New Zealand rest home nurses' knowledge of hearing impairment, hearing aids and communication strategies.

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Abstract

Background: The prevalence of hearing impairment rises as ageing occurs and many individuals residing in aged care facilities live with some level of hearing loss. Of the aged care facility residents who have hearing impairment, many use hearing aids. Nurses and staff who work with the residents are often required to assist in the daily use and upkeep of these hearing aids. From a limited amount of international research, pre-service training for nurses appears to lack education and practical information about hearing impairment and supporting residents with hearing aids and strategies specifically intended to improve communication with the hearing impaired. Currently there is no New Zealand data on what rest home nurses know about hearing impairment, hearing aids and specific strategies to enhance communication with hearing impaired residents. Obtaining data on levels of knowledge and potential gaps in knowledge will help inform the current curricula or the design of formal training in these areas for New Zealand nurses and other rest home and health care workers.

Aim: This study set out to investigate the basic knowledge and understanding about hearing impairment, hearing aids and strategies used to enhance communication among registered nurses working in New Zealand rest homes. A gap in the knowledge may suggest a need for the provision of relevant pre- and in-service training to achieve more holistic and client-centred care.

Methods: A survey was developed based on previous studies and questionnaires. A mixed method design incorporated both qualitative and quantitative questions in the online survey. The survey link was distributed to the participants via email.

Results: A total of 40 participants were recruited. All were New Zealand registered nurses working in a rest home. There were varying levels of knowledge among the participants and many of the respondents did not appear to have sufficient knowledge on hearing loss, hearing

aids as well as communication strategies. Many reported that they have not received previous training in these areas. Many respondents also reported a need for training in these areas particularly on hearing aids and communication strategies particularly with those who have more moderate to severe levels of hearing loss.

Conclusions: The results were consistent with international research findings. The knowledge gap among rest home-based nurses suggests that registered nurses and other staff members working in rest homes could benefit from further education and practical training. Ideally rest home staff would receive training before starting to work in a facility and that regular in-service sessions be provided to ensure up-to-date knowledge on hearing aids and communication strategies to support residents with hearing loss.

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1. Introduction

The population of older persons in New Zealand is growing each year. Many elderly people live in aged care accommodations. As the prevalence of hearing impairment escalates as age advances, many residents in aged care facilities likely live with some level of hearing loss and not all those with a loss use hearing aids. Residents who have vision and fine motor control may need nurses or other staff members to assist in the daily use, care and upkeep of these hearing aids (Cohen-Mansfield & Taylor, 2004). International research is limited on the knowledge of hearing impairment and supporting people through the use of technology such as hearing aids and strategies designed to enhance communication of nurses working in rest homes. Education for this population lacks practical training as well as education regarding hearing impairment, hearing aids and specific strategies to improve communication with hearing impaired residents (Solheim et al., 2016). A lack of education and practical training could influence the perspectives and experiences of the nurses towards hearing impairment and hearing aids. The absence of adequate communication between residents and their caregivers and/or health professionals can also have a number of negative consequences (Bowers et al., 2001).

Nurses, along with other rest home staff, have an important role in monitoring the sensory abilities and ensuring any assistive technology is functioning appropriately for those in their care (Solheim et al., 2016). It is essential to ensure that residents and patients in their care have access to the world around them; environmental sounds and those with who they want to communicate with. Inadequate communication is the most significant barrier between a resident with hearing impairment and receiving quality health care from their health professionals (Scheier, 2009). The consequences of inadequate communication between a patient and the health care professional are dire, plentiful, and clearly does not allow for patient-centered care.

Patient-centered care has been described as care that is founded on the patient's preferences, values and requirements (Epstein, 2000). This allows the patient to be actively part of making decisions for their health care (Institute of Medicine (US) Committee on Quality of Health Care in America, 2001;2004).

Currently, there is no New Zealand data on what registered nurses know about hearing loss, hearing aids, and strategies to improve communication with hearing impaired residents. The focus of this thesis is to understand the knowledge and experience of New Zealand registered nurses working in rest homes regarding hearing impairment and supporting people through the use of technology such as hearing aids and strategies designed to enhance communication. In order to obtain a full understanding of what rest home nurses will need to know, this thesis will outline how the ear works, how hearing can be damaged, and what happens when it is, particularly when the hearing loss is age-related. It will also outline the role that nurses play as well as the variety of challenges the nurses and the residents face in their environments. Obtaining a better grasp of the gap in knowledge and practical experience of New Zealand rest home nurses will hopefully guide any future endeavors to modify existing training programs or designs for more specific education resources and programs for people working in rest homes or other care facilities.

Hearing Impairment

1.1 Overview

Hearing is one of the five key senses of the human being. It is a sense that is a critical component to how humans connect with the people and the world around them. When the ability

to hear is impaired, it can affect many areas of the individual's life, and depending on the individual and the extent of their loss, it can be considered debilitating. Some areas of an individual's life that could be affected by hearing impairment are their mental, social and emotional well-being (Ciorba et al., 2012). When a person experiences constant difficulty when communicating with their friends and family, withdrawal from these social situations and circles can appear to be the easier and/or more desired solution (Laplante-Lévesque et al., 2010). This action can have a flow-on effect on the individual's mental and emotional well-being. Hearing loss is also known to affect those who spend a lot of time with the person with hearing loss e.g., the spouse and close friends (Kamil & Lin, 2015). This is also called third-party disability. Scarinci et al. (2012) defined third party disability as changes and impact on the family member's function as a consequence of their loved ones' impairment.

Hearing impairment occurs when part or several parts of the ear are damaged or when the nerve responsible for carrying signals from the ear to the brain is damaged. The site (or sites) of lesion determines the type of loss. The different types of hearing loss are conductive, sensorineural, and mixed. In New Zealand, hearing loss is classified as slight, mild, moderate, moderately-severe, severe and profound. The hearing impairment can occur bilaterally (both ears) or unilaterally (one ear only) and it can also be either a symmetric or asymmetric loss. The following section will explore the prevalence of hearing impairment in more detail.

1.2 Prevalence of Hearing impairment and New Zealand hearing impairment data.

The percentage of people in the world living with hearing impairment has been recorded to be larger than 5% (World Health Organisation, 2020). Of these people with hearing loss, 32 million are children and 432 million are adults (World Health Organisation, 2020).

The prevalence of reported hearing loss varies between countries. According to Goman and Lin (2016) 38.2 million are estimated to be living with hearing loss in both ears (1 in 7) and 60.7 million (1 in 4) are estimated to have a unilateral hearing loss in Americans aged 12 years old and above. There are approximately 6.6 million Americans who live with severe to profound hearing loss and are aged 12 years and above with 5 million being 60 years or older. The researchers also saw that more men had hearing loss than women (Goman & Lin, 2016). In 2009, 2012 and 2015, surveys were administered in the United Kingdom, France and Germany with the aim to determine factors that influenced the sale increase of hearing aids (Bisgaard & Ruf, 2017). Based on their analysis, the researchers also found that as the severity of hearing loss increases, the median age of participants also rises. The most mild levels of loss have a median of 51 years of age and the most severe level of hearing loss at 73 years old. Research by Sanders et al., (2015) concluded that there is limited accurate data on hearing impairment prevalence of those living in the pacific islands. However, their findings indicate 20 to 23 percent of the population have at the very least a mild level of hearing impairment. A study completed in 2017 discovered that there are 3.6 million (14.5%) Australians who are hearing impaired (Deloitte Access Economics, 2017).

Similar to other OECD countries, New Zealand has an ageing population. The New Zealand 2018 Census (as cited by Environmental Health Indicators NZ, n.d.) reported 495,600

people in New Zealand living with a hearing loss at the age of 65 years old and older (12.3% of New Zealand's population) in 2006, 607,000 (14.3% of New Zealand's population) in 2013 and 715,000 (15.2% of New Zealand's population) in 2018. As people age, the prevalence of hearing loss increases. This is because over the course of a lifetime there is an accumulation of insults to the ear for example loud noise exposure, illness and ototoxic substances (Fischer et al., 2016). On top of this, there is the natural progression of physical and functional deterioration of the human body and cortex that also has a role in the increasing prevalence of hearing loss as people age (Fischer et al., 2016). According to Deloitte Access Economics (2016), 880,350 people were living with hearing loss in New Zealand in 2016. The prevalence of males living with hearing loss is higher compared to females in New Zealand (Deloitte Access Economics, 2016). According to the survey findings, 23 percent of females and 34 percent of male adults aged 65 and older experience hearing loss. Exeter et al., (2015) looked at the anticipated burden of hearing impairment in New Zealand between 2011 and 2061. Their findings indicate that there were more than 330,000 people living in New Zealand with some level of hearing impairment in 2011 and that this number is likely to increase to 683,000 in 2061 (Exeter et al., 2015).

By 2063, the number of older persons living in New Zealand is anticipated to be approximately over 1.6 million according to the 2013 Census Quick Stats (Statistics New Zealand, 2015). Life expectancy is seen to be increasing for females and males according to the 2016 Social Report (Ministry of Social Development [MSD], 2016). It is therefore likely that the rising population numbers in the older age range will result in even more people living in residential care, and an increased prevalence of age-related health issues. Census data from 2013 recorded 31,899 persons living in aged care residences in New Zealand. This was a 14.1 percent

increase compared to the 2006 census (Statistics New Zealand, 2015). Furthermore, an estimated 1 in 7 people who were aged 80 years or older lived in residential care during the 2013 census. These statistics indicate a growing demand for trained and experienced nurses in the realm of hearing impairment and hearing aids in order to meet the specific needs of residents living with hearing impairment.

