanted to limit the number of items in the survey and included only those that were relevant to hearing aid outcomes, and only items that provided quantitative data.

International Outcome Inventory for Hearing Aids (IOI-HA) (Cox & Alexander, 2002): The IOI-HA was developed as a product of an international workshop on Self-Report Outcome Measures in Audiological Rehabilitation (Cox et al, 2000). The IOI-HA is a seven item, multi-dimensional measurement of hearing aid daily use, benefit, residual activity limitations, satisfaction, residual participation restrictions, impact on others, and quality of life (Cox and Alexander, 2002; Cox et al., 2003). Each item on the IOI-HA was evaluated on a five-point Likert scale with the overall score calculated by averaging the scores across all items. The IOI-HA has good psychometric data and has been validated internationally (Cox & Alexander, 2002; Cox et al., 2002; Cox et al., 2003; Cox et al., 2003; Heuermann et al., 2005; Hickson, Clutterbuck et al., 2010). From the IOI-HA we calculated the overall score as well as hearing aid use (item 1) and hearing aid success (combination of items 1 and 2);

participants were considered to be successful hearing aid users if they used their hearing aid one or more hours per day and benefit was reported to be moderate or greater (Hickson et al., 2014).

Hearing Aid User's Questionnaire (HAUQ) (Dillon et al., 1997): The HAUQ consists of ten items relating to hearing aid use, difficulties or problems experienced and perceived benefits. The survey set in this study used only item four relating to hearing aid benefit, and item five relating to problems experienced with the hearing aid. Both of these items list specific situations where benefit or problems may occur. This study included additional situations wherein benefit or problems are likely to occur based on the study by Hickson et al. (2010). Additional situations for benefit included cafes or restaurants, conversations in the car, outdoors, conversations in quiet, and conversations in noise; additional situations for problems experienced included hearing aid reliability or breakdowns, discomfort with loud sounds, and difficulty understanding speech. Each sub-item was evaluated on a four-point Likert scale with the overall item scores calculated by averaging the scores across all items. From the HAUQ we calculated the overall score for each item 1) hearing aid benefit and 2) hearing aid problems.

Practical Hearing Aid Skills Test (PHAST) (Desjardins & Doherty, 2009): The PHAST is an eight item clinician administered survey evaluating basic skills required for daily management of hearing aids: insertion, removal, opening the battery door, battery changing, program adjustments, volume control, telephone use and cleaning. Given that no self-report survey evaluating hearing aid handling skills was available at the time (Bennett et al., 2015), this study generated a list of hearing aid handling skills based on the PHAST which allowed participants to self-report their experiences with hearing aid handling tasks. Tasks

included hearing aid cleaning, identifying the left from the right, insertion, changing the battery, and ability to alter the volume or program of the device. These items were scored using a four-point Likert scale ranging from “always” to “never able to perform”, with a not applicable option. The overall score was calculated by averaging the score across all six items.

Additional questions were adopted from the MarkeTrak consumer survey (Kochkin, 2000; Kochkin, 2002) evaluating satisfaction with hearing aid/s, satisfaction with the clinician, likelihood to recommend hearing aids to a friend and likelihood to recommend the clinic to a friend. The two satisfaction items were evaluated on a five-point Likert scale, where 1 indicated very satisfied and 5 indicated very dissatisfied. The two likelihood to recommend items were measured on a ten-point Likert scale, where 1 indicated not likely to recommend and 10 indicated very likely to recommend.

Procedure

This study was approved by the Human Research Ethics Office of The University of Western Australia and the Behavioural and Social Sciences Ethical Review Committee of the University of Queensland. All participating patients provided written consent to participate and for additional information to be collected from their patient files.

In April 2011, potential participants were sent a letter inviting them to participate in the survey, including an information letter and consent form, the survey set, and a stamped, return addressed envelope. Completion of the survey took approximately 7 minutes (69 questions) as demonstrated during pilot testing in the clinic. Those who did not respond to the initial questionnaire received a second questionnaire by mail one month following.

Responses were entered into a Microsoft Excel™ spreadsheet, and routinely audited to ensure accurate transcription of information.

