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Complete List of Authors:	Wittich, Walter; Universite de Montreal, School of Optometry; Centre de recherche interdisciplinaire en readaptation du Montreal metropolitain, MAB-Mackay & Institut Nazareth et Louis-Braille Hobler, Fiona; Toronto Rehabilitation Institute, Research; University of Toronto, Speech-Language Pathology Jarry, Jonathan; Universite de Montreal, School of Optometry McGilton, Kathy; University of Toronto
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Screening for sensory impairment in older adults with dementia: Recommendations from specialists

Walter Wittich[1, 2, 3], Fiona Höbler [4, 5], Jonathan Jarry[1, 2], Kathy McGilton[4, 6],

1) School of Optometry, Univeristy of Montreal, Montreal, Quebec, Canada

2) CRIR/Centre de réadaptation MAB-Mackay du CIUSSS du Centre-Ouest-de-l'Île-de-Montréal

3) CRIR/Institut Nazareth et Louis-Braille du CISSS de la Montérégie-Centre

4) Department of Research, Toronto Rehabilitation Institute-University Health Network, Toronto, Ontario, Canada

5) Department of Speech-Language Pathology, University of Toronto, Toronto, Ontario, Canada

6) Lawrence S. Bloomberg Faculty of Nursing, University of Toronto, Ontario, Canada

Corresponding author:

Walter Wittich, PhD FAAO CLVT

Assistant Professor, School of Optometry Université de Montréal

3744, rue Jean-Brillant, 260-7

Montréal, (Québec) H3T 1P1

Tel. 514 343 7962; Fax. 514 343 2382

walter.wittich@umontreal.ca

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ABSTRACT

Objectives – This study aimed to identify screening tools, technologies, and strategies that vision- and hearing-care specialists recommend to front-line healthcare professionals for the screening of older adults in long-term care homes who have dementia.

Setting: An environmental scan of healthcare professionals took place via telephone interviews between December 2015 and March 2016. All interviews were audio-recorded, transcribed, proofed for accuracy, and their contents thematically analyzed by two members of the research team.

Participants – Eleven professionals from across Canada specializing in the fields of vision- and hearing healthcare and technology for older adults with cognitive impairment were included in the study.

Outcome measures– As part of a larger mixed-methods project, this qualitative study used semi-structured interviews and their subsequent content analysis.

Results - Following a two-step content analysis of interview data, coded citations were grouped into three main categories: 1) barriers, 2) facilitators, and 3) tools and strategies that do or do not work for sensory screening of older adults with dementia. We report on the information offered by participants within each of these themes, along with a summary of tools and strategies that work for screening older adults with dementia

Conclusions – Recommendations from sensory specialists to nurses working in long-term care included the need for improved inter-professional communication and collaboration, as well as flexibility, additional time, and strategic use of clinical intuition and ingenuity. These suggestions were contradicted at times the realities of service provision or the need for standardized and validated measures.

Strengths and Limitations of this Study

- This study provides a unique opportunity for inter-professional knowledge translation by drawing on the clinical experience of experts in vision- and hearing-healthcare who specialize in providing services to older adults with dementia, in order to let nurses working in long-term care benefit from their expertise when screening for sensory impairments.
- By taking advantage of a qualitative research approach, this study is able to provide a description of directly applicable tools and strategies for sensory screening with older adults whose ability to respond to standardized traditional screening techniques may be impaired due to their cognitive limitations.
- Despite a small sample size (n = 11), the participants were from a relatively small population of vision and hearing experts with a focus on persons with dementia. In addition data saturation was reached.
- The results highlight the challenge of bridging the gap between the professional expectations of rigor and standardization in sensory assessment, and the realities of practice in a long-term care environment.

INTRODUCTION

As we age, our sensory capacities decline, which is reflected in the increased prevalence rates of hearing and visual loss in older adults. Hearing loss has been estimated to affect up to 50% of individuals 65 years of age and older [1], and vision impairment estimated to affect 18% of those aged 70 years and over [2]. Together, vision and hearing loss, known as dual-sensory impairment (DSI), increases from a prevalence of less than 1% in persons younger than 70 years to 11.3% in adults aged 80 years or over, at which point over 80% of adults are affected by at least one sensory impairment [3]. Impaired sensory abilities are seen to be significantly more prevalent in older adults who are also experiencing cognitive decline. Indeed, hearing loss has been found in over 90% of adults with cognitive impairment [4], and visual impairment in more than 30% of individuals with dementia [5]. The most common type of dementia is Alzheimer's disease and is seen to increase dramatically in prevalence from 1.7-3% of adults aged over 65 years to 32% amongst those aged 85 years and older, and above 40% in those older than over 95 years of age [6,7]. The neurodegeneration that characterizes dementia is caused by a proliferation of the pathogenic proteins β-amyloid (Aβ) and tau across neural networks including brain regions that support auditory and visual function [8–10].

Although research on the underlying relationship between cognitive and sensory decline has not reached consensus [11,12], their co-occurrence in the older population is unequivocal [13–16]; yet hearing and vision impairments continue to be under-diagnosed and under-treated in this vulnerable population of older adults with cognitive impairment [5,17].

The process of screening, assessment and evaluation of sensory and cognitive impairment in older adults has been researched in a variety of ways. Some researchers have examined how to evaluate cognition in persons who have either a hearing or a vision loss, both of which can

interfere with the administration of cognitive testing procedures [18]. For example, Bertone and colleagues [19] magnified sub-tests of the Wechsler Adult Intelligence Scale [20] in order to make them accessible and visible for persons with central vision loss due to age-related macular degeneration. Wittich et al. [21] provided validation data for the Montreal Cognitive Assessment (MoCA) [22] in its blind version, which can be administered verbally only. Similarly, Lin et al. [23] developed a procedure to administer the MoCA to individuals with severe hearing impairment by making the test instructions available as a PowerPoint presentation, thereby avoiding problems of audibility. Other researchers have focused on the reverse of this approach, whereby they examined how vision or hearing testing can be adapted to individuals with cognitive decline, because many sensory tests require a response from the individual whether the testing stimuli are seen or heard. It is this second approach that is the focus of the present study, and how screening for sensory loss can be facilitated by nurses working in long-term care homes (LTCHs).

The decline of older adults' cognitive and functional status and the severity of their disabilities are reported risk factors for institutionalization into nursing and LTCHs [24–26]. In fact, the prevalence of impaired sensory capacity is disproportionately higher in people with dementia living in care homes [5] than amongst older adults living in the community, with one third of residents in this setting having a single sensory impairment and an additional third experiencing DSI [27]. Furthermore, over half of such cases have been shown to be unreported [28], with under-diagnosis by the appropriate specialist due to lack of service utilization [5] or those documented being untreated due to underutilization of rehabilitative services by older adults [29,30].

The importance of appropriately identifying the sensory capacity in individuals with dementia is not only underscored by their incommensurate prevalence rates and the need to accurately determine the person's true cognitive status, but has been established as a healthcare and research priority by those living with dementia themselves [31]. Furthermore, nurses and other health care professionals responsible for the care of older adults with dementia have reported the difficulty of differentiating between sensory and cognitive impairment in affected residents [32]. Höbler et al. and others have also requested the provision of more specific education on the appropriate methods of evaluating sensory impairment amongst residents [33,34].

Prioritization of identifying the sensory capacity of older adults is further supported by evidence of accelerated cognitive decline [35,36] and increased risk of incident dementia in those with sensory impairment [37–39], as hearing impairment in particular can impact on all domains of cognition [11]. Moreover, residents with impairment of both vision and hearing demonstrate significantly higher incidence of new behavioral symptoms [27], and accelerated cognitive decline due to lack of social engagement [40], which is, in turn, significantly associated with untreated sensory loss [41–43]. A recent study has also shown that cognitive impairment is most common in long-term care residents with DSI and that these individuals are at increased risk of mortality [44].

Objectives

To address the urgent need of appropriate evaluation and treatment of sensory impairment in adults already experiencing cognitive decline, we conducted an environmental scan with professionals working in the field of health technology, optometry, ophthalmology, audiology, and dual sensory impairment, which was part of a larger mixed-methods project

investigating suitable vision and hearing screening measures for older adults with dementia that could be used by nurses working in long-term care [45]. The main purpose of this environmental scan was to identify screening tools, old and new technologies, and assessment strategies that sensory healthcare specialists find suitable for screening older adults who have dementia, and was carried out complementary to an environmental scan with nurses who work with residents who have dementia in LTCHs) [34].

METHODS

Following the completion of a review of the literature on hearing and vision screening tools as per our protocol [45], this second step of the investigation was carried out in order to identify what tools, technologies and strategies are currently being used by vision and hearing professionals when serving older adults with cognitive impairment. As in the literature review, a broad definition of measures and technologies was adopted, to include paper-based tests, software solutions such as apps and extensions for mobile devices, and higher-tech devices such as portable ophthalmic or audiometric equipment, as well as informal assessment strategies used with residents who had dementia or limited cognitive or communication abilities.

The scan was conducted by a clinically trained member of the research team (FH, MSc, female), who interviewed participating professionals about: their thoughts and experiences of using tools, technologies, and strategies to screen for vision or hearing impairment in persons who have dementia, the tools and strategies they have found to be most useful, the ways in which current measures could be improved, and what they consider to be key elements for inclusion in a sensory screening package (see Table 1). This research was completed with the approval of the Research Ethics Boards of the University Health Network, Toronto, Canada, and in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for

experiments involving humans [46]. All participants provided informed written consent before enrolling in the study.

PARTICIPANTS

A convenience sample of eleven professionals from across Canada with expertise in vision, hearing, dual sensory impairment or healthcare technologies were recruited through their connections with members of the larger study team or through referral by participants already enrolled in or contacted about the study. The sample size was seen as sufficient for the data collection purposes of this study, as judged on previous research [47,48]. The research coordinator (FH) made initial contact with potential candidates by email or by phone. Eleven participants agreed to take part in this study, while one candidate declined due to a perceived lack of expertise in the area, and another due to time constraints during the data collection period. Participant characteristics of all interviewees included in this study are summarized in Table 2.

DATA COLLECTION

By use of a semi-structured guide, the environmental scan interviews took place via telephone between December 2015 and March 2016. After receiving background information on the study, its purpose, as well as answers to any questions they had, written informed consent was received from all participants at the time of or prior to data collection via email or fax. The interview protocol was applied in relevance to the participants' area of expertise (i.e., vision, hearing or dual sensory loss), and participants were encouraged to offer any additional information they felt was applicable to the study's objectives and/or that had not been covered by

the semi-structured interview script [49]. Two participants were interviewed together upon request, resulting in a total of 10 interviews with 11 participants being conducted. There was no time limit applied to the interviews, with these having a mean duration of 40 minutes 30.66 seconds [SD = 11.83 mins.].

DATA ANALYSIS

All interviews were audio-recorded, transcribed by a third party, and proofed for accuracy by a member of the research team [FH]. Following full anonymization of the data sets, the transcribed contents of the interviews underwent thematic analysis [50]. Two members of the research team (WW, PhD; JJ, MSc) analyzed all sets to identify data relating to the following: tools/strategies that work for screening (vision/hearing), tools/strategies that do not work for screening, and tools/strategies that may work. This data analysis followed a coding protocol in which data was first coded as a Tool or Strategy, and secondly whether it was reported to work or not, then as to whether it applied to vision or hearing screening. For example, "T+H", which denoted a measured that was reported to work well for hearing screening, or "S?V", which denoted a strategy that may work for vision. Additional codes related to information reported as: a "golden quote", a sentence or paragraph that is striking or characteristic, the name of a tool when first mentioned (e.g., Snellen chart), a barrier to sensory screening, a recommendation on what should be done according to the participant, other content of interest, as well as any "red flag" or risk factor or other trigger for screening (e.g. diabetes, missing hearing aid, missing glasses). During a second level of thematic analysis, the extracted data from the first level were again analyzed for the identification of prominent themes in the interviews with participants. Agreement was achieved through the concurrent coding and discussion involving both analysts

(WW, JJ), and differences in opinion when interpreting content were resolved face to face [51], an approach that members of the team have previously utilized successfully [52–55]. These themes are reported below.

FINDINGS

Following a two-step content analysis of interview data, coded citations were grouped into three main themes: 1) *barriers*, 2) *facilitators,* and 3) *tools and strategies that related to the screening of older adults with dementia*. Here we report on the information offered by participants within each of these themes. In addition, we present a summary of tools and strategies that work for screening older adults with dementia (see Table 3). Direct participants' quotes are presented in italics below, whereby each quote is identified by the source code.