The following sections of this introduction are aimed to provide a basic overview of the hearing system, causes and different types of hearing impairment and what happens when hearing is lost. The information will provide a broad background in hearing impairment information particularly centred towards older individuals with hearing impairment.

1.3 Hearing Anatomy

There are three parts of the human ear that work together to send auditory signals from external sources into the ear and then into the brain for processing.

The first of these mechanisms is called the Outer Ear. This portion of the ear is made up of 2 major structures; the pinna (the most observable portion of the ear) and the ear canal which is also termed as the external auditory meatus (EAC) (Møller, 2013). The EAC is made up of 2 portions; The outer third of the EAC is made up of cartilage which is an extension of the cartilage that makes up the concha part of the pinna. The inner most two-thirds of the ear canal is the bony section of the EAC and is part of the temporal bone. (Narayanan et al., 2019). In older adults, the ear canal may begin to narrow and there may also be an increase in hair growth (Jerger & Jerger, 1981 as cited in Wiley et al., 1996).

The middle ear contains three tiny bones that make up the ossicular chain and the cavity encompassing these bones is filled with air. The broader side of the Malleus (which is the first

small bone of the ossicular chain) is attached to the eardrum while the other end is connected to another bone called the Incus (Møller, 2013). The smallest bone of the body and of the ossicular chain is called the Stapes. The incus is connected to the narrower end of the stapes bone whilst the oval window (a structure that is part of the inner ear) is attached to the stapes footplate (Irwin, 2006). The opening of the Eustachian tube in the middle ear connects this space to the nasal cavity and in adults, are angled slightly downwards which aids in keeping the middle ear space clear of any fluid (Bluestone & Doyle, 1998). The Eustachian tube functions not only as a drainage system but also as a pressure equaliser between the middle ear cavity and atmospheric pressure.

The oval window is an opening to the bony wall of the inner ear covered by a membrane. The inner ear is an intricate structure that is filled with fluid. It comprises two main parts; the cochlea and the vestibular system. The vestibulocochlear nerve connects the brain and both systems. The cochlea is the organ of hearing, it has a hollow snail-shaped structure that is separated in length by the Basilar membrane and Reissner's membrane (Moore, 2012). The outer and inner hair cells are the two types of sensory hair cells found within the cochlea and are particularly sensitive to inner ear damage (Lee, 2013; Wang & Puel, 2020).

1.4 Hearing Physiology

The pinna of the outer ear is important for localization as it alters the incoming auditory signals in particular the high frequency sounds (Alvord & Farmer, 1997). The function of the pinna is to aid in sound localisation as well as collect and direct sound waves which then travel into the middle ear through the tympanic membrane – also known as the eardrum (Alberti, 2001). This membrane is the structure that keeps the outer and the middle ear separate. The

sound makes its way down the ear canal and vibrates the tympanic membrane which consequently transfers the vibration via the ossicular chain. The movement of the ossicular chain in the middle ear amplifies the acoustic sound and is transmitted from the middle ear and into the inner ear by way of the oval window. The main function of the middle ear is to counter the impedance mismatch between air and fluid for a more efficient transfer of sound (Moore, 2012). The oval window is moved by the motion of the stapes, transmitting the sound vibrations into the inner ear. (Pickles, 2012). Movement of the inner ear fluid results in inner hair cell vibration. The outer hair cells are significant in the amplification of soft, low level sounds and the inner hair cells are crucial for the conversion of mechanical vibrations into electrical signals which are delivered via the cochlear nerve to the brain so that the signals can be processed and interpreted (Musiek & Baran, 2020).

The vestibular system is the organ of balance, consisting of 3 fluid-filled tubes, semicircular canals and 2 sacs called the saccule and the utricle. Together these structures detect head motions in space and produce reflexes important for daily function, for example in keeping one's posture and maintaining a stable gaze (Casale et al., 2020). Movements on the horizontal plane are detected by the saccule while movements on the vertical place are detected by the utricle (Kingma & van de Berg, 2016). The semicircular canals are important in detecting head rotation movements (Fitzpatrick et al., 2006). Imbalance and dizziness are commonly reported symptoms in older adults as several studies on dizziness report that the dysfunction of the vestibular system is the most frequent if not the second most frequent cause of this symptom in this population (Iwasaki & Yamasoba, 2015; Lawson et al., 1999; Katsarkas, 1994).

Morphological changes associated with age can also cause dysfunction of the vestibular system (Iwasaki & Yamasoba, 2015).

1.5 Types of Hearing Impairment

Conductive Hearing Loss

Conductive hearing loss (CHL) occurs when there is an impediment to the transmission of sound waves through the typical pathway of the outer ear, tympanic membrane and middle ear (Moore et al., 1999). When there is an obstacle to the normal pathway of the sound waves through these structures, the sound levels are decreased as they travel into the inner ear (Lupo et al., 2011). This results in difficulty for people with hearing loss to hear soft sounds across the entire frequency range i.e., difficulty hearing high pitch sounds as well as low pitch sounds.

This type of hearing impairment is caused by a range of pathologies which more commonly include Eustachian Tube dysfunction, fluid build-up in the middle ear portion, infection in the middle ear and perforation of the tympanic membrane (Lupo et al., 2011). The Eustachian tube dysfunction is one of the more common otological complaints of the older population and the structure (the eustachian tube) has been reported to be hypofunctional in the older population when compared to the younger population (Lafferty & McKinnon, 2020; Newman & Spitzer, 1981). Wax build-up and/or impaction, ossification of the ossicular chain (Otosclerosis), foreign objects in the ear canal and swimmers' ears are also other pathologies that can also cause some CHL (Isaacson, 2003). Impacted wax is more prevalent in the older population due to the atrophy of the cerumen glands which causes the cerumen produced to be drier in nature (Meador, 1995; Weinstein, 2003).

Conductive hearing losses are often temporary hearing losses or recover close to normal hearing depending on the pathology. A recent study by Okada et al., (2020) discovered increased difficulty with speech perception even at volumes that speech is expected to be audible when the conductive hearing loss is moderate to moderately severe over an extended amount of time. This finding indicates that individuals who suffer from this will have difficulty with speech perception even if the person is wearing hearing aids or the speaker increases their volume.

Conductive hearing losses can result in localisation deficits (Noble et al., 1994). Localisation deficits increase the level of difficulty faced by many hearing impaired persons and even more so in environments that are reverberant and noisy. Researchers have also identified a link between auditory deprivation from long-term conductive hearing loss and cochlear degeneration (Kurioka et al., 2020; Liberman et al., 2015). These findings point to the importance of maintaining auditory connections as a way of preservation of the individual's residual speech perception abilities. In cases of permanent conductive hearing losses, other management options include standard hearing aids or Bone Anchored Hearing Aids (BAHA). These aids are good implantable options for those with significant ear wax or chronic discharge issues (Hagr, 2007).

Sensorineural Hearing Loss

Sensorineural hearing loss (SNHL) is the sensory deficit considered most significantly widespread in humans (Angeli et al., 2005). This type of hearing loss presents itself either bilaterally or unilaterally and is caused by damage to any structural part or disturbance in the operation of the inner ear or auditory nerve structures. Therefore, it is permanent by nature in

most cases. It can occur congenitally, develop over childhood or be acquired as an adult. In adults, there is a natural degeneration of the auditory structures as the body ages and goes through a lifetime of use and insults (Gates & Mills, 2005). Sensorineural hearing loss generally occurs due to the genetics of the individual and/or acquired by environmental factors (Steel, 1998). Daily exposure to high noise levels, blunt or direct trauma to the ear, ototoxicity and acoustic trauma are all possible etiologies of acquired sensorineural hearing loss (Axelsson et al., 1987; Rybak & Ramkumar, 2007). Tinnitus can also be experienced by people with sensorineural hearing loss (Savastano, 2008). Tinnitus is a noise in the ear that is not a result of external sounds (Eggermont & Roberts, 2004). It can be described by sufferers as ringing, buzzing or roaring in their ears and present bilaterally or unilaterally. Tinnitus can be mild to severe and can also be constant or fluctuating. In severe cases, it can be debilitating (Baguley et al., 2013). Tinnitus often accompanies hearing loss such as presbycusis or noise induced hearing loss and can also be aggravated -or caused by- certain drugs (Møller, 2007; Swain et al., 2016).

Other difficulties that people with sensorineural hearing loss have is difficulty hearing some frequencies that even at higher sound levels, the signal is indistinguishable (Jepsen & Dau, 2011; Wendt et al., 2015). People with sensorineural hearing loss also typically report trouble hearing in environments with high levels of background noise, lower intelligibility of speakers who speak at high rates and trouble hearing voices that are generally higher in pitch such as women's and children's voices (Kenyon et al., 1998; Li et al., 2017; Turner & Henry, 2002; Victory, 2020).

Sensorineural hearing loss can also come about suddenly due to other illnesses or for no known reason even after a thorough investigation (Chau et al., 2010; Schreiber et al.,2010). There is no universally approved way of treating sudden sensorineural hearing loss and therefore is a controversial topic in the medical literature. Some physicians will provide a variety of treatments which can include corticosteroids and there are some who do not believe any treatment beneficial to the patient because of the cases of spontaneous recovery (Fetterman, 1996; Finger & Gostian, 2006; Olex-Zarychta, 2017). Researchers have shown that sudden sensorineural hearing loss can sometimes be remediated if addressed early enough (Fetterman, 1996; Schreiber et al., 2010).