Further information was added to the datasheet, transcribed from patient files, to include demographic information (age and gender), audiometric data (four frequency average hearing loss: 4FAHL, calculated from 500Hz, 1kHz, 2kHz and 4kHz) and device data (previous experience with hearing aids, level of technology of current hearing aid and hearing aid funding source [whether they paid in full for their hearing services: private or received government subsidies through the Office of Hearing Services: OHS]). The number of clinicians who provided services during their aural rehabilitation program was also recorded.

Data Analysis

All data were analysed using IBM SPSS Statistics (v21, 2014). All data were inspected for outliers (i.e., visual inspection of boxplots and |z| score calculations using a cut-off point of 2.58), after which tests of normality and skewness (i.e., Shapiro-Wilk test of normality and Q-Q plots) were conducted. Skewed data were transformed using logarithmic and square root transformations; however, transformation did not result in normally distributed data and as such nonparametric tests were used for all analyses.

As there is currently no universal definition for clinician continuity in aural rehabilitation, this study examined the data in two ways. First, participants were divided into two groups based on whether they had received aural rehabilitation services from one clinician (single clinician group) or more than one clinician (multiple clinicians group). Second, to investigate whether the number of clinicians involved in the rehabilitation

program affected patient outcomes, the participants were divided into three groups based on whether they had received aural rehabilitation services from one clinician (single clinician group), two clinicians (two clinicians group) or three clinicians (three clinicians group). Due to the low number of participants who received rehabilitation services from four clinicians (n = 4), the four clinicians group was not investigated.

The number of clinicians was treated as the dependant variable in all statistical analyses. Sampling distribution was evaluated using Mann-Whitney U and Chi-square tests to establish whether groups were similar for demographic and audiometric factors. In order to address the primary aim of this study, Mann-Whitney U and Chi-square tests were used to evaluate whether there were any differences in hearing aid outcomes (i.e. use, benefit, satisfaction, success, handling skills and likelihood to recommend hearing aid/clinician) between the single clinician group and multiple clinicians group; and between the single clinician group, two clinicians group, and three clinicians group.

RESULTS

Four hundred and sixty-eight hearing aid owners participated in the study (response rate of 52.8%), ranging in age from 24.4 to 95.8 years (mean 73.9 ± 10.9); the majority were male (59.5%). Approximately half (47.9%) were patients being fitted with hearing aids for the first time, and 52.1% had previous experience with hearing aid(s). Seventy-three percent of patient participants received hearing aids and services subsidised by the Australian government's Office of Hearing Services (OHS) scheme. The number of appointments taken to complete the aural rehabilitation with hearing aids program (defined here as the number of appointments attended within 12 months of the hearing aid fitting, including the hearing assessment and excluding the annual review appointment) ranged from three to 13 (mean

5.13 ± 3.05). All participants were encouraged to attend a minimum of four appointments, for: (i) hearing assessment and hearing aid selection, (ii) hearing aid fitting, (iii) first follow-up, and (iv) second follow-up. Whether participants attended more or less than the recommended four appointments depended on their progress (clinicians may have suggested additional appointments if further training was required), the occurrence of hearing aid related problems requiring additional appointments to resolve the problems, or participant initiative to request additional appointments or cancel existing appointments. No patient recalls were conducted during this 12 month period. Two hundred and eighty-nine patients (62%) received hearing aid associated services by the same clinician (single clinician group) and 179 (38%) saw at least 2 (up to 4) different clinicians during their rehabilitation program (multiple clinicians group). Within the multiple clinicians group, 127 (27%) saw two different clinicians, 44 (10%) saw three different clinicians and four (1%) saw four different clinicians.

Participants reported high levels of hearing aid use with 65.8% reporting more than four hours of use per day. Satisfaction was high, with 63.8% of participants indicating they were Satisfied or Very Satisfied with their current hearing aids. Overall IOI-HA scores ranged from 1.8 to 5 (mean 3.84; SD 0.71), with 73.7% deemed as successful hearing aid users (Hickson, Meyer et al., 2014). Overall, self-reported hearing aid benefit was high (mean 2.18; SD 0.69), hearing aid handling skills were high (mean 1.4; SD 0.5) and hearing aid problems were low (mean 3.46; SD 0.37).

There were no significant differences between the single clinician group and multiple clinicians group with respect to demographic, audiometric and device data with the exception of previous experience with hearing aids and 4FAHL for the left ear (Table 1). Participants in the multiple clinicians group were more likely to have worn hearing aids

Table 1. Descriptive and between group differences for participant demographic, audiometric and device data.