Facilitators

Our interviewees identified few *facilitators,* as they were more likely to share barriers to their work. The main enablers of sensory screening in residents with dementia were indeed other people. The clients themselves can become facilitators and advocates, as can family members, activation workers, as well as long-term care facility staff.

An audiologist pointed out that hearing screening clinics in long-term care facilities can be organized by a facility employee:

I'm thinking we could get called in to do a screening, we could have an activation worker in a long-term care facility say, "I would like to have a hearing screening clinic." [participant 4]

Local support by staff and residents can help bring awareness of hearing loss to others:

It's not always possible for me, as an audiologist, to be everywhere and see everyone, so to have staff members also be advocates for hearing is very important and, you know, to have residents themselves be advocates for hearing. [participant 5]

The nurses, whose lack of availability was often branded as a barrier, were once mentioned in a more positive context:

The nurse manager on that unit was very receptive to having some audiological intervention on her unit, and so we actually designed a simple screening program there, because she wanted the nurses to be able to do the screening […]. And she felt that it was important to get the nurses on her unit involved in that screening. [participant 2]

Barriers

In the interviews with vision and hearing specialists on the subject of sensory screening in residents with a cognitive impairment, the two barriers to screening that were most often repeated were *impaired communication* and *lack of staff involvement* . Impaired communication can mean not knowing if a client's answer is reliable; not being able to use traditional means of communication; or not being able to communicate at all when the neurological condition is too advanced. One interviewee explained:

And when we are at the long-term care facility, […] some of [our residents] are completely unresponsive, which of course is a challenge and, other times, it's just they require more encouragement, constant repetition to remind them of the task that we're doing, that kind of thing. [participant 7]

Since many screening tests rely on self-report, impaired communication can jeopardize subjective assessments:

In the more advanced stages of dementia, it's very difficult to get a pure-tone audiogram, because pure-tones become meaningless, so you have to use more meaningful stimuli. [participant 2]

Many sensory experts flagged the lack of staff involvement in the screening of persons for hearing and vision loss. Some reported that educating the staff on the need to screen for sensory loss was not helpful, as it is not a mandatory training activity for nurses. In part, this absence may be due to policies or regulations that do not include or promote sensory screening, lack of education and training on how to screen, or not prioritizing hearing and vision screening given the multiple demands on their time. Moreover, screening by staff is not always systematic:

We did find that the nurses, number one, only bothered to do […] their screening on 50% of the intake of the people that were admitted. And furthermore, failed to identify 40% of the people that the student identified with the more extensive screening. [participant 2]

A long list of additional barriers can be assembled based on these interviews: hearing loss denial; lack of cooperation by the client's family; discomfort vis-à-vis the physical closeness often required for sensory screening; environmental noises during hearing screening; the presence of a combined hearing and vision loss; and the limitations of portable equipment often necessary for these on-location screenings.

Strategies and Tools

Given the specific characteristics of people with a cognitive impairment, our specialists frequently suggested *strategies* to conduct sensory screening. We defined these as adaptations or behavioural accommodations in order to administer a particular screening tool, such as choosing a specific location or speed of administration. While certain strategies were unique to either vision or hearing screening, many such adaptations were mentioned by both groups of experts.

By far the most common strategy was to *improve communication*. Many specialists highlighted the importance of establishing a friendly rapport with the client before screening, of reassuring and encouraging them throughout the procedure. Sometimes, repetition was key:

> *They require more encouragement, constant repetition to remind them of the task that we're doing. [participant 7]*

Often, according to our interviewees, the client may not provide the type of feedback traditionally required by the subjective screen, emphasizing the value of flexibility. The response to "Can you see this?" or "Can you hear this?" can be a smile, a number of raised fingers, or a movement of the eye:

> *I remember one woman that was singing constantly, but she would stop singing when she could hear me, so that was one way of finding information. [participant 2]*

It may also mean playing along with a resident's own understanding of the situation:

> *One man believed he was being assessed to join the Greek military and so he was reading all of the letters on the Snellen chart in Greek. And I don't speak Greek and so we also bring a number chart with us. So, he was reading those out in Greek but at least there were only nine numbers for me memorize. So, I just started accepting Greek readings of the numbers instead and kind of learning Greek numeric system as we went. [participant 10]*

The *preference for familiarity* was a recurring strategy mentioned by both hearing and vision specialists, such as choosing a familiar room and having a person the client trusts sitting by their side during the screening. Considerations of *time* were brought up as well: examples included screening on the right day, with breaks during the procedure, and the possibility of resting of finishing another day:

Sometimes the assessment needs to be done over several appointments [*participant* 5].

Finally, information can be gathered indirectly through *staff, family, and behaviour*. The latter, we were told, can serve as a clue to impairment:

One of the most helpful things is having family there to at least give us a little bit of background about the resident, about things that they may have liked to have done when they were not at the long-term care facility such as reading or knitting, activities that they haven't been doing lately which could be because of their vision problems, either glasses or having some sort of eye condition that needs to be treated. [participant 3]

A small number of strategies were mentioned exclusively by vision specialists, while a much longer list could be drawn from the input of the hearing experts (see Table 3). Since hearing screening often relies on the playback of tones through headphones, it is interesting to note that interviewees disagreed amongst themselves as to whether or not ear buds were preferable to headsets for this population. Some clients may prefer the former:

If you come at somebody with a headset, often that's a bit alarming and they immediately don't want to cooperate; but I've found that they're more compliant with insert phones. [participant 2]

while others are more at ease with the latter:

I haven't had issues with people putting on headsets. […] I'm not sold on removing the idea of a headset." [participant 4]

The above-mentioned strategies highlight that no one method of screening works for everyone as some residents preferred headsets while others preferred phones. For both vision and hearing, experts spoke of numerous tools they considered either to work, to not work, or to possibly work with this population (see Table 3). On the hearing side, speech testing was often

mentioned as providing more meaningful stimuli to a client with a cognitive impairment than a pure-tone audiogram: indeed, the latter test ended up both being recommended and being rejected depending on the interviewee. Meanwhile, for either sense, very few of our participants qualified themselves as knowledgeable on the topic of screening apps, such as Peek™ for vision testing. They often knew of these portable technologies but had rarely used them. These apps elicited the following concerns: that they were not designed or validated for use in a context of dementia; that they relied on batteries that need to be recharged; and that the hardware (i.e. cell phone or tablet screen and camera) is not professional grade. Still, many interviewees wanted to see data on how they compared to traditional screening methods and were even willing to try them out for themselves.

A recurring comment on the part of audiologists spanned multiple coding categories, acting as a barrier, forming a recommendation, and being suggested as a screening tool that works for hearing: the *presence of wax* and its removal through otoscopy. As one hearing expert put it:

> *I think all screening should be accompanied by otoscopic examination, because one other thing I've learned is that many seniors, especially those in the nursing homes, they don't tend to get kind of routine ear exams, tend to have accumulations of wax that would definitely be possibly interfering with their hearing. So having that wax removed before you do any testing, is really important. […] Anybody who's getting involved with screening of seniors' hearing needs to have some training in cerumen management, certainly. [participant 2]*

DISCUSSION

The purpose of the present study was to explore the advice of specialists in the field of sensory health care for older adults with dementia, in order to develop recommendations for nurses working in long-term care facilities to be able to better screen their residents for the presence of vision and/or hearing loss. The participants reported on several facilitators and barriers, and how these can each be strengthened and overcome through adaptive strategies. Ideally, a screening protocol would be able to examine vision and hearing function simultaneously or during the same testing opportunity, because time is often sparse and the pressures on health care providers are many. However, one central theme, common among the suggested approaches, was to allow and encourage clients (and clinicians) to take their time when engaging in the testing of sensory functioning, as subtle information and behavioural cues often become the true source of information in sensory screening, and may then be lost if rigorously standardized (and fast) protocols are adhered to.

In this particular population, sensory screening methods need to be flexible enough to accommodate a range of cognitive resources, whereby individuals with mild cognitive impairments may well be able to complete normal testing procedures if given the chance and the time. Those with moderate to severe cognitive impairment, however, may require adjustments in the administration of screening measures and strategies, led by use of clinical judgment and intuition. Such approaches can easily be supplemented with the use of questionnaires (or a subsection of questions therein), as well as more objective measures in order to ensure reliability of test results. Ideally, the stimuli that are used are meaningful to the resident (e.g., their name) and are speech-based because of their ecological importance over pure tones. When simplicity was important, the use of numbers (both for speech as well as vision testing) was recommended. In addition, the use of pictograms or picture-matching was a proposed possibility to elicit

responses. In addition, making sure the methods of screening aligned with the residents preferences (phones or headsets) is essential for a quality screening result. Finally, our respondents expressed openness to using and exploring the potential of new technologies, such as apps and devices, for screening purposes. However, their own experience with current technologies was limited and they expressed concerns about their validity and availability, thus, recommending that technologies require further development in order to serve this population.

A strength of the present study is its range of professionals and their level of expertise in providing services to older adults with sensory and cognitive impairments; despite their number being relatively small, data saturation was reached when assessed. In addition, this study tackles cross-disciplinary communication barriers by bringing specialist recommendations to the attention of nurses. We were able to replicate previous reports on the barriers and challenges that are encountered when providing sensory care to older adults in LTCHs, including difficulties in client's willingness to participate in the assessment (at times expressed as aggression or anxiety) as well as communication difficulties linked to cognitive losses, resulting in confusion (both at the part of the client and the clinician) [33]. Communication recommendations were in line with previous suggestions to adjust speech volume, speed, and body positioning face-to-face [32] . In addition, the present data are in agreement with previous reports about the necessity for flexibility in the testing procedure, such as the need to determine the optimal time of day for each individual to be tested, the option to pause and continue testing as needed, along with taking care to avoid fatigue or frustration on the part of the client [56].

A remaining challenge, however, is to reconcile the realities of nurses workloads in LTCHs with the recommendations that have emerged from our specialist interviews. Specifically, the recommendations of our vision and hearing care professionals are likely to go

beyond the resources available. Even though both groups agree that increased priority should be placed on the sensory assessment of residents in order to improve communication [43], the reality of service provision in LTCHs rarely allows for this level of individualized attention [57]. For nurses working in LTCHs, the impact of regulations on nurse role flexibility and professional judgment and an underfunded system contributing to insufficient resources and staffing [48] which influences their ability to find time and resources to screen effectively. In addition, the technologies, tools and abilities available versus the devices, techniques and skills that were recommended may not match. For example, LTCH nurses may not have access to the necessary tools and training to remove earwax, a potentially necessary step before hearing can truly be evaluated. Similarly, pocket-sized eye charts may be necessary for vision screening, but may not necessarily be available to all staff at any time, or staff may lack training to properly administer and interpret the results when presenting the test at a specific distance or under non-optimal lighting conditions. Meanwhile, some of the tests that may be known and available to nurses may not hold up to the demands of rigor for sensory testing by the specialists. For example, the use of measures such as the Whisper test and Finger Rub test that are evidenced as suitable tests in the literature [58] did not find the approval of the specialists in our study, given problems with standardization and validation.

The next steps in the development of a sensory screening tool for older adults with dementia will include the integration of nurses' recommendations [34] with recommendations from the experts who were interviewed for this environmental scan, as well as the results of a systematic review of the literature on this topic. The members of this research team will then develop and pilot test a screening tool for nurses to use in the LTCH to examine its feasibility, reliability and validity. The present data indicate that strategies and training in easy-to-use methods, as well as careful client observation, may play a prominent role in such a screening

tool. It is also possible that these methods and adaptive strategies may take shape in a new technological application, which can be incorporated into portable devices such as cellphones or a tablet computer - both technologies that are becoming more available in the clinical environment [59,60]. Mandated training on the use of such a screening tool and continuous efforts in knowledge translation would ensure its success, especially given its potential for far-reaching benefits to clients and clinicians alike in their care provision and interaction in LTCHs.

Contributors: KSMcG is responsible for project conception and along with FH and WW for writing the protocol. FH, KSMcG and WW obtained ethics approval. FH collected the data. WW and JJ conducted the data analysis. WW, FH, JJ and KSMcG were involved in data interpretation, writing, editing and revising the manuscript.

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Data sharing statement: Access to the raw qualitative data is available upon request, given appropriate ethics approval.