1.6 Aetiology of Hearing Impairment

Hearing loss results from a range of environmental, genetic and toxicity factors. Natural ageing presents a set of factors that result in hearing loss. The natural degeneration within the physical structures of the ear and the central nervous system can cause an interruption in the intricate mechanisms involved with hearing (Canlon et al., 2010). Hearing loss can also be a result of health conditions and medication containing ototoxic substances (McKee et al., 2017; 2018; Rybak & Ramkumar, 2007). Throughout an entire lifetime, the hearing system of an individual also experiences damage externally that may degrade the system's ability to function at optimal levels. For example, the form of mild everyday loud sounds like loud music in earphones, extended exposure to high sound levels like music in concerts and noise trauma from brief spontaneous dangerous sound levels like work place noises. Risk factors of hearing impairment have conflicting findings in research (Lin et al., 2011). Age, gender, noisy occupation, serving in war torn areas in the military, obesity, hypertension, alcoholism, diabetes

and smoking are some of the risk factors linked with hearing loss that has been mentioned in the past by researchers (Lin et al., 2011; McKee et al., 2017; 2018; Mulrow et al., 1990).

Presbycusis

Presbycusis is also known as an age-related hearing impairment which involves a decline in a person's hearing sensitivity that progresses over time (Ciorba et al., 2012). Left unmanaged, presbycusis can affect the person's emotional, social and cognitive wellbeing as various difficulties from the hearing impairment develop and accumulate (Mulrow et al., 1990). This highlights the importance for those working with elderly people to be aware of the first telltale signs and to know when to refer them to a hearing specialist.

Presbycusis typically results from a complex combination of genetics, a lifetime of insults to the ear as well as the natural degeneration of the structures of the ear, in particular the inner ear and its mechanisms (Fischer et al., 2016). From an audiological perspective, presbycusis is typically described as bilateral, symmetrical sensorineural hearing loss that is related to ageing (Blevins, 2020). The severity of loss ranges from mild to substantial and if left unmanaged can have significant consequences on the individual as well as the people close to them. The development of presbycusis is insidious as well as progressive so many of those who develop presbycusis do not notice significant changes in their hearing in the early stages (Ren et al., 2013). For some clients, the changes in hearing are first noticed by the individual's family and close social contacts. Increased need for repetition and more difficulty hearing in busy environments are some of the first tell-tale signs of presbycusis. Genetics can have a level of influence on the time at which hearing impairment begins, the frequencies affected and how progressive the impairment is. Typically, presbycusis affects the high frequencies during the

initial stages and affects the mid and low frequencies as the hearing loss progresses (Huang & Tang, 2010).

Many factors contribute to hearing loss related to age with some factors more so than others. Outer hair cell deterioration is the most prominent change that occurs when humans age and the resulting presbycusis is also known as sensory presbycusis (Lee, 2013). The stria vascularis is important for sound transduction because it generates as well as maintains the correct composition of endolymph which is a fluid that encompasses the inner and outer hair cells (Hopkins, 2015; Peng & Linthicum, 2016). Atrophy of this structure results in a decline in the cochlea's metabolic function and therefore worsening of hearing sensitivity (Gates & Mills, 2005). This type of presbycusis is also known as metabolic or stria presbycusis. The basilar membrane can also stiffen and thicken as the person ages which is also known as mechanical or cochlear presbycusis. Presbycusis related to these changes is often related to a gradual and progressive decline of the person's sensorineural hearing beginning with the high frequencies. Speech discrimination is typically consistent with the severity of the person's loss.

Along with physical and metabolic decline, neural connections also deteriorate with age as previous research has shown neuro-physiological changes to occur in the brain (Andrews-Hanna et al., 2007). The consequence of these changes was reported to be a reduction and deficiency in the coordination of different parts of the brain that typically interact with each other (Andrews-Hanna et al., 2007). Neural connections provide the pathways for auditory information to be sent to the auditory cortex for perception (Gates & Mills 2005). Degeneration or damage to these connections are detrimental to hearing and understanding of any content within the

auditory signal. Cardin (2016) reviewed research regarding cortical function in auditory research and the influences of hearing impairment and ageing. The findings of her review indicate degeneration in the auditory cortical regions as a result of ageing and hearing impairment and consequently increased cognitive load and listening effort in hearing impaired older persons.

Noise Induced Hearing Loss

Noise induced hearing loss is a result of exposure to extremely high levels of sound (Rabinowitz, 2000; Sliwinska-Kowalska & Davis, 2012). Second only to presbycusis, hearing loss due to noise exposure is the next most common type of sensorineural hearing loss. It can take either an extended period of time such as working in loud environments without the consistent use of appropriate hearing protection or in a single incident such as exposure to an explosion during a war for veterans (Le et al., 2017). Noise induced hearing loss from a single incident is also known as acoustic trauma. Noise induced hearing loss is another factor that can be superimposed onto presbycusis. This is more obvious in the early stages of presbycusis but gradually disappears as the thresholds progressively get worse (McBride & Williams, 2001). People who have noise induced hearing loss can also experience tinnitus and diminished clarity and sensitivity to high frequencies (Thorne et al., 2008). This gives rise to reduced speech intelligibility and consequently an increase in communication difficulties. A review by Rosenhall (2003) reported that the interaction between aging and noise induced hearing loss is controversial in previous literature and clearly complex in nature therefore still not comprehensively understood.

1.7 Hearing Impairment and Effect on Quality of Life

Hearing impairment has negative influences on the social, emotional and other aspects of the life of individuals. For example, some individuals with even a mild hearing loss experience challenges with hearing and verbally communicating in situations with elevated levels of background noise such as social gatherings and cafes (Newman et al., 1997). Some of the emotional consequences of those with hearing loss include feelings of exclusion, irritability and sadness (Contrera et al., 2016; Newman et al., 1997). Other known consequences associated with hearing loss are depression, social withdrawal and cognitive decline in the older adults (Ciorba et al., 2012; Laplante-Lévesque et al., 2010; Lin et al., 2013).

Psychosocial

Reductions in both the number and frequency of social interaction is a predictor of mental illness and cognitive decline in the elderly (Blazer, 1982; Holtzman et al., 2004). Hearing impairment has a well-documented negative effect on an individual's interactions. A study by Chia et al. (2007) reported an association between hearing loss and limitations to the individual's role in their social circle as a result of emotional issues as well as a poor social function. Another study with a cohort of 900 older persons found that those who self-reported increased challenges in their hearing correlated with a decline in their social support network (Pronk et al., 2011). The study also found significant negative outcomes of hearing loss on social inclusion and emotions particularly for elderly men and those who do not wear hearing aids (Pronk et al., 2011). Hearing loss has also been demonstrated to be more highly associated with older adults who have developed depression, particularly when compared to other co-morbidities (Mener et al., 2013).

There is an independent association between hearing loss and accelerated decline in cognitive function and hearing loss (Lin et al., 2013). A study by Lin et al. (2013) investigated 1,984 older adults living in Pennsylvania, Tennessee, Pittsburgh and Memphis who were already enrolled in a study called The Health Aging and Body Composition (ABC). Audiometric assessments were carried out in the fifth year of the participants being in the Health ABC and cognitive assessments (3MS - measuring global function and Digital Symbol substitution) were also carried out in their 5th, 8th 10th and 11th year of being involved with the ABC study. Lin et al. (2013) discovered over a 6-year time period that participants with hearing loss showed an increased rate (30 to 40%) of decline in their cognition and a greater risk (24%) for incidental impairment of cognition. These findings are consistent with the results of previous studies regarding the association between poor cognitive function and hearing impairment (Wallhagen et al., 2008; Uhlmann et al., 1989). A systematic review by Thomson et al. (2017) found 17 articles that assessed the link between cognitive impairment (and/or incident dementia) and hearing impairment. The authors reported that dementia is strongly linked with hearing loss in the 17 articles included in the review.

Older persons who live with dual sensory impairment are not able to compensate for their sensory impairment (e.g vision or hearing) due to having more than one sensory system impairment and therefore are at a much greater risk of developing negative health issues (Davidson & Guthrie, 2017;2019).

Hearing Aids and Relationships of the person with hearing impairment.

Studies have shown that hearing impairment negatively affects the relationships of a person with hearing impairment (Govender et al., 2014; Hétu et al., 1993). However, several studies have reported positive effects on the relationship when hearing aids are worn by the person living with the impairment. A study by Yorgason et al. (2007) revealed that the quality of the relationship is particularly improved between spouses. Spouses and family members have reported less difficulty when watching TV together, communicating face-to-face and an overall improvement in other important hearing situations after being fitted with a hearing aid (Brooks et al., 2001; Stark and Hickson, 2004). Dawes et al. (2015) also reported that there may be a positive effect on the cognitive health of hearing-impaired individuals when they use hearing aids.

1.8 Hearing Impairment Management

There are many ways hearing loss can be managed, for the purposes of this thesis management of hearing impairment due to presbycusis will be focused on.

Medical Treatment

Medical treatments vary depending on the origin of the hearing loss. Conductive hearing losses can be treatable depending on the pathology. Medical treatments for conductive hearing losses can include the insertion of grommets, surgery to remove masses or foreign bodies found in the outer and middle ear cavities (Musiek & Baran, 2007). Ossicular chain repairment is also another surgical treatment. Some hearing can be lost after surgery for a number of reasons. There are a handful of options to help manage the resulting hearing impairment, including hearing devices (e.g., hearing aids) and assistive listening technology (e.g., remote microphone systems).

Bone Anchored Hearing Aids (BAHA)

Individuals whose hearing loss severity is not suitable for modern hearing aids may be more suited for implantable devices. For example, people who have chronic middle ear infections would not be suitable for a modern hearing aid as the fluid can block the ear mould and possibly damage the hearing aid. One of the partially implantable aid option is Bone Anchored Hearing Aids (BAHA). These devices are made up of 3 major components which include the sound processor which picks up sounds with its microphone and transmits the sound to the titanium implant (Roman et al., 2011). The titanium implant is surgically inserted underneath the skin and onto the skull with a fixture called the external abutment. The abutment connects the sound processor to the implant and transmits sound from the processor to the implant (Kurz et al., 2014). The abutment can be clicked onto or have a magnetic connection. The BAHA sends the signal acoustic signal straight into the cochlea via bone conduction, bypassing the outer and middle ear structures. This implantable aid is suitable for those with outer and middle ear structural damage or obstructions that are not surgically repairable and unilateral hearing loss or deafness (Ricci et al., 2010; Roman et al., 2011).