	Single clinician group (n = 289)	Two clinician group (n = 127)	Three clinician group (n = 44)	Multiple clinicians group (n = 179)	Single clinician group compared to multiple clinicians group (2, 3 & 4 clinicians combined)	Single clinician group compared to two clinicians group	Single clinician group compared to three clinicians group
Age (mean ± SD) (years)	73.58 ± 10.59	75.67 ± 9.27	74.35 ± 9.71	74.36 ± 11.48	*U* = 20,254 *p* = 0.112	*U* = 20,254 *p* = 0.134	*U* = 3,137 *p* = 0.975
Gender					$\chi^2(1) = 0.28$	$\chi^2(1) = 0.10$	$\chi^2(1) = 0.49$
Male: n (%)	174 (60.2)	84 (65.8)	23 (52.0)	112 (62.6)	*p* = 0.599	*p* = 0.757	*p* = 0.486
Female: n (%)	115 (39.8)	43 (34.2)	21 (48.0)	67 (37.4)			
4FAHL for the right ear (mean ± SD) (dBs)	46.19 ± 19.01	48.26 ± 14.76	41.40 ± 11.14	49.06 ± 18.04	*U* = 19,308 *p* = 0.076	*U* = 16,207 *p* = 0.022	*U* = 2,642 *p* = 0.342
4FAHL for the left ear (mean ± SD) (dBs)	46.70 ± 17.87	50.49 ± 15.81	45.50 ±13.14	51.60 ± 18.81	*U* = 20,671 *p* = 0.002	*U* = 17,003 *p* = 0.002	*U* = 2,927 *p* = 0.868
Previous experience with hearing aids					$\chi^2(2) = 10.02$ *p* = 0.007	$\chi^2(2) = 2.01$ *p* = 0.136	$\chi^2(2) = 0.43$ *p* = 0.805
No: n (%)	148 (53.8)	42 (33.8)	26 (59.1)	68 (38.6)			
Yes: n (%)	127 (46.2)	83 (66.2)	18 (40.9)	108 (61.4)			
Level of technology					$\chi^2(5) = 2.38$	$\chi^2(5) = 3.80$	$\chi^2(5) = 4.17$
Basic: n (%)	145 (63.0%)	84 (66.9)	21 (47.7)	94 (63.1)	*p* = 0.795	*p* = 0.579	*p* = 0.525
Low: n (%)	39 (17.0%)	17 (13.6)	11 (25.0)	23 (15.4)			
Mid-level: n (%)	30 (13.0%)	20 (16.1)	5 (11.4)	24 (16.1)			
High: n (%)	16 (7.0%)	4 (3.4)	7 (15.9)	8 (5.4)			

Number of appointments (mean ± SD)	5.26 ± 2.88	5.40 ± 2.77	5.08 ± 3.41	5.39 ± 2.88	*U* = 17,537 *p* = 0.557	*U* = 14,200 *p* = 0.518	*U* = 2,705 *p* = 0.470
Hearing aid funding source					χ^2 (1) = 0.78 *p* = 0.377	χ^2 (1) = 0.81 *p* = 0.368	χ^2 (1) = 4.00 *p* = 0.046
OHS: n (%)	197 (71.4%)	104 (83.1)	25 (56.8)	132 (75.9)			
Private: n (%)	79 (28.6%)	21 (16.9)	19 (43.2)	42 (24.1)			

Notes: dBs: decibels; 4FAHL: four frequency average hearing loss; OHS: funding received from the Office of Hearing Services; private = self-funded

previously and have a higher 4FAHL for the left ear than participants in the single clinician group. Spearman's rank order correlations revealed no significant association between previous experience with hearing aids and 4FAHL for the left ear and outcome measures in either group, indicating these group differences are unlikely to influence our overall findings.

There were also no significant differences between the single clinician group and the two clinicians group; or between the single clinician group and the three clinicians group with respect to demographic, audiometric and device data with the exception of hearing aid funding source and 4FAHL for the left and right ear (Table 1). Participants in the three clinicians group were more likely to be privately funded whereas participants in the single clinician group were more likely to have worn hearing aids subsidised by the Office of Hearing Services. Participants in the two clinicians group had higher 4FAHL for the left and right ear than participants in the single clinicians group. Spearman's rank order correlations revealed no significant association between hearing aid funding source and 4FAHL for the left or right ear and outcome measures in either group, again indicating these group differences are unlikely to influence our overall findings.