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Table 1: Interview Questions

- Do you administer hearing and vision screening tests to residents at this facility?
- How long have you been working with persons who have dementia?
- Please describe your experience of working with persons who have dementia, as well as persons with hearing and vision loss.
- How do you differentiate between residents who have difficulty understanding due to a hearing impairment and those with cognitive impairments?
- How are residents identified as being in need of assessment for vision and hearing impairment?
  - Is there a standard procedure in place, and, if so, what are the steps?
  - What is the procedure for referring residents to a hearing and/or vision specialist?
- What tools, technologies, and strategies are you currently using to assess and/or detect vision and/or hearing in persons who have dementia?
- What approach is used or do you use in assessing persons who have dementia e.g. what combination of tools, technologies, and strategies is being implemented?
- How do these tools, technologies, and strategies identify a person as having hearing and/or vision impairments?
- What are the facilitators and barriers in implementing this approach and/or procedure?
  - Please list all the challenges in using these tools, technologies, and strategies.
  - Please also list all the benefits to using these tools, technologies, and strategies.
- In what way can these tools, technologies, and strategies be improved?
- In your opinion, what are the key elements to include in a hearing and vision screening package for persons who have dementia?
- Do you have knowledge of or experience in using either of the following:
  - **Peek** application (turns a smartphone into an eye exam tool)?

    …or similar other apps?
  - **uHear** application (downloadable audiometer on to an iPod Touch as a test for hearing loss)?

    …or similar other apps?

Table 2: Summary of Participant Characteristics (N=11)

	N	[%]
Categorical Characteristics		
Audiologist	2	18
Optometrist	4	36
Speech-Language Pathologist	1	9
Dual-sensory specialist	2	18
Hearing counsellor	1	9
Health technology specialist	1	9
Female	10	91
Continuous Characteristics		
Years' experience working in dementia care (N=8)	14.56	[SD= 12.03]

	HEARING SCREENING	VISION SCREENING
TOOLS	▪ "Hear Mans" (manikin head with headphones on used for a quick hearing test) ▪ Asking simple questions (does the patient wear hearing aids? does the patient have them?) ▪ Chart review ▪ Five-minute hearing test ▪ Hearing Dependent Daily Activities questionnaire ▪ Otoacoustic emissions ▪ Picture board ▪ Pocket Talker (how the person responds to using it) ▪ Pure-tone audiology ▪ Questionnaire devised by a former student of the interviewee's ▪ Repeating numbers ▪ Speech testing ▪ Whisper test and finger rub	▪ Auto-refractor ▪ Case history ▪ Finger counting ▪ Health questionnaire ▪ Matching game ▪ Objective measures (prescription assessment, eye exam) ▪ Sentences on a board in different sized font ▪ Vision questionnaire ▪ Visual charts (letters, numbers, sentences, single words, pictures, tumbling Es)
STRATEGIES	▪ Alternating between testing the left and right ear until you get an answer if no initial response to pitch testing ▪ Applying techniques developed for screening in children ▪ Asking basic questions as a form of hearing screening ▪ Bowing out of the screening gracefully if it could not be finished ▪ Choosing more meaningful stimuli than pure tones ▪ Choosing "pulsing beeps" instead of "single beeps" on the audiometer ▪ Choosing a quiet room ▪ Educating nurses and doctors on the importance of hearing and screening ▪ Frequently encouraging the client ▪ Gradually reducing the level of stimulus presentation to find their threshold ▪ Repeating measurements to ensure reliability of client self-report ▪ Rephrasing screening questions to avoid denial of the problem ▪ Starting with speech testing ▪ Taking breaks as needed ▪ Using a headset instead of ear buds ▪ Using ear buds instead of a headset ▪ Using sound amplification (e.g. Pocket Talker) to facilitate communication	▪ Bringing the eye chart closer than normal ▪ Distributing a vision form for caregiver to request exam or to help staff look at changes that would warrant a screening ▪ Emphasizing that the purpose of the screening is to monitor the health of the individual ▪ Respecting their autonomy during the screening ▪ Staying away from the patient and moving around them with portable instruments

COREQ (COnsolidated criteria for REporting Qualitative research) Checklist

A checklist of items that should be included in reports of qualitative research. You must report the page number in your manuscript where you consider each of the items listed in this checklist. If you have not included this information, either revise your manuscript accordingly before submitting or note N/A.

Topic	Item No.	Guide Questions/Description	Reported on Page No.
Domain 1: Research team and reflexivity			
Personal characteristics			
Interviewer/facilitator	1	Which author/s conducted the interview or focus group?	7
Credentials	2	What were the researcher's credentials? E.g. PhD, MD	7
Occupation	3	What was their occupation at the time of the study?	7
Gender	4	Was the researcher male or female?	7
Experience and training	5	What experience or training did the researcher have?	7
Relationship with participants			
Relationship established	6	Was a relationship established prior to study commencement?	7
Participant knowledge of the interviewer	7	What did the participants know about the researcher? e.g. personal goals, reasons for doing the research	7
Interviewer characteristics	8	What characteristics were reported about the inter viewer/facilitator? e.g. Bias, assumptions, reasons and interests in the research topic	7
Domain 2: Study design			
Theoretical framework			
Methodological orientation and Theory	9	What methodological orientation was stated to underpin the study? e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis	7
Participant selection			
Sampling	10	How were participants selected? e.g. purposive, convenience, consecutive, snowball	7
Method of approach	11	How were participants approached? e.g. face-to-face, telephone, mail, email	7
Sample size	12	How many participants were in the study?	7
Non-participation	13	How many people refused to participate or dropped out? Reasons?	8
Setting			
Setting of data collection	14	Where was the data collected? e.g. home, clinic, workplace	7
Presence of non-participants	15	Was anyone else present besides the participants and researchers?	7
Description of sample	16	What are the important characteristics of the sample? e.g. demographic data, date	table 2
Data collection			
Interview guide	17	Were questions, prompts, guides provided by the authors? Was it pilot tested?	table 1
Repeat interviews	18	Were repeat inter views carried out? If yes, how many?	n/a
Audio/visual recording	19	Did the research use audio or visual recording to collect the data?	8
Field notes	20	Were field notes made during and/or after the inter view or focus group?	n/a
Duration	21	What was the duration of the inter views or focus group?	8
Data saturation	22	Was data saturation discussed?	17
Transcripts returned	23	Were transcripts returned to participants for comment and/or	n/a

Topic	Item No.	Guide Questions/Description	Reported on Page No.
		correction?	
Domain 3: analysis and findings			
Data analysis			
Number of data coders	24	How many data coders coded the data?	8-9
Description of the coding tree	25	Did authors provide a description of the coding tree?	Table 3
Derivation of themes	26	Were themes identified in advance or derived from the data?	9
Software	27	What software, if applicable, was used to manage the data?	n/a
Participant checking	28	Did participants provide feedback on the findings?	n/a
Reporting			
Quotations presented	29	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g. participant number	9-15
Data and findings consistent	30	Was there consistency between the data presented and the findings?	9-15
Clarity of major themes	31	Were major themes clearly presented in the findings?	9-15
Clarity of minor themes	32	Is there a description of diverse cases or discussion of minor themes?	9-15

Developed from: Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care*. 2007. Volume 19, Number 6: pp. 349 – 357

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BMJ Open

Recommendations for successful sensory screening in older adults with dementia in long-term care: A qualitative environmental scan of Canadian specialists

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Recommendations for successful sensory screening in older adults with dementia in long-term care: A qualitative environmental scan of Canadian specialists

Walter Wittich[1, 2, 3], Fiona Höbler [4, 5], Jonathan Jarry[1, 2], Kathy McGilton[4, 6],

1) School of Optometry, Univeristy of Montreal, Montreal, Quebec, Canada

2) CRIR/Centre de réadaptation MAB-Mackay du CIUSSS du Centre-Ouest-de-l'Île-de-Montréal

3) CRIR/Institut Nazareth et Louis-Braille du CISSS de la Montérégie-Centre

4) Department of Research, Toronto Rehabilitation Institute-University Health Network, Toronto, Ontario, Canada

5) Department of Speech-Language Pathology, University of Toronto, Toronto, Ontario, Canada

6) Lawrence S. Bloomberg Faculty of Nursing, University of Toronto, Ontario, Canada

Corresponding author:

Walter Wittich, PhD FAAO CLVT

Assistant Professor, School of Optometry Université de Montréal

3744, rue Jean-Brillant, 260-7

Montréal, (Québec) H3T 1P1

Tel. 514 343 7962; Fax. 514 343 2382

walter.wittich@umontreal.ca

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ABSTRACT

Objectives – This study aimed to identify screening tools, technologies, and strategies that vision- and hearing-care specialists recommend to front-line healthcare professionals for the screening of older adults in long-term care homes who have dementia.

Setting: An environmental scan of healthcare professionals took place via telephone interviews between December 2015 and March 2016. All interviews were audio-recorded, transcribed, proofed for accuracy, and their contents thematically analyzed by two members of the research team.

Participants – Eleven professionals from across Canada specializing in the fields of vision- and hearing healthcare and technology for older adults with cognitive impairment were included in the study.

Outcome measures– As part of a larger mixed-methods project, this qualitative study used semi-structured interviews and their subsequent content analysis.

Results - Following a two-step content analysis of interview data, coded citations were grouped into three main categories: 1) barriers, 2) facilitators, and 3) tools and strategies that do or do not work for sensory screening of older adults with dementia. We report on the information offered by participants within each of these themes, along with a summary of tools and strategies that work for screening older adults with dementia

Conclusions – Recommendations from sensory specialists to nurses working in long-term care included the need for improved inter-professional communication and collaboration, as well as flexibility, additional time, and strategic use of clinical intuition and ingenuity. These suggestions at times contradicted the realities of service provision or the need for standardized and validated measures.

Strengths and Limitations of this Study

- This study provides a unique opportunity for inter-professional knowledge translation by drawing on the clinical experience of experts in vision- and hearing-healthcare who specialize in providing services to older adults with dementia, in order to let nurses working in long-term care benefit from their expertise when screening for sensory impairments.
- By taking advantage of a qualitative research approach, this study is able to provide a description of directly applicable tools and strategies for sensory screening with older adults whose ability to respond to standardized traditional screening techniques may be impaired due to their cognitive limitations.
- The results highlight the challenge of bridging the gap between the professional expectations of rigor and standardization in sensory assessment, and the realities of practice in a long-term care environment.
- Generalization of the findings is limited by the small sample size (n = 11), narrow recruitment region (Canada) and the focus on stakeholders in sensory care only.

INTRODUCTION

As we age, our sensory capacities decline, which is reflected in the increased prevalence rates of hearing and visual loss in older adults. Hearing loss has been estimated to affect up to 50% of individuals 65 years of age and older [1], and vision impairment has been reported to to affect 18% of those aged 70 years and over [2]. Together, vision and hearing loss, known as dual-sensory impairment (DSI), increases from a prevalence of less than 1% in persons younger than 70 years to 11.3% in adults aged 80 years or over, at which point over 80% of adults are affected by at least one sensory impairment [3]. Impaired sensory abilities are seen to be significantly more prevalent in older adults who are also experiencing cognitive decline. The most common type of dementia is Alzheimer's disease and is seen to increase dramatically in prevalence from 1.7-3% of adults aged over 65 years to 32% amongst those aged 85 years and older, and above 40% in those older than over 95 years of age [4,5]., Hearing loss has been found in over 90% of adults with cognitive impairment [6], and is highly correlated with the presence of cognitive problems [7], while visual impairment has been reported in more than 30% of individuals with dementia [8]. The neuro-degeneration that characterizes dementia likely has multifactorial causes [9] and involves and affects multiple cortical networks, including brain regions that support auditory and visual function [10–12]. Even though research on the underlying causal relationships between cognitive and sensory decline has not yet reached consensus [13,14], it is already clear that many factors related to aging and frailty are involved [15–17].

Hearing and vision impairments continue to be under-diagnosed and under-treated in this vulnerable population of older adults with cognitive impairment [8,18], even though adapted rehabilitation interventions for individuals with sensory loss have been presented [19] and

evidence exists for the improvement of cognitive functioning after sensory interventions [20,21]. The decline of older adults' cognitive and functional status and the severity of their disabilities are reported risk factors for institutionalization into nursing and long-term care homes (LTCHs) [22–24]. In fact, the prevalence of impaired sensory capacity is disproportionately higher in people with dementia living in care homes [8] than amongst older adults living in the community, with one third of residents in this setting having a single sensory impairment and an additional third experiencing DSI [25]. Furthermore, over half of such cases have been shown to be unreported [26], with under-diagnosis by the appropriate specialist due to lack of service utilization [8] or those documented being untreated due to underutilization of rehabilitative services by older adults [27,28].