Cochlear Implants

A cochlear implant (CI) is an electrical device that is surgically implanted to help transmit acoustic signals from the environment into the brain. The basic structure of the CI includes external and internal parts. The external part comprises a device that is worn like a behind the ear (BTE) hearing aid and contains a microphone and a speech processor. The microphone picks up sounds in the environment and a speech processor picks out and organizes the sounds that were picked up by the microphone and sends it to the transmitter. The transmitter

is contained in another external part that sits on top of the skin and is held in place by magnets located within this device and the internal device underneath the skin (Clarke, 2003). The transmitter sends the signal into the receiver which is contained in the internal part. The receiver then decodes this and generates a pattern of electrical stimulus in the electrodes which lie close to the spiral ganglion cells. This stimulates the auditory nerve and an activity pattern is generated which is then interpreted in the brain as sound (Clark, 2003). Cochlear implants are suitable for those with severe to profound hearing loss in one or both ears (Lin et al., 2012).

Hearing Aids

Presbycusis and other causes of sensorineural hearing losses currently have no known medical treatments that can recover hearing thresholds. This is due to the structural damage when hair cells are lost. Hearing aids are a high-tech, non-implantable assistive technology rehabilitation option for hearing impaired persons. (Laplante-Lévesque at al., 2010). These devices provide the hearing-impaired person a way to be able to connect with the people and the environment around them. Modern hearing aids can be used for a range of hearing loss severities and are the most well-known hearing impairment management option. These devices are primarily used to allow for comfortable acoustic amplification in order to improve speech perception. The most common types of hearing aids are Behind-the-Ear (BTE), Receiver-in-the-Ear (RITE) and In-the Ear (ITE).

The hearing aid is comprised of a battery to power the device, one or more microphones that convert the acoustic signal into an electrical signal, an amplifier that will amplify the strength of this signal, a receiver that works like a loudspeaker and a dome or a mould to couple the sound

into the ear canal (Dillon, 2012). Modern hearing aids also have a digital sound processor which is responsible for other features such as noise reduction.

BTE and RITE are generally suitable for both conductive and sensorineural hearing losses provided there are no contraindications and can be used for most levels of hearing loss. The difference between a BTE and RITE is where the electronics are sitting. BTE hearing aids are the traditional standard type that have the receiver component placed in the body of the aid which sits behind the ear. RITE hearing aids are similar to BTE however the receiver component is placed in the ear with a dome or mould attached to it. With the receiver component placed within the ear, a thin wire couples the receiver to the electronics in the body of the component. The ITE hearing aid typically has a custom-made ear mould body with the electronics placed inside the shell.

Hearing aids have been shown to have positive effects that help with some negative consequences of untreated hearing impairment however it can take about 7 to 10 years from when symptoms of the hearing loss first manifest before the person with the hearing loss decides to see a specialist for their difficulties (Davis et al., 2007). Hearing aids are known to be under-used by hearing impaired residents living in aged care facilities (Cohen-Mansfield & Taylor, 2004). Kricos (2000; 2006;) indicated that hearing aid uptake is significantly influenced by the owner's self-efficacy regarding learning how to maintain and use hearing aids. This further indicates the need to provide support for rest home residents in order to improve the self-efficacy of the person with hearing loss.

Remote Microphone Systems (RMS)

For people with hearing loss due to damage to the auditory nerve, hearing aids and cochlear implants are not very suitable management options. Remote microphone systems (RMS) is an assistive listening technology that can be utlised to assist in challenging hearing situations along with or independent of hearing aids (Boothroyd, 2004). In situations where the noise level is greater than the desired signal, remote microphones can enhance the signal-to-noise ratio by transmitting the desired signal to the hearing aids of the wearer. This eliminates resulting difficulties due to the distance between the speaker and the wearer (Wagener et al., 2018). Improved signal-to-noise ratio results in the reduced listening effort and therefore reduces the cognitive load by providing easier listening situations for the wearer (Peelle, 2018). Remote microphone systems are composed of a microphone that can be worn by the speaker or placed on a table which allows for voices of speakers at the table to be picked up more easily than environmental noise. The signal is sent from the microphone to the transmitter device which is worn by the individual with hearing impairment (Kates et al., 2019).

Communication Strategies

In addition to technology, communication strategies specifically for the hearing impaired are an important addition to the management of hearing loss. Important and influential aspects for successful communication include the environment, the delivery, the message and body language.

Environment

The environment is very important to successful communication. Background noise is a hindrance to those even with normal hearing to hear and understand what their communication

partner(s) have said. It is even more so for those with hearing impairment because of the reduced ability to focus on and understand what the speaker has said and to ignore all other competing noises around (Kramer et al., 1998). For those with hearing loss particularly with presbycusis, this is typical because of the reduced hearing sensitivity at high frequencies which are important for clarity of speech (Fioretti et al., 2014). This indicates a need for communication to occur in quiet environments where background noise is eliminated or kept to a minimum.

Speech

The way in which the message is spoken is also an important factor in successful communication with hearing impaired persons. Previous research has shown improvements in the intelligibility of hearing impaired listeners when the message is spoken clearly (Picheny et al., 1985). Volume, rate of speech and the way the words are pronounced are often modified to become more intelligible to the listener with hearing impairment (Smiljanić & Bradlow, 2009). How loudly someone speaks is generally dependent on the degree of background noise in the environment and the distance of the speaker from the listener. The volume of speech is also generally increased in an attempt to improve intelligibility when the distance is greater between the speaker and the listener and/ or if there are lots of competing background noise. Many people, in particular, older people with hearing loss, can find it very challenging to understand fast speech (Wingfield et al., 2006). This is due to a combination of age-related changes occurring in the person's auditory system processes as well as changes in the ear and their cognitive function (Wendt et al., 2015). It is then useful for people interacting with older people with hearing impairment to speak at a slightly slower speed to allow more time for the person with hearing impairment to understand the message. This is because it can allow more time for

the hearing impaired person to make sense of and respond to the message. The tone of a person's voice can also add more information to their message as their tone can also convey further communicative information without increasing the length and complexity of the message (Phelan, 2014).

Message

The message of the speaker is an aspect that can be modified to help the hearing-impaired listener. Keeping the message short and simple allows the hearing-impaired residents to be able to hold onto the keywords within the sentence in order to make sense of staff and fellow rest home residents' message. Longer and more complex sentences can increase the listening effort for people with hearing impairment (Ayasse & Wingfield, 2018). Provision of more time for rest home residents with hearing loss to make sense of what they have heard is useful for successful communication interactions. It is common for those who have hearing loss to ask for repetitions which may also require rephrasing if the individual does not appear to understand the message. Some residents may nod and appear to understand what the staff members have said even when they have not completely understood the message. Many people with hearing loss find it easier to pretend to understand that they've understood the message instead of asking for repetitions which can be due to several reasons (Heffernan et al., 2016). When communicating with others increases in difficulty, they may avoid social gatherings altogether in order to avoid embarrassing situations where they've misheard or asked for numerous repetitions (Heffernan et al., 2016). Some may also feel that they do not want to take more time from their healthcare professionals and therefore do not ask for clarification in appointments or put in the time and effort to inform

them of the communication difficulties they are experiencing (Heffernan et al., 2016). These challenges indicate a real need for advocacy for people with hearing impairment.

Body Language

Communication is not restricted to speech only; body language is another way of communicating with others. Nurses are well known for having many tasks to achieve in a short period of time, and therefore multitasking where possible is part of the job (Bowers et al., 2001; Carayon & Gurses, 2008). Multi-tasking while communicating with a person with hearing impairment does not aid in successful and efficient communication. People with hearing impairment often need facial cues, particularly lip reading in order to fill in the gaps of information that they are unable to hear (Atcherson, 2017; Tye-Murray et al., 2007). To provide this, the speaker must place themselves nearer to the person with the hearing impairment and at eye level if possible. When the speaker continuously turns their back on the hearing impaired person, this makes lip reading essentially impossible. Another useful tool to facilitate successful communication is the use of hand gestures particularly in more challenging communication situations (Obermeier et al., 2012). It is a strategy that many nurses use to aid communication with hearing impaired residents (Benbenishty & Hannink, 2015; Wanko Keutchafo et al., 2020).

Other Modes of Communication

Along with body language, there are a number of other means to communicate. It is imperative to make use of other modes of communication because different residents with hearing impairment may find different modes easier to comprehend. Writing down keywords and phrases on a whiteboard or a piece of paper can be very useful for those who have relatively

good vision and severe hearing impairment and is a mode of communication already utilised by many nurses (Blevins, 2015; Britto & Samperiz, 2010). Other situations could benefit from hand-on-hand guidance particularly for those who are both hearing and vision impaired.

On top of communication strategies, it is very useful for family and staff working with a hearing aid wearer to check the device(s) as the purpose of these aids is to amplify sounds (Dillon, 2012). This allows its wearer to hear their speaker and environmental sounds better. The previous sections have described and reviewed relevant literature regarding the hearing system, hearing impairment and management options. The previous sections have described and reviewed relevant literature on hearing impairment, its effect on the individual's life and different management options. The following section considers elderly living environments particularly rest homes and registered nurses working in the facilities.