The primary aim of this study was to evaluate whether hearing aid outcomes differed depending on the number of clinicians involved in the patients' hearing care. There were no significant differences in hearing aid outcomes measured between the single clinician group and the multiple clinicians group (Table 2); or between the single clinician group and both the two clinicians group and three clinicians group (Table 2).

Table 2. Descriptive and between group differences for hearing aid outcomes.

	Single clinician group (n = 289) (mean ± SD)	Two clinician group (n = 127) (mean ± SD)	Three clinician group (n = 44) (mean ± SD)	Multiple clinicians group (n = 179) (mean ± SD)	Single clinician group compared to Two clinicians group	Single clinician group compared to Three clinicians group	Single clinician group compared to multiple clinicians group (2, 3 & 4 clinicians combined)
IOI-HA overall score	3.72 ± 0.79	3.87 ± 0.74	3.79 ± 0.78	3.79 ± 0.83	*U* = 15,446 *p* = 0.508	*U* = 3,190 *p* = 0.836	*U* = 19,088 *p* = 0.472
Hearing aid Benefit (HAUQ)	2.56 ± 0.94	2.19 ± 0.72	2.17 ± 0.57	2.46 ± 0.91	*U* = 14,055 *p* = 0.871	*U* = 2,842 *p* = 0.919	*U* = 17,653 *p* = 0.589
Hearing aid handling skills (adapted from PHAST)	1.91 ± 0.80	1.48 ± 0.54	1.26 ± 0.32	1.82 ± 0.81	*U* = 15,706 *p* = 0.108	*U* = 2,561 *p* = 0.400	*U* = 18,365 *p* = 0.397
Hearing aid Problems (HAUQ)	3.41 ± 0.48	3.43 ± 0.38	3.45 ± 0.35	3.40 ± 0.42	*U* = 19,866 *p* = 0.187	*U* = 2,662 *p* = 0.617	*U* = 16,197 *p* = 0.204
Success with hearing aids (IOI-HA items 1 and 2)					χ^2 (1) = 0.69 *p* = 0.406	χ^2 (1) < 0.01 *p* = 0.988	χ^2 (1) = 0.03 *p* = 0.864
Successful: n (%)	174 (74.0)	88 (72.8)	30 (73.2)	104 (73.2)			
Not successful: n (%)	61 (26.0)	33 (27.2)	11 (26.8)	38 (26.8)			
Hearing aid use (IOI-HA item 1)	3.82 ± 1.44	4.97 ± 1.18	5.08 ± 1.18	3.99 ± 1.32	*U* = 14,644 *p* = 0.325	*U* = 3,211 *p* = 0.328	*U* = 18,178 *p* = 0.228
Satisfaction with hearing aid	2.43 ± 1.07	2.36 ± 0.95	2.40 ± 0.82	2.45 ± 1.01	*U* = 14,019 *p* = 0.589	*U* = 2,579 *p* = 0.509	*U* = 17,116 *p* = 0.394

Likelihood to recommend hearing aids	7.74 ± 2.27	7.98 ± 2.23	8.08 ± 2.12	7.77 ± 2.52	*U* = 14,754 *p* = 0.541	*U* = 3,081 *p* = 0.743	*U* = 18,258 *p* = 0.491
Satisfaction with audiologist	1.40 ± 0.75	1.35 ± 0.63	1.48 ± 0.82	1.45 ± 0.78	*U* = 15,141 *p* = 0.731	*U* = 3,385.5 *p* = 0.398	*U* = 19,074 *p* = 0.436
Likelihood to recommend the clinic	8.54 ± 2.05	8.78 ± 1.92	8.48 ± 2.43	8.54 ± 2.31	*U* = 15,304 *p* = 0.627	*U* = 3,077 *p* = 0.892	*U* = 18,910 *p* = 0.599

Notes: IOI-HA: International Outcomes Inventory for Hearing Aids; HAUQ: Hearing Aid Users Questionnaire; PHAST: Practical Hearing Aid Skills Test.