The importance of appropriately identifying the sensory capacity in individuals with dementia is not only underscored by their incommensurate prevalence rates and the need to accurately determine the person's true cognitive status, but has been established as a healthcare and research priority by those living with dementia themselves [29]. Furthermore, nurses and other health care professionals responsible for the care of older adults with dementia have reported the difficulty of differentiating between sensory and cognitive impairment in affected residents [30]. Höbler et al. and others have also requested the provision of more specific education on the appropriate methods of evaluating sensory impairment amongst residents [31,32]. Prioritization of identifying the sensory capacity of older adults is further supported by evidence of accelerated cognitive decline [33,34] and increased risk of incident dementia in those with sensory impairment [35–37], as hearing impairment in particular can impact on all domains of cognition [13]. Moreover, residents with impairment of both vision and hearing demonstrate significantly higher incidence of new behavioral symptoms [25], and accelerated cognitive

decline due to lack of social engagement [38], which is, in turn, significantly associated with untreated sensory loss [39–41]. A recent study has also shown that cognitive impairment is most common in long-term care residents with DSI and that these individuals are at increased risk of mortality [42].

The process of screening, assessment and evaluation of sensory and cognitive impairment in older adults has been researched in a variety of ways. Some researchers have examined how to evaluate cognition in persons who have either a hearing or a vision loss, both of which can interfere with the administration of cognitive testing procedures [43]. For example, Bertone and colleagues [44] magnified sub-tests of the Wechsler Adult Intelligence Scale [45] in order to make them accessible and visible for persons with central vision loss due to age-related macular degeneration. Wittich et al. [46] provided validation data for the Montreal Cognitive Assessment (MoCA) [47] in its blind version, which can be administered verbally only. Similarly, Lin et al. [48] developed a procedure to administer the MoCA to individuals with severe hearing impairment by making the test instructions available as a PowerPoint presentation, thereby avoiding problems of audibility. Other researchers have focused on the reverse of this approach, whereby they examined how vision or hearing testing can be adapted to individuals with cognitive decline [49,50]. Traditional testing procedures often require a response from the person tested as to whether the stimuli are seen or heard. However, in the presence of cognitive impairment, such "true" responses are potentially impacted by a variety of factors, including attention, comprehension, recall, focus, impairment severity, only to mention a few, and may need to be extrapolated in a different way. Therefore, the focus of the present study is on this adapted approach to sensory testing, and how nurses working in long-term care homes may be able to facilitate screening for sensory loss.

Objectives

To address the urgent need of appropriate evaluation and treatment of sensory impairment in adults already experiencing cognitive decline, we conducted an environmental scan with professionals working in the field of health technology, optometry, ophthalmology, audiology, and dual sensory impairment, which was part of a larger mixed-methods project investigating suitable vision and hearing screening measures for older adults with dementia that could be used by nurses working in long-term care [51]. The main purpose of this environmental scan was to identify screening tools, old and new technologies, and assessment strategies that sensory healthcare specialists find suitable for screening older adults who have dementia, and was carried out complementary to an environmental scan with nurses who work with residents who have dementia in LTCHs) [32].

METHODS

Following the completion of a review of the literature on hearing and vision screening tools as per our protocol [51], this second step of the investigation was carried out in order to identify what tools, technologies and strategies are currently being used by vision and hearing professionals when serving older adults with cognitive impairment. To accomplish this, we employed an environmental scan. In healthcare research, the environmental scan is often employed as a needs-assessment tool for the purposes of improving and developing the efficiency of health service programs and evidence-based policies [52,53]. In using this approach, environmental or contextual factors are evaluated by reviewing existing data or actively collecting new data in the form of surveys or interviews, including a diversity of views and information, to determine the benefits, needs and efficiencies of practices within that environment [52]. As in the literature review, a broad definition of measures and technologies

was adopted, to include paper-based tests, software solutions such as apps and extensions for mobile devices, and higher-tech devices such as portable ophthalmic or audiometric equipment, as well as informal assessment strategies used with residents who had dementia or limited cognitive or communication abilities.

The scan was conducted by a clinically trained member of the research team (FH, MSc, female), who interviewed participating professionals about: their thoughts and experiences of using tools, technologies, and strategies to screen for vision or hearing impairment in persons who have dementia, the tools and strategies they have found to be most useful, the ways in which current measures could be improved, and what they consider to be key elements for inclusion in a sensory screening package (see Table 1). This research was completed with the approval of the Research Ethics Boards of the University Health Network, Toronto, Canada, and in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for experiments involving humans [54]. All participants provided informed written consent before enrolling in the study.

PARTICIPANTS

A convenience sample of eleven professionals from across Canada with expertise in vision, hearing, dual sensory impairment or healthcare technologies were recruited through their connections with members of the larger study team or through referral by participants already enrolled in or contacted about the study. Based on previous research with similar methodological approaches [55,56], the sample size was seen as sufficient for the data collection purposes of the present study. The research coordinator (FH) made initial contact with potential candidates by email or by phone. Eleven participants agreed to take part in this study, while one candidate

declined due to a perceived lack of expertise in the area, and another due to time constraints during the data collection period. Participant characteristics of all interviewees included in this study are summarized in Table 2.

DATA COLLECTION

By use of a semi-structured guide, the environmental scan interviews took place via telephone between December 2015 and March 2016. After receiving background information on the study, its purpose, as well as answers to any questions they had, written informed consent was received from all participants at the time of or prior to data collection via email or fax. The interview protocol was applied in relevance to the participants' area of expertise (i.e., vision, hearing or dual sensory loss), and participants were encouraged to offer any additional information they felt was applicable to the study's objectives and/or that had not been covered by the semi-structured interview script [57]. Two participants were interviewed together upon request, resulting in a total of 10 interviews with 11 participants being conducted. There was no time limit applied to the interviews, with these having a mean duration of 40 min 30.66 s [SD = 11.83 min, range 19 to 54 min.].

DATA ANALYSIS

All interviews were audio-recorded, transcribed by a third party, and proofed for accuracy by a member of the research team [FH]. Following full anonymization of the data sets, the transcribed contents of the interviews underwent thematic analysis [58]. Two members of the research team (WW, PhD; JJ, MSc) analyzed all sets to identify data relating to the following: tools/strategies that work for screening (vision/hearing), tools/strategies that do not work for

screening, and tools/strategies that may work. This data analysis followed a coding protocol in which data was first coded as a Tool or Strategy, and secondly whether it was reported to work or not, then as to whether it applied to vision or hearing screening. For example, "T+H", which denoted a measured that was reported to work well for hearing screening, or "S?V", which denoted a strategy that may work for vision. Additional codes related to information reported as: a "golden quote", a sentence or paragraph that is striking or characteristic, the name of a tool when first mentioned (e.g., Snellen chart), a barrier to sensory screening, a recommendation on what should be done according to the participant, other content of interest, as well as any "red flag" or risk factor or other trigger for screening (e.g. diabetes, missing hearing aid, missing glasses). During a second level of thematic analysis, the extracted data from the first level were again analyzed for the identification of prominent themes in the interviews with participants. Agreement was achieved through the concurrent coding and discussion involving both analysts (WW, JJ), and differences in opinion when interpreting content were resolved face to face [59], an approach that members of the team have previously utilized successfully [60–63]. These themes are reported below.

FINDINGS

Following a two-step content analysis of interview data, coded citations were grouped into three main themes: 1) *barriers*, 2) *facilitators,* and 3) *tools and strategies that related to the screening of older adults with dementia*. Here we report on the information offered by participants within each of these themes. In addition, we present a summary of tools and strategies that work for screening older adults with dementia (see Table 3). Direct participants' quotes are presented in italics below, whereby each quote is identified by the source code.

Facilitators

Our interviewees identified few *facilitators,* as they were more likely to share barriers to their work. The main enablers of sensory screening in residents with dementia were indeed other people. The clients themselves can become facilitators and advocates, as can family members, activation workers, as well as long-term care facility staff.

An audiologist pointed out that hearing screening clinics in long-term care facilities can be organized by a facility employee:

I'm thinking we could get called in to do a screening, we could have an activation worker in a long-term care facility say, "I would like to have a hearing screening clinic." [participant 4]

Local support by staff and residents can help bring awareness of hearing loss to others:

It's not always possible for me, as an audiologist, to be everywhere and see everyone, so to have staff members also be advocates for hearing is very important and, you know, to have residents themselves be advocates for hearing. [participant 5]

The nurses, whose lack of availability was often branded as a barrier, were once mentioned in a more positive context:

The nurse manager on that unit was very receptive to having some audiological intervention on her unit, and so we actually designed a simple screening program there, because she wanted the nurses to be able to do the screening […]. And she felt that it was important to get the nurses on her unit involved in that screening. [participant 2]

Barriers

In the interviews with vision and hearing specialists on the subject of sensory screening in residents with a cognitive impairment, the two barriers to screening that were most often

repeated were *impaired communication* and *lack of staff involvement* . Impaired communication can mean not knowing if a client's answer is reliable; not being able to use traditional means of communication; or not being able to communicate at all when the neurological condition is too advanced. One interviewee explained:

> *And when we are at the long-term care facility, […] some of [our residents] are completely unresponsive, which of course is a challenge and, other times, it's just they require more encouragement, constant repetition to remind them of the task that we're doing, that kind of thing. [participant 7]*

Since many screening tests rely on self-report, impaired communication can jeopardize subjective assessments:

> *In the more advanced stages of dementia, it's very difficult to get a pure-tone audiogram, because pure-tones become meaningless, so you have to use more meaningful stimuli. [participant 2]*

Many sensory experts flagged the lack of staff involvement in the screening of persons for hearing and vision loss. Some reported that educating the staff on the need to screen for sensory loss was not helpful, as it is not a mandatory training activity for nurses. Participants speculated that this absence may, in part, be due to policies or regulations that do not include or promote sensory screening, lack of education and training on how to screen, or not prioritizing hearing and vision screening given the multiple demands on their time. Moreover, screening by staff is not always systematic:

> *We did find that the nurses, number one, only bothered to do […] their screening on 50% of the intake of the people that were admitted. And furthermore, failed to identify 40% of the people that the student identified with the more extensive screening. [participant 2]*

Additional barriers that were less frequently mentioned were: hearing loss denial; lack of cooperation by the client's family; discomfort vis-à-vis the physical closeness often required for sensory screening; environmental noises during hearing screening; the presence of a combined hearing and vision loss; and the limitations of portable equipment often necessary for these on-location screenings.

Strategies and Tools

Given the specific characteristics of people with a cognitive impairment, our specialists frequently suggested *strategies* to conduct sensory screening. We defined these as adaptations or behavioural accommodations in order to administer a particular screening tool, such as choosing a specific location or speed of administration. While certain strategies were unique to either vision or hearing screening, many such adaptations were mentioned by both groups of experts. By far the most common strategy was to *improve communication*. Many specialists highlighted the importance of establishing a friendly rapport with the client before screening, of reassuring and encouraging them throughout the procedure. Sometimes, repetition was key:

> *They require more encouragement, constant repetition to remind them of the task that we're doing. [participant 7]*

Often, according to our interviewees, the client may not provide the type of feedback traditionally required by the subjective screen, emphasizing the value of flexibility. The response to "Can you see this?" or "Can you hear this?" can be a smile, a number of raised fingers, or a movement of the eye:

> *I remember one woman that was singing constantly, but she would stop singing when she could hear me, so that was one way of finding information. [participant 2]*

It may also mean playing along with a resident's own understanding of the situation:

One man believed he was being assessed to join the Greek military and so he was reading all of the letters on the Snellen chart in Greek. And I don't speak Greek and so we also bring a number chart with us. So, he was reading those out in Greek but at least there were only nine numbers for me memorize. So, I just started accepting Greek readings of the numbers instead and kind of learning Greek numeric system as we went. [participant 10]

The *preference for familiarity* was a recurring strategy mentioned by both hearing and vision specialists, such as choosing a familiar room and having a person the client trusts sitting by their side during the screening. Considerations of *time* were brought up as well: examples included screening on the right day, with breaks during the procedure, and the possibility of resting of finishing another day:

Sometimes the assessment needs to be done over several appointments [*participant* 5].