Elderly Living Environments

Attitudes towards ageing are ever changing as societal and cultural norms change and therefore are expected to have an influence on the living environment of older people (von Humboldt et al., 2014). Many of those who are able to live an independent lifestyle continue to live in their home, oftentimes downsizing to a smaller property as these tend to be easier to care for and elderly individuals don't require as much space. This is not to say that all who are still able to live independently choose to continue living in their homes as some choose to move into a retirement village. In other Asian cultures such as the Filipino culture, it is common for a child or another family member to take in their elders and look after them under their home (Badana & Andel, 2018). In contrast, there are a significant number of those who would prefer to grow old at home for as long as possible in many western cultures. Depending on the country and

community, support can be provided at a person's home to help them stay at home and live as independently as possible for longer. However, if an elderly person is unable to live independently, they may choose to or are arranged to be placed in a residential aged care facility that can cater to their needs (Cress et al., 2011). A retirement village is a place where a community of older people live and specifically provides for their needs and way of life (Age Concern New Zealand, n.d). Aged care facilities may include some if not all of the following: independent apartments, serviced rooms, rest home level care, hospital level care, and dementia level care.

Rest Home Environments

Rest home facilities house many of the older persons' population in New Zealand with 647 registered aged care facilities in New Zealand (Walker et al.,2020). There is a variation in the level of available service between facilities which –alongside the unique needs of each person- influences the decision regarding which facility to choose. Those living in retirement villages and independent apartments either do not need any support or may need extra support in some meals and cleaning. Hospital level care facilities provide services to those who need a high level of attention and care. Dementia level care facilities provide a safe place for those who have been diagnosed with dementia and cater to their needs.

Many rest home facilities have social spaces that are not acoustically suitable for the needs of hearing-impaired residents. These social spaces include dining rooms and living rooms where many are seated and have the opportunity to converse with one another. Lau and McPherson (2002, as cited in McCreedy et al., 2018) reported a mean of 64 dB in the common areas of the rest homes included in their study. Another study by Joosse (2011) who looked at

sound levels in 4 nursing homes found that the mean peak levels of sound during supper is 95.6 dBA.

Residents generally spend a substantial quantity of time in environments with high levels of noise and their care is oftentimes provided in noisy and/or reverberant environments (McCreedy et al., 2018). In these environments, hearing is more challenging and requires greater listening effort, therefore, increases the cognitive load for those with hearing impairment (Tun et al., 2009; Wingfield and Grossman, 2006). Social gatherings prove to become more problematic due to the challenges that arise in these environments (Mick et al., 2014). Relationships are likely to suffer when there are constant communication difficulties between the parties. This is not only because of consequent misunderstandings and frustration but also due to a change in desire to participate in activities that were once enjoyed together (Mick et al., 2014).

Rest Home Staff

Rest homes have a team of staff members who complete their specific roles in order to continue providing services to their residents. These include but are not limited to caregivers, administrators, managers, cleaners and nurses. Caregivers are often responsible for the preparation of meals, positioning and personal care such as showering and toileting assistance. Nurses often have a focus on medical assessment and support such as administering medications and monitoring health.

A registered nurse in New Zealand is a healthcare professional who has studied a course (either a Bachelor in Nursing or a Level 7 or 8 qualification) that is accepted by the Nursing Council of New Zealand as well as pass examinations required for a nursing license. (Nursing

Council New Zealand, n.d.). Their scope of practice is to assess the needs of a patient's health, provide care as well as advise and support the patient and family members in health management (Nursing Council New Zealand, n.d). Depending on their training, registered nurses can practice in a number of different environments. Aged residential care facilities in New Zealand must have at least one registered nurse employed, contracted or at least engaged with each facility. Hospital level care facilities at all times require at least one registered nurse to be on duty (Ministry of Health, 2004).

A breakdown in communication between nurses and the older person can result in reduced quality of care and outcome of their health (Ruesch, 2018). People with hearing impairments experience challenges in communication with their health care team, particularly when communication occurs in an environment with poor acoustics. Communication is further challenged if an individual has visual impairment or communication takes place in poor visibility environments where individuals are likely to have limited access to facial expressions and other visual communication cues. Communication strategies aid in allowing for a smoother flow and reduce communication breakdowns when communicating with a person who has difficulties expressing themselves or receiving communication messages.

This chapter has reviewed hearing impairment, its aetiologies, effects on the individual and those around them as well as how it can be managed. It has also briefly explored the prevalence of hearing impairment around the world as well as available relevant data on New Zealand older persons and nurses. The following chapter reviews specific literature to present existing findings regarding nurses and their knowledge of hearing impairment and supporting

people through the use of technology such as hearing aids and strategies designed to enhance communication. Due to the limited amount of research identified, studies that included registered nurses working in different settings and healthcare workers in rest homes were also included in the literature review.

2. Literature Review

Historically, there is a high turnover in aged care facilities nursing staff in many parts of the world (Cohen-Mansfield, 1997; Castle & Engberg, 2005). In New Zealand, there is also a high turnover of nurses working in rest homes. This not only gives way to extra costs but also results in an increased workload for remaining staff while recruiting for a replacement. This lowers the job satisfaction levels for overloaded staff members. A study by Ikeda-Sonoda et al. (2020) reported that residents function better with staff who have a greater level of work satisfaction. The results of their study implied that when the work life of nursing home staff is improved, the functional performance of their residents – who have varying levels of disability severity - will also be enhanced. The authors also reflected that the more satisfied patients, the better the quality of staff work life.

The quality of care experienced by residents is influenced by how well staffed a facility is and the workload of staff members (Harrington et al., 2000). There are also reports of inconsistencies in different facilities' level and quality of care provided for example, "But when it comes to the level and quality of care in facilities—nursing homes, assisted living, etc.—Hawley's experience has taught her that not all are created equal." (Glantz, 2020, p.22). It has been found that low quality patient care is associated with nurses who have been tasked with extremely demanding workloads (Carayon & Gurses, 2008). Misdiagnosis, non-compliance, mistreatment, mistakes in medication provision, extended hospital stays and unintentional injury are some of the many adverse, possible consequences of poor communication between nurses and those in their care (Barnett et al., 2014).

2.1 Knowledge of Hearing Impairment and Communication Strategies

There is limited research specifically on rest home nurses and their knowledge on hearing impairment however it is clear from previous research that nurses who work in rest homes feel that they were not equipped with sufficient knowledge and training to provide satisfactory care for their hearing-impaired residents (Höbler et al., 2018; Solheim et al., 2016). Burnip and Erber (1997) looked at how staff at five rest homes in Adelaide perceived the communication challenges of their residents. The authors surveyed 142 staff members who often interacted with hearing impaired residents and 35 of them were registered nurses. The authors found varying levels of knowledge regarding hearing impairment among the staff members and reported challenges regarding the accuracy of staff perceptions without the completion of an observational study.

Norwood-Chapman and Burchfield (2000) investigated the knowledge and attitudes of nurses who work in nursing homes in Knoxville, Tennessee. The study involved 260 participants who all completed a questionnaire. The questionnaire consisted of 33 questions. Norwood-Chapman and Burchfield (2000) reported that with regard to experience with hearing impairment, almost half of their participants (n = 177) indicated that they have had some previous training. However, less than half of those participants (n = 44) indicated that they felt sufficiently trained and ready to give satisfactory care to their residents. This suggests that many of their respondents could benefit from more education in this area. The authors suggested that while previous studies have reported that some nurses have a handful of knowledge about hearing impairment, there is a limited number who have received specific training about hearing impairment and how to manage the needs of residents (Norwood-Chapman & Burchfield, 2000).

This finding is somewhat surprising considering the high prevalence of hearing impairment in the older adult population. This finding may be influenced by the relatively small geographical location of participants. According to Kemker et al. (2013) many, if not most, nursing schools in the United States do not formally educate student nurses about communication with hearing impaired patients. Adib-Hajbaghery & Rezaei-Shahsavarloo (2015) also reported that not only did the study's participants have a lack of education around communicating with the hearing impaired but they also had a lack of clinical experience.

A study by Ruesch (2018) addressed the scarcity of research that is focused specifically on the knowledge of registered nurses regarding hearing loss, hearing aids and strategies that enhance communication with hearing impaired residents. Her study included 339 participants from a community hospital in Pennsylvania who completed a questionnaire that included 4 sections focused on general knowledge of hearing loss, hearing devices like hearing aids and assistive technology, communication strategies as well as law and policies regarding the care of those with hearing impairment in a hospital setting. The study found that there was insufficient knowledge of hearing impairment and strategies for improving communication with the hearing impaired. The researchers, however, also stated that the study findings cannot be generalised because they used a convenience sample (Ruesch, 2018). The author also concludes that more research is necessary to determine if their findings are replicable in larger samples from different contexts.

A small study by Mattjus (2012) described the challenges that nurses experienced when communicating with residents who are hearing impaired. The five participants who worked in

separate wards reported difficulties in communicating with residents who have a more significant hearing loss and were unable to remember if they received training in this area while they were still students. The findings suggest that communication challenges faced by rest home residents indicate a need for rest home-based nurses to be skilled in using appropriate communication strategies. Tailored communication strategies as per the unique needs of each resident are one important way to provide patient-centred care. Adequate education regarding hearing impairment and hearing aids is likely to increase confidence in knowing when a resident or a situation is appropriate for referral (Lamb & Jones, 2017).