DISCUSSION

In contrast to studies exploring the effects of clinician continuity on patient outcomes in general medicine (Love et al., 2000; Fan, Burman et al., 2005), no significant association was found between clinician continuity and outcomes with hearing aids in this study. While these results may suggest that clinician continuity does not contribute to improved hearing aid outcomes, it is possible that the association was not measureable in this instance due to three reasons: 1) the use of patient management systems that enhance patient care, 2) clinician training that emphasised the value of the therapeutic relationship in patient care, and 3) patient preference for clinician continuity.

Firstly, the mechanisms by which clinician continuity could influence outcomes may not have differed between the two groups. That is, patient management through connected and coherent clinical practices have been demonstrated to improve patient care (Haggerty, Roberge et al., 2013). Examples of such practices include: offering choice between the first available appointment or waiting for an appointment with preferred clinician (Saultz & Albedaiwi, 2004); offering follow up appointments and maintaining recall systems (Funnell & Anderson, 2003); and effective communication between clinicians wherein knowledge of the patient is transferred from one clinician to another, such as via detailed case notes (Byng et al., 2004). The aforementioned clinical practices were all employed by the clinic from which participants were recruited, likely reducing the impact of clinician continuity on patient outcomes.

Secondly, our hypothesis was that clinician continuity would facilitate the development of a patient-clinician therapeutic relationship and thus lead to better hearing aid outcomes. However, it is possible that clinician training emphasising the value of the

therapeutic relationship may have facilitated the development of a therapeutic relationship in the absence of clinician continuity. Haggerty et al. (2003) poses that the number of clinicians providing the care is less important if the other aspects of continuity of care are met such as a personalised and consistent care management plan. This concept is supported by Funnell and Anderson (2003) who suggested that patient outcomes are improved when patients are offered treatment options and involved in the design of their treatment plan; and Naithani et al. (2006) who suggest the use of robust clinical protocols to avoid delivery of conflicting treatment and clinical advice, techniques that all clinicians in this study were encouraged to implement as outlined in their clinical guidelines. Thus it is possible that clinicians involved in this study were able to develop therapeutic relationships with their patients in the absence of clinician continuity based on training received in patient engagement and patient counselling techniques prior to the commencement of this study.

Thirdly, Love et al. (2000) suggests that clinician continuity may only affect patient outcomes in cases where the patient values and thus seeks out clinician continuity. Although patients in the clinician continuity group and the multiple clinicians group were similar with regards to their demographic and audiometric data, it is possible that they differed in their personal preferences for clinician continuity. For example, the participants in the clinician continuity group may have actively sought clinician continuity and decided to wait for an appointment with their preferred clinician rather than taking the next available appointment. If participants in the multiple clinicians' group/s placed less value on clinician continuity and preferred the next available appointment, one may assume that the lack of clinician continuity would then have less influence on their hearing aid outcomes.

For the purpose of this study clinician continuity for aural rehabilitation with hearing aids was defined as occurring when a patient was cared for by the same clinician for the hearing assessment, hearing aid selection process, hearing aid fitting and programming, and subsequent hearing aid fine tuning appointments. It is possible that in the context of aural rehabilitation with hearing aids the definition of clinician continuity may not be so stringent, for example, it may be more important that patients see the same clinician for majority of appointments, or for specific appointment types. Although no significant differences in hearing aid outcomes were observed between the single clinician group and the two clinician group in this study, no criteria were placed on how many appointments each clinician delivered or which appointments each clinician delivered. Further investigation into what constitutes clinician continuity in aural rehabilitation is needed to clarify this debate.

Study limitations & future directions

A limitation of this study is that participants were not randomly assigned to groups, nor did this study measure whether participants valued clinician continuity. Additionally, classifications for what constitutes clinician continuity in aural rehabilitation are not yet established and as such the definition of clinician continuity used here may have been too stringent. Furthermore, all participants were recruited from the same centre and thus all clinicians involved had received the same clinical training and followed the same protocols. It may be worthwhile replicating this study in a more diverse population to include a wide range of clinical protocols and approaches to care. While this study contributes to our understanding of clinician continuity in aural rehabilitation, more studies looking at the impact of clinician continuity on the therapeutic relationship and patient outcomes are needed.

This study evaluate whether clinician continuity is associated with successful hearing aid outcomes for hearing aid owners. Patients who underwent a hearing aid fitting, but then returned the hearing aid were not included in this study. Future research might investigate whether clinician continuity is associated with hearing aid adoption.