Finally, information can be gathered indirectly through *staff, family, and behaviour*. The latter, we were told, can serve as a clue to impairment:

One of the most helpful things is having family there to at least give us a little bit of background about the resident, about things that they may have liked to have done when they were not at the long-term care facility such as reading or knitting, activities that they haven't been doing lately which could be because of their vision problems, either glasses or having some sort of eye condition that needs to be treated. [participant 3]

A small number of strategies were mentioned exclusively by vision specialists, while a much longer list could be drawn from the input of the hearing experts (see Table 3). Since hearing screening often relies on the playback of tones through headphones, it is interesting to

note that interviewees disagreed amongst themselves as to whether or not ear buds were preferable to headsets for this population. Some clients may prefer the former:

> *If you come at somebody with a headset, often that's a bit alarming and they immediately don't want to cooperate; but I've found that they're more compliant with insert phones. [participant 2]*

while others are more at ease with the latter:

> *I haven't had issues with people putting on headsets. […] I'm not sold on removing the idea of a headset." [participant 4]*

The above-mentioned strategies highlight that no one method of screening works for everyone as some residents preferred headsets while others preferred phones. For both vision and hearing, experts spoke of numerous tools they considered either to work, to not work, or to possibly work with this population (see Table 3). On the hearing side, speech testing was often mentioned as providing more meaningful stimuli to a client with a cognitive impairment than a pure-tone audiogram: indeed, the latter test ended up both being recommended and being rejected depending on the interviewee. Meanwhile, for either sense, very few of our participants qualified themselves as knowledgeable on the topic of screening apps, such as Peek™ for vision testing. They often knew of these portable technologies but had rarely used them. These apps elicited the following concerns: that they were not designed or validated for use in a context of dementia; that they relied on batteries that need to be recharged; and that the hardware (i.e. cell phone or tablet screen and camera) is not professional grade. Still, many interviewees wanted to see data on how they compared to traditional screening methods and were even willing to try them out for themselves.

A recurring comment on the part of audiologists spanned multiple coding categories, acting as a barrier, forming a recommendation, and being suggested as a screening tool that works for hearing: the *presence of wax* and its removal through otoscopy. As one hearing expert put it:

> *I think all screening should be accompanied by otoscopic examination, because one other thing I've learned is that many seniors, especially those in the nursing homes, they don't tend to get kind of routine ear exams, tend to have accumulations of wax that would definitely be possibly interfering with their hearing. So having that wax removed before you do any testing, is really important. […] Anybody who's getting involved with screening of seniors' hearing needs to have some training in cerumen management, certainly. [participant 2]*

DISCUSSION

The purpose of the present study was to explore the advice of specialists in the field of sensory health care for older adults with dementia, in order to develop recommendations for nurses working in long-term care facilities to be able to better screen their residents for the presence of vision and/or hearing loss. The participants reported on several facilitators and barriers, and how these can each be strengthened and overcome through adaptive strategies. Ideally, a screening protocol would be able to examine vision and hearing function simultaneously or during the same testing opportunity, because time is often sparse and the pressures on health care providers are many. However, one central theme, common among the suggested approaches, was to allow and encourage clients (and clinicians) to take their time when engaging in the testing of sensory functioning, as subtle information and behavioural cues

often become the true source of information in sensory screening, and may then be lost if rigorously standardized (and fast) protocols are adhered to.

In this particular population, sensory screening methods need to be flexible enough to accommodate a range of cognitive resources, whereby individuals with mild cognitive impairments may well be able to complete normal testing procedures if given the chance and the time. Those with moderate to severe cognitive impairment, however, may require adjustments in the administration of screening measures and strategies, led by use of clinical judgment and intuition. Such approaches can easily be supplemented with the use of questionnaires (or a subsection of questions therein), as well as more objective measures in order to ensure reliability of test results. Ideally, the stimuli that are used are meaningful to the resident (e.g., their name) and are speech-based because of their ecological importance over pure tones. When simplicity was important, the use of numbers (both for speech as well as vision testing) was recommended. In addition, the use of pictograms or picture-matching was a proposed possibility to elicit responses. In addition, making sure the methods of screening aligned with the residents preferences (phones or headsets) is essential for a quality screening result. Finally, our respondents expressed openness to using and exploring the potential of new technologies, such as apps and devices, for screening purposes. However, their own experience with current technologies was limited and they expressed concerns about their validity and availability, thus, recommending that technologies require further development in order to serve this population. A strength of the present study is its range of professionals and their level of expertise in providing services to older adults with sensory and cognitive impairments; despite their number being relatively small, data saturation was reached when assessed. In addition, this study tackles cross-disciplinary communication barriers by bringing specialist recommendations to the

attention of nurses. We were able to replicate previous reports on the barriers and challenges that are encountered when providing sensory care to older adults in LTCHs, including difficulties in client's willingness to participate in the assessment (at times expressed as aggression or anxiety) as well as communication difficulties linked to cognitive losses, resulting in confusion (both at the part of the client and the clinician) [31]. Communication recommendations were in line with previous suggestions to adjust speech volume, speed, and body positioning face-to-face [30] . In addition, the present data are in agreement with previous reports about the necessity for flexibility in the testing procedure, such as the need to determine the optimal time of day for each individual to be tested, the option to pause and continue testing as needed, along with taking care to avoid fatigue or frustration on the part of the client [49].

Our study needs to be viewed within certain limitations; for example, the logistics of data collection and imposed time and funding restrictions limited the recruitment scope, thereby only including participants within Canada, and those that were known within the professional network of the study team. This recruitment approach might have excluded practice perspectives more representative of other countries or service delivery systems. The scope of the study is further limited by the choice to focus on sensory health professionals, without including additional stakeholders. A parallel study is currently exploring the opinions of nurses working in LTCHs; however, including caregivers or primary care providers would provide further insights. The data-driven analysis approach revealed that the majority of strategies and tools mentioned were in the hearing domain, which is intuitively more closely linked to communication. Future studies may need to probe further into the use and usability of vision testing devices and strategies. They should provide additional background data on the participants that will allow for a better contextualization of the findings. For example, the frequency and intensity of service delivery by

the participating stakeholders would provide information about the level of expertise and experience in service delivery and strategy development. In addition, this limitation may also have had an effect on data saturation.

A remaining challenge is to reconcile the realities of nurses workloads in LTCHs with the recommendations that have emerged from our specialist interviews. Specifically, the recommendations of our vision and hearing care professionals are likely to go beyond the resources available. Even though both groups agree that increased priority should be placed on the sensory assessment of residents in order to improve communication [41], the reality of service provision in LTCHs rarely allows for this level of individualized attention [64]. For nurses working in LTCHs, the impact of regulations on nurse role flexibility and professional judgment and an underfunded system contributing to insufficient resources and staffing [56] which influences their ability to find time and resources to screen effectively. In addition, the technologies, tools and abilities available versus the devices, techniques and skills that were recommended may not match. For example, LTCH nurses may not have access to the necessary tools and training to remove earwax, a potentially necessary step before hearing can truly be evaluated. Similarly, pocket-sized eye charts may be necessary for vision screening, but may not necessarily be available to all staff at any time, or staff may lack training to properly administer and interpret the results when presenting the test at a specific distance or under non-optimal lighting conditions. Previous research has provided educational content on vision- and hearing screening, specifically with LTCH in mind [65–67]; however, knowledge transfer and implementation appear to still be lacking. Meanwhile, some of the tests that may be known and available to nurses may not hold up to the demands of rigor for sensory testing by the specialists. For example, the use of measures such as the Whisper test and Finger Rub test that are evidenced as

suitable tests in the literature [68] did not find the approval of the specialists in our study, given problems with standardization and validation.

The next steps in the development of a sensory screening tool for older adults with dementia will include the integration of nurses' recommendations [32] with recommendations from the experts who were interviewed for this environmental scan, as well as the results of a systematic review of the literature on this topic. The members of this research team will then develop and pilot test a screening tool for nurses to use in the LTCH to examine its feasibility, reliability and validity. The present data indicate that strategies and training in easy-to-use methods, as well as careful client observation, may play a prominent role in such a screening tool. It is also possible that these methods and adaptive strategies may take shape in a new technological application, which can be incorporated into portable devices such as cellphones or a tablet computer - both technologies that are becoming more available in the clinical environment [69,70]. Mandated training on the use of such a screening tool and continuous efforts in knowledge translation would ensure its success, especially given its potential for far-reaching benefits to clients and clinicians alike in their care provision and interaction in LTCHs.

Contributors: KSMcG is responsible for project conception and along with FH and WW for writing the protocol. FH, KSMcG and WW obtained ethics approval. FH collected the data. WW and JJ conducted the data analysis. WW, FH, JJ and KSMcG were involved in data interpretation, writing, editing and revising the manuscript.

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Data sharing statement: Access to the raw qualitative data is available upon request, given appropriate ethics approval.

Table 1: Interview Questions

- Do you administer hearing and vision screening tests to residents at this facility?
- How long have you been working with persons who have dementia?
- Please describe your experience of working with persons who have dementia, as well as persons with hearing and vision loss.
- How do you differentiate between residents who have difficulty understanding due to a hearing impairment and those with cognitive impairments?
- How are residents identified as being in need of assessment for vision and hearing impairment?
  - Is there a standard procedure in place, and, if so, what are the steps?
  - What is the procedure for referring residents to a hearing and/or vision specialist?
- What tools, technologies, and strategies are you currently using to assess and/or detect vision and/or hearing in persons who have dementia?
- What approach is used or do you use in assessing persons who have dementia e.g. what combination of tools, technologies, and strategies is being implemented?
- How do these tools, technologies, and strategies identify a person as having hearing and/or vision impairments?
- What are the facilitators and barriers in implementing this approach and/or procedure?
  - Please list all the challenges in using these tools, technologies, and strategies.
  - Please also list all the benefits to using these tools, technologies, and strategies.
- In what way can these tools, technologies, and strategies be improved?
- In your opinion, what are the key elements to include in a hearing and vision screening package for persons who have dementia?
- Do you have knowledge of or experience in using either of the following:
  - **Peek** application (turns a smartphone into an eye exam tool)?

    …or similar other apps?
  - **uHear** application (downloadable audiometer on to an iPod Touch as a test for hearing loss)?

    …or similar other apps?

Table 2: Summary of Participant Characteristics (N=11)

Categorical Characteristics	**N**	**[%]**
Audiologist	2	18
Optometrist	4	36
Speech-Language Pathologist	1	9
Dual-sensory specialist	2	18
Hearing counsellor	1	9
Health technology specialist	1	9
Female	10	91
Continuous Characteristics		
Years' experience working in dementia care (N=8)	14.56	[SD= 12.03]

Table 3. Tools and Strategies for vision and hearing screening with older adults affected by dementia, as recommended by sensory specialists.

	HEARING SCREENING	VISION SCREENING
TOOLS	▪ "Hear Mans" (manikin head with headphones on used for a quick hearing test) ▪ Asking simple questions (does the patient wear hearing aids? does the patient have them?) ▪ Chart review ▪ Five-minute hearing test ▪ Hearing Dependent Daily Activities questionnaire ▪ Otoacoustic emissions ▪ Picture board ▪ Pocket Talker (how the person responds to using it) ▪ Pure-tone audiology ▪ Questionnaire devised by a former student of the interviewee's ▪ Repeating numbers ▪ Speech testing ▪ Whisper test and finger rub	▪ Auto-refractor ▪ Case history ▪ Finger counting ▪ Health questionnaire ▪ Matching game ▪ Objective measures (prescription assessment, eye exam) ▪ Sentences on a board in different sized font ▪ Vision questionnaire ▪ Visual charts (letters, numbers, sentences, single words, pictures, tumbling Es)
STRATEGIES	▪ Ensure that cerumen (ear wax) has been removed ▪ Alternating between testing the left and right ear until you get an answer if no initial response to pitch testing ▪ Applying techniques developed for screening in children ▪ Asking basic questions as a form of hearing screening ▪ Bowing out of the screening gracefully if it could not be finished ▪ Choosing more meaningful stimuli than pure tones ▪ Choosing "pulsing beeps" instead of "single beeps" on the audiometer ▪ Choosing a quiet room ▪ Educating nurses and doctors on the importance of hearing and screening ▪ Frequently encouraging the client ▪ Gradually reducing the level of stimulus presentation to find their threshold ▪ Repeating measurements to ensure reliability of client self-report ▪ Rephrasing screening questions to avoid denial of the problem ▪ Starting with speech testing ▪ Taking breaks as needed ▪ Using a headset instead of ear buds ▪ Using ear buds instead of a headset ▪ Using sound amplification (e.g. Pocket Talker) to facilitate communication	▪ Bringing the eye chart closer than normal ▪ Distributing a vision form for caregiver to request exam or to help staff look at changes that would warrant a screening ▪ Emphasizing that the purpose of the screening is to monitor the health of the individual ▪ Respecting their autonomy during the screening ▪ Staying away from the patient and moving around them with portable instruments

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COREQ (COnsolidated criteria for REporting Qualitative research) Checklist

A checklist of items that should be included in reports of qualitative research. You must report the page number in your manuscript where you consider each of the items listed in this checklist. If you have not included this information, either revise your manuscript accordingly before submitting or note N/A.