2.2 Knowledge of Hearing Aids

Monitoring residents' sensory abilities and ensuring any assistive technology is functioning appropriately is another responsibility that many nurses undertake (Solheim et al., 2016). Solehim et al. (2016) looked at the knowledge, experience and skills of registered nurses working in rest homes. A total of 195 completed responses were included in the study from seven rest homes. The questionnaire used was based on previous studies regarding residents with hearing impairment. The study found that in general, the nurses did not have the necessary knowledge and skills required to assist their hearing impaired residents with their hearing aids. they found that their participants not only recognised that they needed further education and training but also expressed their desire to upskill in these areas. Many of the nurses did not have previous training or had minimal education regarding hearing impairment and hearing aids. Not many of the participants were able to correctly identify left and right hearing aids or check the battery of the aids before inserting them into each respective ear. It also found that cleaning of hearing aids and monitoring of ear health (e.g., for ear wax) was not regular. One of this study's

limitations includes the use of a non-validated questionnaire which may have been subject to the researcher's assumptions. An additional study has shown that positive support from the significant other is heavily associated with success in older adults' hearing aid outcomes (Hickson et al., 2014).

Different studies show a range in frequency and length of visits of family members however most studies show that many residents living in aged care facilities do not have their significant other or family around on a daily basis (Gaugler, 2005; Yamamoto-Mitani et al., 2002). Depending on the level of assistance required from the people in their care, nurses may need to know how to help them put their hearing aids on, make sure that they are working properly and help keep it clean. There are a number of reasons as to why hearing aids are not worn by residents that include but are not limited to hearing aids not working properly because experiencing pain or discomfort when wearing the aids, that the hearing aids do not sit well in the ear, challenging to use for the resident and does not receive help when required. It is therefore important that residents are supported through the barriers they face in hearing aid uptake by rest home staff members. However, research has shown that many nurses do not feel that they have had much if any education and practical training in carrying out basic hearing aid care and maintenance as well as hearing aid troubleshooting (Mattjus, 2012) therefore may not feel as confident to adequately assist residents in their care with hearing aids.

International research (Norwood-Chapman & Burchfield, 2000; Ruesch, 2018; Solheim et al., 2016) has identified that there is a potential gap in nurses' knowledge of hearing impairment, hearing aids and communication strategies. The authors have indicated that further

professional development training is needed to address the gaps identified in the study. The provision of effective training in specialist areas will support nurses to increase their knowledge and skills in providing individualised care for their resident's unique needs. However, there is no New Zealand-based research that reports on rest home nurses' knowledge of hearing impairment, hearing aids and communication strategies. In order to inform such a training program, it is important to identify the gaps of knowledge and experience of the target population.

2.3 Research aims and research questions

Research Aims

This research aimed to investigate the basic knowledge and perceptions of hearing impairment, hearing aids, and communication among registered nurses working in New Zealand rest homes.

Research Questions

With regard to New Zealand-based rest home nurses

1. What is their knowledge of hearing impairment?
2. What are their perceived skills in supporting hearing impaired residents who use hearing aids?
3. What is their knowledge of communication strategies skills to support residents who are hearing impaired?
4. What are their perceived needs for professional development in supporting people with hearing impairment?

3. Method

3.1 Ethical approval

This project was approved by the University of Canterbury Human Ethics Committee on Wednesday 5th August, 2020 (Reference: HEC 2020/49). See Appendix 1.

3.2 Participants

This study aimed to recruit registered nurses working in rest home level facilities in New Zealand. A priori analysis was conducted using G*Power to obtain an estimated sample size of 34. A correlation point biserial model statistical test and a one tail t-test was applied. The input parameters included an effect size of 0.5, an alpha level of 0.05 and a statistical power of 0.95. The participants were initially recruited using publicly available information to identify rest homes in each of the 20 District Health Board (DHB) regions. This information was obtained from the Ministry of Health Rest Homes webpage (Ministry of Health, 2021.). Initially, ten rest homes within each DHB were randomly selected. Rest homes with residents and/or nurses reported to be affected by COVID-19 were excluded from the study. The rest home managers of the selected facilities were contacted via email to (a) inform them about the project and (b) to obtain their permission to distribute study information to the registered nurses at the facility. Participants received study information and the survey link from the email forwarded by their manager. An incentive of entry into a prize draw for one of ten $50 fuel vouchers was used. Initial interest in the study was low. Therefore, after 8 weeks, the method of recruitment was modified as follows. A random number generator was used to select rest homes from Eldernet (Eldernet, 2020). For example, if the random generator produced number 3, the third rest home listed on the page was contacted. Eldernet is a website with information on New Zealand rest

homes that are categorised in the facility's primary level of care. There were 30 rest homes contacted for each level of care. Each facility had a phone number and/or a publicly available email. The study was verbally outlined to the facility nurse managers who were contacted using the phone numbers found on Eldernet. Those who were interested in partaking entered an email address for the researcher to send the written information about the study as well as the survey link. Ethical approval for the study was amended accordingly, please see Appendix 2 for amendment approval. Recruitment took place over a 17-week period with the intention of obtaining a minimum of 34 participants. A total of 45 participants responded to the survey within the recruitment period. Five partially completed survey responses were excluded from the data analysis.

3.3 Instrumentation

Survey Development

The study utilised a mixed method design to incorporate both quantitative and qualitative methodology to answer the research questions. Qualtrics Survey Software (2020) platform was used to create the online survey. The questions used in the creation of the online survey were constructed from several different questionnaires used in previous studies that involved elderly hearing loss, nurses, and/or other rest home staff. (Norwood & Burchfield, 2000; Ruesch, 2018; Solheim et al., 2016). Demographic questions looked at several factors including how long the participant has worked as a nurse, their age, the highest level of qualification and where they trained as a nurse. Questions regarding hearing impairment, hearing aids and communication strategies were based on a validated questionnaire from a research study conducted in Pennsylvania by Ruesch (2018). Some of the questions from that study were modified for

contextual and population differences. Some recurrently asked questions were also added from similar studies (Norwood & Burchfield et al., 2000; Ruesch, 2018; Solheim et al., 2016) to help answer the research questions. The survey consisted of 43 questions adapted from these articles. Questions included in the survey were focused on general hearing aid knowledge, hearing aids and communication strategies for a person with hearing impairment. An additional section was included to explore areas in which the participants believed they needed more information and/or training. Sample questions from the survey have been included below:

- *The type of hearing loss associated with ageing is known as a...?* 4 options provided. See Table 1
- *The medical term of hearing loss due to age is...?* 4 options provided. See Table 2
- *Research has shown that untreated hearing loss can increase the risk of...?* 4 options provided. See Table 3

Pilot

To support the development of the survey instrument, a pilot study was conducted with 3 registered nurses working in a public hospital setting. Modifications were made to the survey in response to specific feedback provided by the pilot participants. Changes included rewording Likert scale statements. For example, an original statement was "*I can clean hearing aids regularly*" was changed to "*I can clean hearing aids when necessary*."

Final Survey Instrument

The final survey included 5 sections with 43 questions (See Appendix 3). The first section focused on participant demographics and included 13 questions. For example, the

participant's age, length of time practicing as a registered nurse, level of care their facility provided and how often they interact with hearing impaired residents. The second section focused on the participants' knowledge of hearing impairment and included 4 multi-choice questions. The third section focussed on hearing aids and included 16 questions which encompassed 14 questions requiring slider scale responses, 1 multiple-choice and 1 5-point Likert scale question. Some of the questions in this section include:

- *I can insert hearing aids for residents.*
- *I can troubleshoot a hearing aid that has stopped working.*
- *I can identify different parts of a particular hearing aid (i.e., microphone, speaker, volume control, battery door etc.)*

The fourth section focused on communication strategies and included 1 multiple-choice question and 1 question with a text box available for free text responses. For example

- *Briefly describe some communication strategies that would help a hearing-impaired person to understand your message.*

At the end of the survey, a general comments section was included for participants to reflect on each category and provide additional relevant information where necessary. Testing confirmed the completion time of the survey was an average of 13 minutes.

3.4 Measures

The survey questions were divided into five different categories for data analysis. The categories were: demographics, hearing impairment knowledge, hearing aids and communication strategies and further professional development. See Appendix 3 for the extensive outline of survey questions for each section.

Section 1: Demographics

The first of these sections included questions regarding the demographics of the participants and their rest home contexts. On analysis, the questions in this group were split into the 'participant nurse' demographic and 'rest home context' demographic. Example questions for the nurse demographic:

- *Please select your age.* Drop down box to select age.
- *How many years have you been practicing as a registered nurse?* Drop down box to select number of years.

Example questions for the rest home demographic:

- *What levels of care does your facility provide?* 4 options are provided.
- *How many residents in your facility?* 4 options are provided.

Section 2: Hearing Impairment Knowledge

The second section included multiple choice questions on the topic of general hearing impairment knowledge. Example questions from this section:

- *The medical term of hearing loss due to age is…* 4 options are provided.
- *Research has shown untreated hearing loss can increase the risk of…* 3 options are provided.

Section 3: Hearing Aids

The third section included Likert-type questions regarding their knowledge and skills in hearing aid use. Example questions from this section:

- *I can insert hearing aids for residents.*

- *I can remove hearing aids for residents.*

Section 4: Communication Strategies

The fourth section included a multiple-choice question and an open text box response question. An example of one of these questions is:

- *Briefly describe some communication strategies that would help a hearing impaired person to understand your message.* Open text box response.

Section 5: Professional Development

The final section included questions exploring what areas and topics that the participants would like further information and/or training in. Multiple choice and open text answers regarding communication strategies specific to those with hearing impairment were included for the fourth section. Examples of these include:

- *I need more information regarding hearing impairment.* 5 options are provided.
- *I need more information regarding hearing aids.* 5 options are provided.

3.5 Data Analysis

The data collected from the survey were analysed using Qualtrics Survey report percentages, means and standard deviations. There were a total of 45 participants who took part in the survey which was provided to the participants through an email with survey information and the survey link to the Qualtrics Survey site. There were five incomplete survey responses that were removed before analysing the data. There was a total number of 40 complete survey responses analysed. These responses of the 43-question survey were used to analyse this study's four research questions. Due to non-normal distribution of results (e.g., Likert-type questions), the median and

range were analysed using non-parametric statistical analysis. Open text responses were analysed thematically.