CONCLUSION

No association was found between clinician continuity and hearing aid outcomes in this study. Patients generally demonstrated good outcomes and reported high satisfaction with their clinicians irrespective of clinician continuity. However, participants (hearing aid owners and clinicians) were recruited from the same audiology clinic and thus worked with the same equipment, clinical procedures and organisational values. Thus, we conclude that within a controlled practice setting, services provided through more than a single clinician may not adversely affect hearing aid outcomes.

Future research looking to understand the impact of clinician continuity on the therapeutic relationship and patient outcomes should: 1) include a multi-centre study with a diverse population and a wide range of clinical protocols and approaches to care, 2) ensure that participants are randomly assigned to groups, and 3) evaluate whether participants value clinician continuity.

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Declaration of interest

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REFERENCES

Bennett R.J., Taljaard D.S., Brennan-Jones C.G., Tegg-Quinn S. & Eikelboom R.H. 2015. Evaluating hearing aid handling skills: A systematic and descriptive review *International Journal of Audiology*, 54, 765-776.

Bertoli S., Staehelin K., Zemp E., Schindler C., Bodmer D., et al. 2009. Survey on hearing aid use and satisfaction in Switzerland and their determinants. *International Journal of Audiology*, 48, 183-195.

Byng R., Jones R., Leese M., Hamilton B., McCrone P., et al. 2004. Exploratory cluster randomised controlled trial of shared care development for long-term mental illness. *British Journal of General Practice*, 54, 259-266.

Chisolm T.H., Johnson C.E., Danhauer J.L., Portz L.J., Abrams H.B., et al. 2007. A systematic review of health-related quality of life and hearing aids: final report of the American Academy of Audiology Task Force On the Health-Related Quality of Life Benefits of Amplification in Adults. *Journal of the American Academy of Audiology*, 18, 151-183.

Cox, Alexander & Beyer 2003. Norms for the international outcome inventory for hearing aids. *Journal of the American Academy of Audiology*, 14, 403-413.

Cox R.M. & Alexander G.C. 2002. The International Outcome Inventory for Hearing Aids (IOI-HA): psychometric properties of the English version: El Inventario International de Resultados para Auxiliares Auditivos (IOI-HA): propiedades psicometricas de la version en ingles. *International Journal of Audiology*, 41, 30-35.

Cox R.M., Alexander G.C. & Beyer C.M. 2003. Norms for the international outcome inventory for hearing aids. *Journal of the American Academy of Audiology*, 14, 403-413.

Cox R.M., Stephens D. & Kramer S.E. 2002. Translations of the International Outcome inventory for Hearing Aids (IOI-HA). *International Journal of Audiology*, 41, 3-26.

Desjardins J.L. & Doherty K.A. 2009. Do experienced hearing aid users know how to use their hearing AIDS correctly? *American Journal of Audiology*, 18, 69-76.

Dillon, James & Ginis 1997. The Client Oriented Scale of Improvement (COSI) and its relationship to several other measures of benefit and satisfaction provided by hearing aids. *Journal of the American Academy of Audiology*, 8, 27-43.

Dillon H. 2012. *Hearing Aids*. New York: Boomerang Press.

Ekberg K., Grenness C. & Hickson L. 2014. Addressing patients' psychosocial concerns regarding hearing aids within audiology appointments for older adults. *American Journal of Audiology*, 23, 337-350.

Fan V.S., Burman M., McDonell M.B. & Fihn S.D. 2005. Continuity of care and other determinants of patient satisfaction with primary care. *Journal of General Internal Medicine*, 20, 226-233.

Freeman G. & Hjortdahl P. 1997. What future for continuity of care in general practice? *BMJ*, 314, 1870.

Funnell M.M. & Anderson R.M. 2003. Changing office practice and health care systems to facilitate diabetes self-management. *Current Diabetes Reports*, 3, 127-133.

Grenness C., Hickson L., Laplante-Lévesque A. & Davidson B. 2014. Patient-centred care: A review for rehabilitative audiologists. *International Journal of Audiology*, 53, S60-S67.

Grenness C., Hickson L., Laplante-Lévesque A., Meyer C. & Davidson B. 2015. Communication Patterns in Audiologic Rehabilitation History-Taking: Audiologists, Patients, and Their Companions. *Ear and Hearing*, 36, 191-204.