Topic	Item No.	Guide Questions/Description	Reported on Page No.
Domain 1: Research team and reflexivity			
Personal characteristics			
Interviewer/facilitator	1	Which author/s conducted the interview or focus group?	7
Credentials	2	What were the researcher's credentials? E.g. PhD, MD	7
Occupation	3	What was their occupation at the time of the study?	7
Gender	4	Was the researcher male or female?	7
Experience and training	5	What experience or training did the researcher have?	7
Relationship with participants			
Relationship established	6	Was a relationship established prior to study commencement?	7
Participant knowledge of the interviewer	7	What did the participants know about the researcher? e.g. personal goals, reasons for doing the research	7
Interviewer characteristics	8	What characteristics were reported about the inter viewer/facilitator? e.g. Bias, assumptions, reasons and interests in the research topic	7
Domain 2: Study design			
Theoretical framework			
Methodological orientation and Theory	9	What methodological orientation was stated to underpin the study? e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis	7
Participant selection			
Sampling	10	How were participants selected? e.g. purposive, convenience, consecutive, snowball	7
Method of approach	11	How were participants approached? e.g. face-to-face, telephone, mail, email	7
Sample size	12	How many participants were in the study?	7
Non-participation	13	How many people refused to participate or dropped out? Reasons?	8
Setting			
Setting of data collection	14	Where was the data collected? e.g. home, clinic, workplace	7
Presence of non-participants	15	Was anyone else present besides the participants and researchers?	7
Description of sample	16	What are the important characteristics of the sample? e.g. demographic data, date	table 2
Data collection			
Interview guide	17	Were questions, prompts, guides provided by the authors? Was it pilot tested?	table 1
Repeat interviews	18	Were repeat inter views carried out? If yes, how many?	n/a
Audio/visual recording	19	Did the research use audio or visual recording to collect the data?	8
Field notes	20	Were field notes made during and/or after the inter view or focus group?	n/a
Duration	21	What was the duration of the inter views or focus group?	8
Data saturation	22	Was data saturation discussed?	17
Transcripts returned	23	Were transcripts returned to participants for comment and/or	n/a

Topic	Item No.	Guide Questions/Description	Reported on Page No.
		correction?	
Domain 3: analysis and findings			
Data analysis			
Number of data coders	24	How many data coders coded the data?	8-9
Description of the coding tree	25	Did authors provide a description of the coding tree?	Table 3
Derivation of themes	26	Were themes identified in advance or derived from the data?	9
Software	27	What software, if applicable, was used to manage the data?	n/a
Participant checking	28	Did participants provide feedback on the findings?	n/a
Reporting			
Quotations presented	29	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g. participant number	9-15
Data and findings consistent	30	Was there consistency between the data presented and the findings?	9-15
Clarity of major themes	31	Were major themes clearly presented in the findings?	9-15
Clarity of minor themes	32	Is there a description of diverse cases or discussion of minor themes?	9-15

Developed from: Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care*. 2007. Volume 19, Number 6: pp. 349 – 357

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Recommendations for successful sensory screening in older adults with dementia in long-term care: A qualitative environmental scan of Canadian specialists

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Recommendations for successful sensory screening in older adults with dementia in long-term care: A qualitative environmental scan of Canadian specialists

Walter Wittich[1, 2, 3], Fiona Höbler [4, 5], Jonathan Jarry[1, 2], Kathy McGilton[4, 6],

1) School of Optometry, University of Montreal, Montreal, Quebec, Canada

2) CRIR/Centre de réadaptation MAB-Mackay du CIUSSS du Centre-Ouest-de-l'Île-de-Montréal

3) CRIR/Institut Nazareth et Louis-Braille du CISSS de la Montérégie-Centre

4) Department of Research, Toronto Rehabilitation Institute-University Health Network, Toronto, Ontario, Canada

5) Department of Speech-Language Pathology, University of Toronto, Toronto, Ontario, Canada

6) Lawrence S. Bloomberg Faculty of Nursing, University of Toronto, Ontario, Canada

Corresponding author:

Walter Wittich, PhD FAAO CLVT

Assistant Professor, School of Optometry Université de Montréal

3744, rue Jean-Brillant, 260-7

Montréal, (Québec) H3T 1P1

Tel. 514 343 7962; Fax. 514 343 2382

walter.wittich@umontreal.ca

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ABSTRACT

Objectives – This study aimed to identify screening tools, technologies, and strategies that vision- and hearing-care specialists recommend to front-line healthcare professionals for the screening of older adults in long-term care homes who have dementia.

Setting: An environmental scan of healthcare professionals took place via telephone interviews between December 2015 and March 2016. All interviews were audio-recorded, transcribed, proofed for accuracy, and their contents thematically analyzed by two members of the research team.

Participants – A convenience sample of eleven professionals from across Canada specializing in the fields of vision- and hearing healthcare and technology for older adults with cognitive impairment were included in the study.

Outcome measures– As part of a larger mixed-methods project, this qualitative study used semi-structured interviews and their subsequent content analysis.

Results - Following a two-step content analysis of interview data, coded citations were grouped into three main categories: 1) barriers, 2) facilitators, and 3) tools and strategies that do or do not work for sensory screening of older adults with dementia. We report on the information offered by participants within each of these themes, along with a summary of tools and strategies that work for screening older adults with dementia

Conclusions – Recommendations from sensory specialists to nurses working in long-term care included the need for improved inter-professional communication and collaboration, as well as flexibility, additional time, and strategic use of clinical intuition and ingenuity. These suggestions at times contradicted the realities of service provision or the need for standardized and validated measures.

Strengths and Limitations of this Study

- This study provides a unique opportunity for inter-professional knowledge translation by drawing on the clinical experience of experts in vision- and hearing-healthcare who specialize in providing services to older adults with dementia, in order to let nurses working in long-term care benefit from their expertise when screening for sensory impairments.
- By taking advantage of a qualitative research approach, this study is able to provide a description of directly applicable tools and strategies for sensory screening with older adults whose ability to respond to standardized traditional screening techniques may be impaired due to their cognitive limitations.
- The results highlight the challenge of bridging the gap between the professional expectations of rigor and standardization in sensory assessment, and the realities of practice in a long-term care environment.
- Generalization of the findings is limited by the small sample size (n = 11), narrow recruitment region (Canada) and the focus on stakeholders in sensory care only.

INTRODUCTION

As we age, our sensory capacities decline, which is reflected in the increased prevalence rates of hearing and visual loss in older adults. Hearing loss has been estimated to affect up to 50% of individuals 65 years of age and older [1], and vision impairment has been reported to to affect 18% of those aged 70 years and over [2]. Together, vision and hearing loss, known as dual-sensory impairment (DSI), increases from a prevalence of less than 1% in persons younger than 70 years to 11.3% in adults aged 80 years or over, at which point over 80% of adults are affected by at least one sensory impairment [3]. Impaired sensory abilities are seen to be significantly more prevalent in older adults who are also experiencing cognitive decline. The most common type of dementia is Alzheimer's disease and is seen to increase dramatically in prevalence from 1.7-3% of adults aged over 65 years to 32% amongst those aged 85 years and older, and above 40% in those older than over 95 years of age [4,5]., Hearing loss has been found in over 90% of adults with cognitive impairment [6], and is highly correlated with the presence of cognitive problems[7], while visual impairment has been reported in more than 30% of individuals with dementia [8]. The neuro-degeneration that characterizes dementia likely has multifactorial causes [9] and involves and affects multiple cortical networks, including brain regions that support auditory and visual function [10–12]. Even though research on the underlying causal relationships between cognitive and sensory decline has not yet reached consensus [7,13], it is already clear that many factors related to aging and frailty are involved [14–16].

Hearing and vision impairments continue to be under-diagnosed and under-treated in this vulnerable population of older adults with cognitive impairment [8,17], even though adapted rehabilitation interventions for individuals with sensory loss have been presented [18] and

evidence exists for the improvement of cognitive functioning after sensory interventions [19,20]. The decline of older adults' cognitive and functional status and the severity of their disabilities are reported risk factors for institutionalization into nursing and long-term care homes (LTCHs) [21–23]. In fact, the prevalence of impaired sensory capacity is disproportionately higher in people with dementia living in care homes [8] than amongst older adults living in the community, with one third of residents in this setting having a single sensory impairment and an additional third experiencing DSI [24]. Furthermore, over half of such cases have been shown to be unreported [25], with under-diagnosis by the appropriate specialist due to lack of service utilization [8] or those documented being untreated due to underutilization of rehabilitative services by older adults [26,27].

The importance of appropriately identifying the sensory capacity in individuals with dementia is not only underscored by their incommensurate prevalence rates and the need to accurately determine the person's true cognitive status, but has been established as a healthcare and research priority by those living with dementia themselves [28]. Furthermore, nurses and other health care professionals responsible for the care of older adults with dementia have reported the difficulty of differentiating between sensory and cognitive impairment in affected residents [29]. Höbler et al. and others have also requested the provision of more specific education on the appropriate methods of evaluating sensory impairment amongst residents [30,31]. Prioritization of identifying the sensory capacity of older adults is further supported by evidence of accelerated cognitive decline [32,33] and increased risk of incident dementia in those with sensory impairment [34–36], as hearing impairment in particular can impact on all domains of cognition [7]. Moreover, residents with impairment of both vision and hearing demonstrate significantly higher incidence of new behavioral symptoms [24], and accelerated cognitive

decline due to lack of social engagement [37], which is, in turn, significantly associated with untreated sensory loss [38–40]. A recent study has also shown that cognitive impairment is most common in long-term care residents with DSI and that these individuals are at increased risk of mortality [41].

The process of screening, assessment and evaluation of sensory and cognitive impairment in older adults has been researched in a variety of ways. Some researchers have examined how to evaluate cognition in persons who have either a hearing or a vision loss, both of which can interfere with the administration of cognitive testing procedures [42]. For example, Bertone and colleagues [43] magnified sub-tests of the Wechsler Adult Intelligence Scale [44] in order to make them accessible and visible for persons with central vision loss due to age-related macular degeneration. Wittich et al. [45] provided validation data for the Montreal Cognitive Assessment (MoCA) [46] in its blind version, which can be administered verbally only. Similarly, Lin et al. [47] developed a procedure to administer the MoCA to individuals with severe hearing impairment by making the test instructions available as a PowerPoint presentation, thereby avoiding problems of audibility. Other researchers have focused on the reverse of this approach, whereby they examined how vision or hearing testing can be adapted to individuals with cognitive decline [48,49]. Traditional testing procedures often require a response from the person tested as to whether the stimuli are seen or heard. However, in the presence of cognitive impairment, such "true" responses are potentially impacted by a variety of factors, including attention, comprehension, recall, focus, impairment severity, only to mention a few, and may need to be extrapolated in a different way. Therefore, the focus of the present study is on this adapted approach to sensory testing, and how nurses working in long-term care homes may be able to facilitate screening for sensory loss.

Objectives

To address the urgent need of appropriate evaluation and treatment of sensory impairment in adults already experiencing cognitive decline, we conducted an environmental scan with professionals working in the field of health technology, optometry, ophthalmology, audiology, and dual sensory impairment, which was part of a larger mixed-methods project investigating suitable vision and hearing screening measures for older adults with dementia that could be used by nurses working in long-term care [50]. The main purpose of this environmental scan was to identify screening tools, old and new technologies, and assessment strategies that sensory healthcare specialists find suitable for screening older adults who have dementia, and was carried out complementary to an environmental scan with nurses who work with residents who have dementia in LTCHs) [31].

METHODS

Following the completion of a review of the literature on hearing and vision screening tools as per our protocol [50], this second step of the investigation was carried out in order to identify what tools, technologies and strategies are currently being used by vision and hearing professionals when serving older adults with cognitive impairment. To accomplish this, we employed an environmental scan. In healthcare research, the environmental scan is often employed as a needs-assessment tool for the purposes of improving and developing the efficiency of health service programs and evidence-based policies [51,52]. In using this approach, environmental or contextual factors are evaluated by reviewing existing data or actively collecting new data in the form of surveys or interviews, including a diversity of views and information, to determine the benefits, needs and efficiencies of practices within that environment [51]. As in the literature review, a broad definition of measures and technologies

was adopted, to include paper-based tests, software solutions such as apps and extensions for mobile devices, and higher-tech devices such as portable ophthalmic or audiometric equipment, as well as informal assessment strategies used with residents who had dementia or limited cognitive or communication abilities.