Thematic Analysis

Thematic analysis was used to systematically identify themes from text response data from open-ended questions/ comments. The approach was used based on Braun and Clarke (2013) and involved following six phases of thematic analysis in the analysis of the open text box response data. Phase one involves making sure that the researcher knows the data very well. This was achieved by reading through the data several times. In phase two, codes were created in a table as the data was being read through. These were recorded in a Microsoft Word document using a table. The data (keywords from the responses) were attached to a matching code using bullet points underneath the code. In phase three, the codes were all reviewed for any amalgamating features. Codes that centred on similar topics were collapsed under the generated theme. For example, the codes ‘minimise background noise’, ‘finding a quiet place’, ‘avoiding distractions’ were collapsed to generate what was named the ‘Environment’ theme further down in phase five. In phase four, the themes were reviewed to ensure that it was relevant to the data available and more broadly, answers the research question. There were not many changes required at this stage therefore the researcher moved onto phase five. Phase five is arguably the most subjective phase as this is highly dependent on the researcher’s interpretation (Labra et al., 2019). The themes for this study were created after individually being defined and labelled. Phase six involved producing the data analysis report. The coming together of the analysis report started in the note-taking stages while the data was being reviewed. Alongside previous research,

these notes were utilised to define the definitions of each theme and used as a guideline to write the final discussion for this thesis.

4. Results

4.1 Survey Demographics

Nurse Demographics:

The participants were recruited from all over New Zealand and were aged between 25 to 71 years old. Twenty percent (*n* = 8) of participants were aged between 18 to 30 years old, 25% (*n* = 10) were 31 to 40 years old, 20% (*n* = 8) were 41 to 50 years old, 12.5% (*n* = 5) were 51 to 60 years old, 20% (*n* = 8) were 61 to 70 years old and 2.5% (*n* = 1) between 71 to 80 years old. Length of time practicing as a registered nurse varied between less than a year and 46 years with the average being 17.3 years.

Of the survey participants, just over half (*52.5%, n = 21*) completed their nursing qualification in New Zealand while 22.5% (*n = 9*) completed theirs from the Philippines. Other participants completed their nursing qualification in India (*7.5%, n = 3*), Australia (*2.5%, n = 1*) and 15% (*n = 6*) indicated that they completed their qualification elsewhere. The answers provided in the open text box included the following countries: Romania, South Africa, United Kingdom and America. None of the participants indicated that they have a known hearing loss. None indicated that they wear hearing aids. Many of the participants (70%, *n = 30*) indicated that they personally know someone who is deaf or is hearing impaired and 25% (*n = 10*) indicated that they do not. Out of the participants who completed the survey, 85% (*n = 34*) identified themselves as female, 12.5% (*n = 5*) as male and 2.5% (*n = 1*) indicated that they preferred not to say. It is unknown exactly how many registered nurses work in rest homes in New Zealand.

Rest Home Demographics

The majority (*44.3%, n = 35*) of participants indicated that they work in rest home level care, followed closely by those working in hospital level care (*38%, n = 30*) and there was 17.7% (*n = 14*) who indicated that they work in dementia level care. Participants were requested to indicate the living arrangements of their residents and the results showed that the majority (44.9%, n = 31) of participants work in facilities where the living arrangement is hospital level care. The results also showed 26.1% work in serviced rooms/ apartments, 13% (n = 9) and 15.9% (n = 11) indicated 'other'. The answers provided included continuing care, rehab, bedrooms (some single rooms and some double) with shared bathrooms. Most participants (45%, n = 18) indicated that they work in a facility with 50 to 100 residents, 40% (n = 16) work in facilities with 20 to 50 residents and the remaining 20% (n = 6) work in facilities with less than 20 residents.

The majority of participants (92.5%, n = 37) indicated that they interact with residents who they believe have hearing impairment several times each day. Two participants (5%) indicated that they interacted with hearing impaired residents only several times a month and one participant (2.5%) indicated that they interact with hearing impaired residents several times a week. In relation to the question regarding the frequency of participants interacting with hearing impaired residents, they were also asked how many of those residents own and/or wear hearing aids. The majority of the participants (45%, n = 18) indicated that of these hearing impaired residents, 0 – 25% own and/or wear hearing aids.

4.3 Nurses Knowledge on Hearing Impairment

The following information outlines the results of questions regarding nurses' knowledge of hearing impairment. The results of this question look to answer the research question 1 ***"What is their knowledge on hearing impairment?"***

The first question in the hearing impairment knowledge section looked at the type of hearing loss that is associated with presbycusis (hearing loss due to ageing), 57.5% (n = 23) of the participants indicated the most accurate answer. See Table 1 for more details.

Table 1

Results for "The type of hearing loss associated with ageing is known as"

Answers Options	*n*	%
A. Conductive Hearing Loss	13	32.5
B. Mixed Hearing Loss	4	10
C. Non-organic Hearing Loss	0	0
D. Sensorineural Hearing Loss	23	57.5

There were twenty-three participants (57.5%) who were able to identify the medical term of hearing loss due to aging. See table two for more details.

Table 2

Results for "The medical term of hearing loss due to age is"

Answers Options	*n*	%
A. Achondrogenesis	5	12.5
B. Mastocytosis	1	2.5
C. Presbycusis	23	57.5
D. Otosclerosis	11	27.5

The results show that most participants (90%, *n = 36*) have correctly indicated that research has shown that untreated hearing loss can increase the risk of falls, depression and cognitive decline. There were 4 participants (10%) who indicated that research shows untreated hearing loss can increase the risk of otosclerosis, depression and cognitive decline. See Table 3.

Table 3

Results for "Research has shown that untreated hearing loss can increase the risk of"

Answers Options	*n*	%
A. Falls, depression and cognitive decline	36	90
B. Cognitive decline, diabetes and depression	0	0
C. C. Otosclerosis, depression and cognitive decline	10	4

Less than half of the participants (47.5%, *n = 19*) correctly indicated the illnesses which can cause hearing loss. See Table 4 for more details.

Table 4

Results for "Which illnesses can cause hearing loss?"

Answers Options	*n*	%
A. Meningitis, Varicella and Diabetes	12	30
B. Diabetes, Meningitis and Rubella	19	47.5
C. Shingles, Diabetes and Meningitis	9	22.5

4.4 Nurses Knowledge on Hearing Aids

The results of this question look to answer research question 2 "What are their perceived skills in supporting hearing impaired residents who use hearing aids."

14 of the questions in this section required the participants to drag a bar along a scale from 0 to 100 (0 being no confidence in being able to do the task outlined in the statement and 100 being complete confidence in being able to do the task as outlined in the statement). Refer to Table 5 for an outline of the results for all the statements.

Table 5

Results for Slider Scale Questions under Hearing Aids Section

Statements	*Mean*	*SD*
1. “I can insert hearing aids for residents”	85.1	21.8
2. “I can remove hearing aids for residents.”	89.5	18.9
3. “I can tell the difference between a right and left hearing aid”	84.9	20.1
4. “I can check if a hearing aid is working properly.”	78.9	27.9
5. “I can troubleshoot a hearing aid that has stopped working.”	62.8	30.6
6. “I can stop a hearing aid from whistling.”	72.1	32.3
7. “I can insert hearing aid batteries.”	88.8	24.1
8. “I can remove hearing aid batteries.”	89.5	23
9. “I know how often to change hearing aid batteries.”	73.3	29.1
10. “I know how to charge rechargeable hearing aids.”	57.5	41.2
11. “I know how often to charge rechargeable batteries”	44.2	38.2
12. “I can turn the volume up and down on a hearing aid as the resident needs it.”	66	35.2
13. “I can identify different parts of a particular hearing aid (i.e., microphone, speaker, volume control, battery door etc.)”	64.3	33.1
14. “I can clean hearing aids when necessary”	70.6	34.8

"I can insert hearing aids for residents"

There were 5 participants (12.5%) who rated their ability at 50 or less confidence in inserting hearing aids, 5% (*n = 2*) who rated between 51 to 75, 27.5% (*n = 11*) rated between 76 to 90 and 55% (*n = 22*) who rated between 91 and 100. There was a response mean of 85.1 with a standard deviation of 21.8. More than 50% of the participants indicated that they were very confident with inserting hearing aids.

"I can remove hearing aids for residents."

There were 3 participants (7.5%) who rated their ability at 50 or less confidence in removing hearing aids, 2.5% (*n = 1*) rated between 51 to 75, 22.5% of the participants (*n = 9*) rated between 76 to 90 and 67.5% (*n = 27*) who rated between 91 and 100. There was a response mean of 89.5 with a standard deviation of 18.9.

"I can tell the difference between a right and left hearing aid"

There were 2 participants (5%) who rated their ability at 50 or less confidence in being able to tell the difference between the right and left hearing aids, 17.5% (*n = 7*) rated between 51 to 75, 22.5% of the participants (*n = 9*) rated between 76 to 90 and 55% (*n = 22*) who rated between 91 and 100. There was a response mean of 84.95 with a standard deviation of 20.1.

"I can check if a hearing aid is working properly."

There were 6 participants (15%) who rated their ability at 50 or less confidence in being able to check if a hearing aid is working properly, 12.5% (*n = 5*) rated between 51 to 75, 22.5% of the

participants (*n = 9*) rated between 76 to 90 and 50% (*n = 20*) who rated between 91 and 100. There was a response mean of 78.9 with a standard deviation of 27.9.

"I can troubleshoot a hearing aid that has stopped working."