Grenness C., Hickson L., Laplante-Lévesque A., Meyer C. & Davidson B. 2015. The nature of communication throughout diagnosis and management planning in initial audiologic rehabilitation consultations. *Journal of the American Academy of Audiology*, 26, 36-50.

Haggerty J.L., Roberge D., Freeman G.K. & Beaulieu C. 2013. Experienced continuity of care when patients see multiple clinicians: a qualitative metasummary. *The Annals of Family Medicine*, 11, 262-271.

Hartley D., Rochtchina E., Newall P., Golding M. & Mitchell P. 2010. Use of hearing aids and assistive listening devices in an older Australian population. *Journal of the American Academy of Audiology*, 21, 642-653.

Heuermann H., Kinkel M. & Tchorz J. 2005. Comparison of psychometric properties of the International Outcome Inventory for Hearing Aids (IOI-hA) in various studies. *International Journal of Audiology*, 44, 102-109.

Hickson L., Clutterbuck S. & Khan A. 2010. Factors associated with hearing aid fitting outcomes on the IOI-HA. *International Journal of Audiology*, 49, 586-595.

Hickson L., Meyer C., Lovelock K., Lampert M. & Khan A. 2014. Factors associated with success with hearing aids in older adults. *International Journal of Audiology*, 53 Suppl 1, S18-27.

Kerse N., Buetow S., Mainous A.G., Young G., Coster G., et al. 2004. Physician-patient relationship and medication compliance: a primary care investigation. *The Annals of Family Medicine*, 2, 455-461.

Kochkin S. 2000. Marke Track V: "Why my hearing aids are in the drawer": The consumers' perspective. *The Hearing Journal*, 53, 34-41.

Kochkin S. 2000. Marke Track V: Consumer satisfaction revisited. *The Hearing journal*, 53, 38-55.

Kochkin S. 2002. MarkeTrak VI: 10-year customer satisfaction trends in the US hearing instrument market. *Hearing Review*, 9, 14-25.

Kochkin S., Beck D., Christensen L., Compton-Conley C., Fligor B., et al. 2012. MarkeTrak VIII: The impact of the hearing healthcare professional on hearing aid user success. *The Hearing Review*.

Laplante-Lévesque A., Knudsen L.V., Preminger J.E., Jones L., Nielsen C., et al. 2012. Hearing help-seeking and rehabilitation: perspectives of adults with hearing impairment. *International Journal of Audiology*, 51, 93-102.

Love M.M., Mainous A., Talbert J.C. & Hager G.L. 2000. Continuity of care and the physician-patient relationship. *Journal of Family Practice*, 49, 998-1004.

Mainous 3rd A. & Gill J. 1998. The importance of continuity of care in the likelihood of future hospitalization: is site of care equivalent to a primary clinician? *American Journal of Public Health*, 88, 1539-1541.

Naithani S., Gulliford M. & Morgan M. 2006. Patients' perceptions and experiences of 'continuity of care'in diabetes. *Health Expectations*, 9, 118-129.

O'Malley A.S., Mandelblatt J., Gold K., Cagney K.A. & Kerner J. 1997. Continuity of care and the use of breast and cervical cancer screening services in a multiethnic community. *Archives of Internal Medicine*, 157, 1462-1470.

Parchman M.L., Pugh J.A., Noël P.H. & Larme A.C. 2002. Continuity of care, self-management behaviors, and glucose control in patients with type 2 diabetes. *Medical Care*, 40, 137-144.

Poost-Foroosh L., Jennings M.B., Shaw L., Meston C.N. & Cheesman M.F. 2011. Factors in client-clinician interaction that influence hearing aid adoption. *Trends in Amplification*, 15, 127-139.

Saultz J.W. & Albedaiwi W. 2004. Interpersonal continuity of care and patient satisfaction: a critical review. *The Annals of Family Medicine*, 2, 445-451.

Schneider J.M., Gopinath B., McMahon C.M., Britt H.C., Harrison C.M., et al. 2010. Role of general practitioners in managing age-related hearing loss. *Medical Journal of Australia*, 192, 20.

Smeeth L., Fletcher A.E., Ng E.S., Stirling S., Nunes M., et al. 2002. Reduced hearing, ownership, and use of hearing aids in elderly people in the UK--the MRC Trial of the Assessment and Management of Older People in the Community: a cross-sectional survey. *Lancet*, 359, 1466-1470.