The scan was conducted by a clinically trained member of the research team (FH, MSc, female), who interviewed participating professionals about: their thoughts and experiences of using tools, technologies, and strategies to screen for vision or hearing impairment in persons who have dementia, the tools and strategies they have found to be most useful, the ways in which current measures could be improved, and what they consider to be key elements for inclusion in a sensory screening package (see Table 1). This research was completed with the approval of the Research Ethics Boards of the University Health Network, Toronto, Canada, and in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for experiments involving humans [53]. All participants provided informed written consent before enrolling in the study.

PARTICIPANTS

A convenience sample of eleven professionals from across Canada with expertise in vision, hearing, dual sensory impairment or healthcare technologies were recruited through their connections with members of the larger study team or through referral by participants already enrolled in or contacted about the study. Based on previous research with similar methodological approaches [54,55], the sample size was seen as sufficient for the data collection purposes of the present study. The research coordinator (FH) made initial contact with potential candidates by email or by phone. Eleven participants agreed to take part in this study, while one candidate

declined due to a perceived lack of expertise in the area, and another due to time constraints during the data collection period. Participant characteristics of all interviewees included in this study are summarized in Table 2.

DATA COLLECTION

By use of a semi-structured guide, the environmental scan interviews took place via telephone between December 2015 and March 2016. After receiving background information on the study, its purpose, as well as answers to any questions they had, written informed consent was received from all participants at the time of or prior to data collection via email or fax. The interview protocol was applied in relevance to the participants' area of expertise (i.e., vision, hearing or dual sensory loss), and participants were encouraged to offer any additional information they felt was applicable to the study's objectives and/or that had not been covered by the semi-structured interview script [56]. Two participants were interviewed together upon request, resulting in a total of 10 interviews with 11 participants being conducted. There was no time limit applied to the interviews, with these having a mean duration of 40 min 30.66 s [SD = 11.83 min, range 19 to 54 min.].

DATA ANALYSIS

All interviews were audio-recorded, transcribed by a third party, and proofed for accuracy by a member of the research team [FH]. Following full anonymization of the data sets, the transcribed contents of the interviews underwent thematic analysis [57]. Two members of the research team (WW, PhD; JJ, MSc) analyzed all sets to identify data relating to the following: tools/strategies that work for screening (vision/hearing), tools/strategies that do not work for

screening, and tools/strategies that may work. This data analysis followed a coding protocol in which data was first coded as a Tool or Strategy, and secondly whether it was reported to work or not, then as to whether it applied to vision or hearing screening. For example, "T+H", which denoted a measured that was reported to work well for hearing screening, or "S?V", which denoted a strategy that may work for vision. Additional codes related to information reported as: a "golden quote", a sentence or paragraph that is striking or characteristic, the name of a tool when first mentioned (e.g., Snellen chart), a barrier to sensory screening, a recommendation on what should be done according to the participant, other content of interest, as well as any "red flag" or risk factor or other trigger for screening (e.g. diabetes, missing hearing aid, missing glasses). During a second level of thematic analysis, the extracted data from the first level were again analyzed for the identification of prominent themes in the interviews with participants. Agreement was achieved through the concurrent coding and discussion involving both analysts (WW, JJ), and differences in opinion when interpreting content were resolved face to face [58], an approach that members of the team have previously utilized successfully [59–62]. These themes are reported below.

FINDINGS

Following a two-step content analysis of interview data, coded citations were grouped into three main themes: 1) *barriers*, 2) *facilitators,* and 3) *tools and strategies that related to the screening of older adults with dementia*. Here we report on the information offered by participants within each of these themes. In addition, we present a summary of tools and strategies that work for screening older adults with dementia (see Table 3). Direct participants' quotes are presented in italics below, whereby each quote is identified by the source code.

Facilitators

Our interviewees identified few *facilitators,* as they were more likely to share barriers to their work. The main enablers of sensory screening in residents with dementia were indeed other people. The clients themselves can become facilitators and advocates, as can family members, activation workers, as well as long-term care facility staff.

An audiologist pointed out that hearing screening clinics in long-term care facilities can be organized by a facility employee:

I'm thinking we could get called in to do a screening, we could have an activation worker in a long-term care facility say, "I would like to have a hearing screening clinic." [participant 4]

Local support by staff and residents can help bring awareness of hearing loss to others:

It's not always possible for me, as an audiologist, to be everywhere and see everyone, so to have staff members also be advocates for hearing is very important and, you know, to have residents themselves be advocates for hearing. [participant 5]

The nurses, whose lack of availability was often branded as a barrier, were once mentioned in a more positive context:

The nurse manager on that unit was very receptive to having some audiological intervention on her unit, and so we actually designed a simple screening program there, because she wanted the nurses to be able to do the screening […]. And she felt that it was important to get the nurses on her unit involved in that screening. [participant 2]

Barriers

In the interviews with vision and hearing specialists on the subject of sensory screening in residents with a cognitive impairment, the two barriers to screening that were most often

repeated were *impaired communication* and *lack of staff involvement* . Impaired communication can mean not knowing if a client's answer is reliable; not being able to use traditional means of communication; or not being able to communicate at all when the neurological condition is too advanced. One interviewee explained:

> *And when we are at the long-term care facility, […] some of [our residents] are completely unresponsive, which of course is a challenge and, other times, it's just they require more encouragement, constant repetition to remind them of the task that we're doing, that kind of thing. [participant 7]*

Since many screening tests rely on self-report, impaired communication can jeopardize subjective assessments:

> *In the more advanced stages of dementia, it's very difficult to get a pure-tone audiogram, because pure-tones become meaningless, so you have to use more meaningful stimuli. [participant 2]*

Many sensory experts flagged the lack of staff involvement in the screening of persons for hearing and vision loss. Some reported that educating the staff on the need to screen for sensory loss was not helpful, as it is not a mandatory training activity for nurses. Participants speculated that this absence may, in part, be due to policies or regulations that do not include or promote sensory screening, lack of education and training on how to screen, or not prioritizing hearing and vision screening given the multiple demands on their time. Moreover, screening by staff is not always systematic:

> *We did find that the nurses, number one, only bothered to do […] their screening on 50% of the intake of the people that were admitted. And furthermore, failed to identify 40% of the people that the student identified with the more extensive screening. [participant 2]*

Additional barriers that were less frequently mentioned were: hearing loss denial; lack of cooperation by the client's family; discomfort vis-à-vis the physical closeness often required for sensory screening; environmental noises during hearing screening; the presence of a combined hearing and vision loss; and the limitations of portable equipment often necessary for these on-location screenings.

Strategies and Tools

Given the specific characteristics of people with a cognitive impairment, our specialists frequently suggested *strategies* to conduct sensory screening. We defined these as adaptations or behavioural accommodations in order to administer a particular screening tool, such as choosing a specific location or speed of administration. While certain strategies were unique to either vision or hearing screening, many such adaptations were mentioned by both groups of experts. By far the most common strategy was to *improve communication*. Many specialists highlighted the importance of establishing a friendly rapport with the client before screening, of reassuring and encouraging them throughout the procedure. Sometimes, repetition was key:

> *They require more encouragement, constant repetition to remind them of the task that we're doing. [participant 7]*

Often, according to our interviewees, the client may not provide the type of feedback traditionally required by the subjective screen, emphasizing the value of flexibility. The response to "Can you see this?" or "Can you hear this?" can be a smile, a number of raised fingers, or a movement of the eye:

> *I remember one woman that was singing constantly, but she would stop singing when she could hear me, so that was one way of finding information. [participant 2]*

It may also mean playing along with a resident's own understanding of the situation:

One man believed he was being assessed to join the Greek military and so he was reading all of the letters on the Snellen chart in Greek. And I don't speak Greek and so we also bring a number chart with us. So, he was reading those out in Greek but at least there were only nine numbers for me memorize. So, I just started accepting Greek readings of the numbers instead and kind of learning Greek numeric system as we went. [participant 10]

The *preference for familiarity* was a recurring strategy mentioned by both hearing and vision specialists, such as choosing a familiar room and having a person the client trusts sitting by their side during the screening. Considerations of *time* were brought up as well: examples included screening on the right day, with breaks during the procedure, and the possibility of resting of finishing another day:

Sometimes the assessment needs to be done over several appointments [*participant* 5].

Finally, information can be gathered indirectly through *staff, family, and behaviour*. The latter, we were told, can serve as a clue to impairment:

One of the most helpful things is having family there to at least give us a little bit of background about the resident, about things that they may have liked to have done when they were not at the long-term care facility such as reading or knitting, activities that they haven't been doing lately which could be because of their vision problems, either glasses or having some sort of eye condition that needs to be treated. [participant 3]

A small number of strategies were mentioned exclusively by vision specialists, while a much longer list could be drawn from the input of the hearing experts (see Table 3). Since hearing screening often relies on the playback of tones through headphones, it is interesting to

note that interviewees disagreed amongst themselves as to whether or not ear buds were preferable to headsets for this population. Some clients may prefer the former:

> *If you come at somebody with a headset, often that's a bit alarming and they immediately don't want to cooperate; but I've found that they're more compliant with insert phones. [participant 2]*

while others are more at ease with the latter:

> *I haven't had issues with people putting on headsets. […] I'm not sold on removing the idea of a headset." [participant 4]*

The above-mentioned strategies highlight that no one method of screening works for everyone as some residents preferred headsets while others preferred phones. For both vision and hearing, experts spoke of numerous tools they considered either to work, to not work, or to possibly work with this population (see Table 3). On the hearing side, speech testing was often mentioned as providing more meaningful stimuli to a client with a cognitive impairment than a pure-tone audiogram: indeed, the latter test ended up both being recommended and being rejected depending on the interviewee. Meanwhile, for either sense, very few of our participants qualified themselves as knowledgeable on the topic of screening apps, such as Peek™ for vision testing. They often knew of these portable technologies but had rarely used them. These apps elicited the following concerns: that they were not designed or validated for use in a context of dementia; that they relied on batteries that need to be recharged; and that the hardware (i.e. cell phone or tablet screen and camera) is not professional grade. Still, many interviewees wanted to see data on how they compared to traditional screening methods and were even willing to try them out for themselves.

A recurring comment on the part of audiologists spanned multiple coding categories, acting as a barrier, forming a recommendation, and being suggested as a screening tool that works for hearing: the *presence of wax* and its removal through otoscopy. As one hearing expert put it:

> *I think all screening should be accompanied by otoscopic examination, because one other thing I've learned is that many seniors, especially those in the nursing homes, they don't tend to get kind of routine ear exams, tend to have accumulations of wax that would definitely be possibly interfering with their hearing. So having that wax removed before you do any testing, is really important. […] Anybody who's getting involved with screening of seniors' hearing needs to have some training in cerumen management, certainly. [participant 2]*

DISCUSSION

The purpose of the present study was to explore the advice of specialists in the field of sensory health care for older adults with dementia, in order to develop recommendations for nurses working in long-term care facilities to be able to better screen their residents for the presence of vision and/or hearing loss. The participants reported on several facilitators and barriers, and how these can each be strengthened and overcome through adaptive strategies. Ideally, a screening protocol would be able to examine vision and hearing function simultaneously or during the same testing opportunity, because time is often sparse and the pressures on health care providers are many. However, one central theme, common among the suggested approaches, was to allow and encourage clients (and clinicians) to take their time when engaging in the testing of sensory functioning, as subtle information and behavioural cues

often become the true source of information in sensory screening, and may then be lost if rigorously standardized (and fast) protocols are adhered to.

In this particular population, sensory screening methods need to be flexible enough to accommodate a range of cognitive resources, whereby individuals with mild cognitive impairments may well be able to complete normal testing procedures if given the chance and the time. Those with moderate to severe cognitive impairment, however, may require adjustments in the administration of screening measures and strategies, led by use of clinical judgment and intuition. Such approaches can easily be supplemented with the use of questionnaires (or a subsection of questions therein), as well as more objective measures in order to ensure reliability of test results. Ideally, the stimuli that are used are meaningful to the resident (e.g., their name) and are speech-based because of their ecological importance over pure tones. When simplicity was important, the use of numbers (both for speech as well as vision testing) was recommended. In addition, the use of pictograms or picture-matching was a proposed possibility to elicit responses. In addition, making sure the methods of screening aligned with the residents preferences (phones or headsets) is essential for a quality screening result. Finally, our respondents expressed openness to using and exploring the potential of new technologies, such as apps and devices, for screening purposes. However, their own experience with current technologies was limited and they expressed concerns about their validity and availability, thus, recommending that technologies require further development in order to serve this population. A strength of the present study is its range of professionals and their level of expertise in providing services to older adults with sensory and cognitive impairments; despite their number being relatively small, data saturation was reached when assessed. In addition, this study tackles cross-disciplinary communication barriers by bringing specialist recommendations to the

attention of nurses. We were able to replicate previous reports on the barriers and challenges that are encountered when providing sensory care to older adults in LTCHs, including difficulties in client's willingness to participate in the assessment (at times expressed as aggression or anxiety) as well as communication difficulties linked to cognitive losses, resulting in confusion (both at the part of the client and the clinician) [30]. Communication recommendations were in line with previous suggestions to adjust speech volume, speed, and body positioning face-to-face [29] . In addition, the present data are in agreement with previous reports about the necessity for flexibility in the testing procedure, such as the need to determine the optimal time of day for each individual to be tested, the option to pause and continue testing as needed, along with taking care to avoid fatigue or frustration on the part of the client [48].

Our study needs to be viewed within certain limitations; for example, the logistics of data collection and imposed time and funding restrictions limited the recruitment scope, thereby only including participants within Canada, and those that were known within the professional network of the study team. This recruitment approach might have excluded practice perspectives more representative of other countries or service delivery systems. The scope of the study is further limited by the choice to focus on sensory health professionals, without including additional stakeholders. A parallel study is currently exploring the opinions of nurses working in LTCHs; however, including caregivers or primary care providers would provide further insights. The data-driven analysis approach revealed that the majority of strategies and tools mentioned were in the hearing domain, which is intuitively more closely linked to communication. Future studies may need to probe further into the use and usability of vision testing devices and strategies. They should provide additional background data on the participants that will allow for a better contextualization of the findings. For example, the frequency and intensity of service delivery by

the participating stakeholders would provide information about the level of expertise and experience in service delivery and strategy development. In addition, this limitation may also have had an effect on data saturation.

A remaining challenge is to reconcile the realities of nurses workloads in LTCHs with the recommendations that have emerged from our specialist interviews. Specifically, the recommendations of our vision and hearing care professionals are likely to go beyond the resources available. Even though both groups agree that increased priority should be placed on the sensory assessment of residents in order to improve communication [40], the reality of service provision in LTCHs rarely allows for this level of individualized attention [63]. For nurses working in LTCHs, the impact of regulations on nurse role flexibility and professional judgment and an underfunded system contributing to insufficient resources and staffing [55] which influences their ability to find time and resources to screen effectively. In addition, the technologies, tools and abilities available versus the devices, techniques and skills that were recommended may not match. For example, LTCH nurses may not have access to the necessary tools and training to remove earwax, a potentially necessary step before hearing can truly be evaluated. Similarly, pocket-sized eye charts may be necessary for vision screening, but may not necessarily be available to all staff at any time, or staff may lack training to properly administer and interpret the results when presenting the test at a specific distance or under non-optimal lighting conditions. Previous research has provided educational content on vision- and hearing screening, specifically with LTCH in mind [64–66]; however, knowledge transfer and implementation appear to still be lacking. Meanwhile, some of the tests that may be known and available to nurses may not hold up to the demands of rigor for sensory testing by the specialists. For example, the use of measures such as the Whisper test and Finger Rub test that are evidenced as

suitable tests in the literature [67] did not find the approval of the specialists in our study, given problems with standardization and validation.

The next steps in the development of a sensory screening tool for older adults with dementia will include the integration of nurses' recommendations [31] with recommendations from the experts who were interviewed for this environmental scan, as well as the results of a systematic review of the literature on this topic. The members of this research team will then develop and pilot test a screening tool for nurses to use in the LTCH to examine its feasibility, reliability and validity. The present data indicate that strategies and training in easy-to-use methods, as well as careful client observation, may play a prominent role in such a screening tool. It is also possible that these methods and adaptive strategies may take shape in a new technological application, which can be incorporated into portable devices such as cellphones or a tablet computer - both technologies that are becoming more available in the clinical environment [68,69]. Mandated training on the use of such a screening tool and continuous efforts in knowledge translation would ensure its success, especially given its potential for far-reaching benefits to clients and clinicians alike in their care provision and interaction in LTCHs.

Contributors: KSMcG is responsible for project conception and along with FH and WW for writing the protocol. FH, KSMcG and WW obtained ethics approval. FH collected the data. WW and JJ conducted the data analysis. WW, FH, JJ and KSMcG were involved in data interpretation, writing, editing and revising the manuscript.

Competing interests: none declared

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Data sharing statement: The complete transcripts of all qualitative data are stored with Walter Wittich. Pending additional ethics approval, these data can be accessed through the authors of this article.

Table 1: Interview Questions

- Do you administer hearing and vision screening tests to residents at this facility?
- How long have you been working with persons who have dementia?
- Please describe your experience of working with persons who have dementia, as well as persons with hearing and vision loss.
- How do you differentiate between residents who have difficulty understanding due to a hearing impairment and those with cognitive impairments?
- How are residents identified as being in need of assessment for vision and hearing impairment?
  - Is there a standard procedure in place, and, if so, what are the steps?
  - What is the procedure for referring residents to a hearing and/or vision specialist?
- What tools, technologies, and strategies are you currently using to assess and/or detect vision and/or hearing in persons who have dementia?
- What approach is used or do you use in assessing persons who have dementia e.g. what combination of tools, technologies, and strategies is being implemented?
- How do these tools, technologies, and strategies identify a person as having hearing and/or vision impairments?
- What are the facilitators and barriers in implementing this approach and/or procedure?
  - Please list all the challenges in using these tools, technologies, and strategies.
  - Please also list all the benefits to using these tools, technologies, and strategies.
- In what way can these tools, technologies, and strategies be improved?
- In your opinion, what are the key elements to include in a hearing and vision screening package for persons who have dementia?
- Do you have knowledge of or experience in using either of the following:
  - **Peek** application (turns a smartphone into an eye exam tool)?

    …or similar other apps?
  - **uHear** application (downloadable audiometer on to an iPod Touch as a test for hearing loss)?

    …or similar other apps?

Table 2: Summary of Participant Characteristics (N=11)

Categorical Characteristics	**N**	**[%]**
Audiologist	2	18
Optometrist	4	36
Speech-Language Pathologist	1	9
Dual-sensory specialist	2	18
Hearing counsellor	1	9
Health technology specialist	1	9
Female	10	91
Continuous Characteristics		
Years' experience working in dementia care (N=8)	14.56	[SD= 12.03]

Table 3. Tools and Strategies for vision and hearing screening with older adults affected by dementia, as recommended by sensory specialists.

	HEARING SCREENING	VISION SCREENING
TOOLS	▪ "Hear Mans" (manikin head with headphones on used for a quick hearing test) ▪ Asking simple questions (does the patient wear hearing aids? does the patient have them?) ▪ Chart review ▪ Five-minute hearing test ▪ Hearing Dependent Daily Activities questionnaire ▪ Otoacoustic emissions ▪ Picture board ▪ Pocket Talker (how the person responds to using it) ▪ Pure-tone audiology ▪ Questionnaire devised by a former student of the interviewee's ▪ Repeating numbers ▪ Speech testing ▪ Whisper test and finger rub	▪ Auto-refractor ▪ Case history ▪ Finger counting ▪ Health questionnaire ▪ Matching game ▪ Objective measures (prescription assessment, eye exam) ▪ Sentences on a board in different sized font ▪ Vision questionnaire ▪ Visual charts (letters, numbers, sentences, single words, pictures, tumbling Es)
STRATEGIES	▪ Ensure that cerumen (ear wax) has been removed ▪ Alternating between testing the left and right ear until you get an answer if no initial response to pitch testing ▪ Applying techniques developed for screening in children ▪ Asking basic questions as a form of hearing screening ▪ Bowing out of the screening gracefully if it could not be finished ▪ Choosing more meaningful stimuli than pure tones ▪ Choosing "pulsing beeps" instead of "single beeps" on the audiometer ▪ Choosing a quiet room ▪ Educating nurses and doctors on the importance of hearing and screening ▪ Frequently encouraging the client ▪ Gradually reducing the level of stimulus presentation to find their threshold ▪ Repeating measurements to ensure reliability of client self-report ▪ Rephrasing screening questions to avoid denial of the problem ▪ Starting with speech testing ▪ Taking breaks as needed ▪ Using a headset instead of ear buds ▪ Using ear buds instead of a headset ▪ Using sound amplification (e.g. Pocket Talker) to facilitate communication	▪ Bringing the eye chart closer than normal ▪ Distributing a vision form for caregiver to request exam or to help staff look at changes that would warrant a screening ▪ Emphasizing that the purpose of the screening is to monitor the health of the individual ▪ Respecting their autonomy during the screening ▪ Staying away from the patient and moving around them with portable instruments

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COREQ (COnsolidated criteria for REporting Qualitative research) Checklist

A checklist of items that should be included in reports of qualitative research. You must report the page number in your manuscript where you consider each of the items listed in this checklist. If you have not included this information, either revise your manuscript accordingly before submitting or note N/A.

Topic	Item No.	Guide Questions/Description	Reported on Page No.
Domain 1: Research team and reflexivity			
Personal characteristics			
Interviewer/facilitator	1	Which author/s conducted the interview or focus group?	7
Credentials	2	What were the researcher's credentials? E.g. PhD, MD	7
Occupation	3	What was their occupation at the time of the study?	7
Gender	4	Was the researcher male or female?	7
Experience and training	5	What experience or training did the researcher have?	7
Relationship with participants			
Relationship established	6	Was a relationship established prior to study commencement?	7
Participant knowledge of the interviewer	7	What did the participants know about the researcher? e.g. personal goals, reasons for doing the research	7
Interviewer characteristics	8	What characteristics were reported about the inter viewer/facilitator? e.g. Bias, assumptions, reasons and interests in the research topic	7
Domain 2: Study design			
Theoretical framework			
Methodological orientation and Theory	9	What methodological orientation was stated to underpin the study? e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis	7
Participant selection			
Sampling	10	How were participants selected? e.g. purposive, convenience, consecutive, snowball	7
Method of approach	11	How were participants approached? e.g. face-to-face, telephone, mail, email	7
Sample size	12	How many participants were in the study?	7
Non-participation	13	How many people refused to participate or dropped out? Reasons?	8
Setting			
Setting of data collection	14	Where was the data collected? e.g. home, clinic, workplace	7
Presence of non-participants	15	Was anyone else present besides the participants and researchers?	7
Description of sample	16	What are the important characteristics of the sample? e.g. demographic data, date	table 2
Data collection			
Interview guide	17	Were questions, prompts, guides provided by the authors? Was it pilot tested?	table 1
Repeat interviews	18	Were repeat inter views carried out? If yes, how many?	n/a
Audio/visual recording	19	Did the research use audio or visual recording to collect the data?	8
Field notes	20	Were field notes made during and/or after the inter view or focus group?	n/a
Duration	21	What was the duration of the inter views or focus group?	8
Data saturation	22	Was data saturation discussed?	17
Transcripts returned	23	Were transcripts returned to participants for comment and/or	n/a

Topic	Item No.	Guide Questions/Description	Reported on Page No.
		correction?	
Domain 3: analysis and findings			
Data analysis			
Number of data coders	24	How many data coders coded the data?	8-9
Description of the coding tree	25	Did authors provide a description of the coding tree?	Table 3
Derivation of themes	26	Were themes identified in advance or derived from the data?	9
Software	27	What software, if applicable, was used to manage the data?	n/a
Participant checking	28	Did participants provide feedback on the findings?	n/a
Reporting			
Quotations presented	29	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g. participant number	9-15
Data and findings consistent	30	Was there consistency between the data presented and the findings?	9-15
Clarity of major themes	31	Were major themes clearly presented in the findings?	9-15
Clarity of minor themes	32	Is there a description of diverse cases or discussion of minor themes?	9-15

Developed from: Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care*. 2007. Volume 19, Number 6: pp. 349 – 357

Once you have completed this checklist, please save a copy and upload it as part of your submission. DO NOT include this checklist as part of the main manuscript document. It must be uploaded as a separate file.