There were 11 participants (27.5%) who rated their ability at 50 or less confidence in being able to troubleshoot a hearing aid that has stopped working. 35% (*n = 14*) rated between 51 to 75, 15% of the participants (*n = 6*) rated between 76 to 90 and 22.5% (*n = 9*) who rated between 91 and 100. There was a response mean of 62.8 with a standard deviation of 30.6.

"I can stop a hearing aid from whistling."

There were 10 participants (25%) who rated their ability at 50 or less confidence in being able to stop a hearing aid from whistling. 15% (*n = 6*) rated between 51 to 75, 15% of the participants (*n = 6*) rated between 76 to 90 and 45% (*n = 18*) who rated between 91 and 100. There was a response mean of 72.10 with a standard deviation of 32.3.

"I can insert hearing aid batteries."

There were 4 participants (10%) who rated their ability at 50 or less confidence in being able to insert hearing aid batteries. 7.5% (*n = 3*) rated between 51 to 75, 5% of the participants (*n = 2*) rated between 76 to 90 and 77.5% (*n = 31*) who rated between 91 and 100. There was a response mean of 88.80 with a standard deviation of 24.1.

"I can remove hearing aid batteries."

There were 4 participants (10%) who rated their ability at 50 or less confidence in being able to remove hearing aid batteries. 5% (*n = 2*) rated between 51 to 75, 7.5% of the participants (*n = 3*) rated between 76 to 90 and 77.5% (*n = 31*) who rated between 91 and 100. There was a response mean of 89.5 with a standard deviation of 23.

"I know how often to change hearing aid batteries."

There were 7 participants (17.5%) who rated their ability at 50 or less confidence in knowing how often to change hearing aid batteries. 27.5% (*n = 11*) rated between 51 to 75, 15% of the participants (*n = 6*) rated between 76 to 90 and 40% (*n = 16*) who rated between 91 and 100. There was a response mean of 73.3 with a standard deviation of 29.1.

"I know how to charge rechargeable hearing aids."

There were 17 participants (42.5%) who rated their ability at 50 or less confidence in knowing how often to change hearing aid batteries. 7.5% (*n = 3*) rated between 51 to 75, 12.5% of the participants (*n = 5*) rated between 76 to 90 and 37.5% (*n = 15*) who rated between 91 and 100. There was a response mean of 57.5 with a standard deviation of 41.2.

"I know how often to charge rechargeable batteries"

There were 23 participants (57.5%) who scored at 50 or less confidence in knowing how often to charge hearing aid batteries. 12.5% (*n = 5*) scored between 51 to 75, 7.5% of the participants (*n = 3*) scored between 76 to 90 and 22.5% (*n = 9*) who scored between 91 and 100. There was a response mean of 44.2 with a standard deviation of 38.2.

"I can turn the volume up and down on a hearing aid as the resident needs it."

There were 12 participants (30%) who rated their ability at 50 or less confidence in being able to turn the volume up and down on the hearing aid as the resident needs it. 17.5% (*n = 7*) rated between 51 to 75, 7.5% of the participants (*n = 3*) rated between 76 to 90 and 52.5% (*n = 21*) who scored between 91 and 100. There was a response mean of 66 with a standard deviation of 35.2.

"I can identify different parts of a particular hearing aid (i.e microphone, speaker, volume control, battery door etc.)"

There were 13 participants (32.5%) who rated their ability at 50 or less confidence in being able to identify different parts of a particular hearing aid. 15% (*n = 6*) rated between 51 to 75, 22.5% of the participants (*n = 10*) rated between 76 to 90 and 27.5% (*n = 11*) who rated between 91 and 100. There was a response mean of 64.3 with a standard deviation of 33.1.

"I can clean hearing aids when necessary"

There were 11 participants (27.5%) who rated their ability at 50 or less confidence in being able to identify different parts of a particular hearing aid. 7.5% (*n = 3*) rated between 51 to 75, 27.5% of the participants (*n = 11*) rated between 76 to 90 and 37.50% (*n = 15*) who rated between 91 and 100. There was a response mean of 70.6 with a standard deviation of 34.8

Responses regarding the main function of an ear mould revealed that most participants (70%, *n = 28*) selected the correct answer. The response mean was 1.8 with a standard deviation of 1.3. See Table 6 for details.

Table 6

Results for "... The main function of an earmould is to:"

Answers Options	*n*	%
A. Deliver sound from the hearing aid to the person's ear canal	28	70
B. Prevent bacteria/dust etc from getting into the ear canal	0	0
C. Stop the hearing aid whistling	2	10
D. Provide extra amplification on top of what the hearing aid can provide	10	25

Participants were also asked to indicate where they stand on a statement regarding hearing aid handling. The response mean was 3.4 with a standard deviation of 1.2. The results showed that most (42%, *n = 17*) disagreed with the statement. See Table 7 for more details.

Table 7

Results for "I am uncomfortable handling hearing aids because I am scared of damaging them."

Answers Options	*n*	%
A. Strongly Agree	2	5
B. Agree	9	22.5
C. I'm not sure	5	12.5
D. Disagree	17	42.5
E. Strongly Disagree	7	17.5

4.5 Nurses Knowledge on Communication Strategies

Participants were asked about what can make lip reading more difficult for a person with hearing impairment. Most (80%, *n = 32*) participants correctly chose 'all of the above' for this question. The response mean was 4.7 with a standard deviation of 0.8. See Table 8 for more details.

Table 8

Results for "Which of the following can make it more difficult for the person with hearing loss to lip read? When the person speaking is...."

Answers Options	*n*	%
A. Standing in front of a source of light.	1	2.5
B. Shouting	0	0
C. Speaking while doing other tasks in the room.	2	5
D. Both B and C.	5	12.5
E. All of the above.	32	80

Participants were asked to briefly describe some communication strategies that they believe would help a hearing-impaired person understand what their communication partner is trying to say. An open text box was supplied for the participants to provide their answers which have been analysed thematically into overarching categories.

Environment

Eleven participants mentioned the need for communication in quiet environments where background noise is eliminated or kept to a minimum for example, "speak… in a quiet environment" and "minimize background noise..." Only one of the 40 participants mentioned

focusing on one task at a time and another mentioned avoiding other distractions while communicating with hearing impaired residents.

Speech

Fourteen participants indicated that speaking clearly is helpful for hearing impaired persons. Speaking clearly comprises several features and one of the most outlined aspects of speech was voice level. Three participants indicated that shouting is not helpful to successful communication. Some indicated that normal voice levels are appropriate in helping successful communication and two participants indicated that using a raised voice is helpful in communicating with the hearing impaired. Ten participants expressed that slow speech is helpful for example, “Speak in a slow and clear manner.” One participant expressed that keeping a normal speed when speaking is helpful. The tone of voice was another aspect of clear speech that participants briefly mentioned. One participant expressed “Speak in moderated tone.” however this was not elaborated on. Speaking in a resident’s good ear was also mentioned which is helpful for those who have a known ‘better’ ear. Another participant mentioned speaking in a lower pitch than a higher pitch.

Message

One participant mentioned that they “give time” for their hearing impaired residents to take in the message and respond. One of the participants expressed the need to advocate for residents who are hearing impaired by making other communication partners aware of the resident’s difficulties in good time“...Ensure others are aware they are hearing impaired when they are communicating with them.” Five participants expressed the need to ask“...simple and

direct questions" and provide "...clear instructions." Two other participants mentioned the need to "Check often that they understand." and "...rephrase if required..."

Body Language

Eighteen participants expressed that facing the person is a useful strategy in order to understand the speaker's message for example, "Stand where they can see your face clearly". Others also expressed that being at the resident's "...eye level." helps as this allows the resident to have a better view of the facial expressions and lip movement of the speaker. Close proximity was mentioned by four participants for example, "Sit or stand next to..." This eliminates the distance factor that would also influence what the resident can hear. Participants also expressed using "hand gestures" to communicate. This can be a useful way to complement verbal communication as it uses a different sense; vision.

Other Modes of Communication

Twelve of the participants mentioned using "written words if not understood." Writing down keywords and phrases on a whiteboard or a piece of paper can be very useful for those who have relatively good vision and severe hearing impairment. Six participants indicated using "sign language if known." Another participant also expressed "Use sense of touch if needed." Eight participants mentioned using "visual cues" and "picture boards" as alternative modes of communication.

Hearing Aid Check

While hearing aid checks are not typically described as a communication strategy, two participants mentioned that they checked how the hearing aid is sitting in the ear and whether or not the aids were working. For example, “Ensure hearing aid are working and properly inserted…”

Professional Development

Participants were also asked questions on professional development areas related to hearing impairment, hearing aids and communication strategies. These were determined by asking the participants to indicate their level of agreeance on the statements provided regarding the main three sections of the study: hearing impairment, hearing aids and communication strategies. Towards the end of the survey, the participants were also asked if they have any further comments on any of these topics they would like the researcher to know.

With regards to further information and training around hearing impairment, 40% (*n = 16*) indicated that they strongly agreed with the need to have further development in this topic, 47.5% (*n = 19*) agreed, 10% (*n = 4*) were neutral and 1 participant disagreed with this. Participants commented on the importance of being able to communicate with hearing impaired residents and that more priority needs to be given to developing more in this area. They also mentioned that most -if not all- residents who come into the homes already have hearing aids.

In regards to further information and training around hearing aids, 42.5% (*n = 17*) strongly agreed with needing more development on this topic, 40% (*n = 16*) agreed, 15% (*n = 6*) were neutral and 1 participant disagreed. Several participants commented on the ever-changing ad advancing hearing aid technology and the importance of regular training and updating on these changes. They expressed the challenges around keeping up with new changes in the aids

particularly with not much training available in some areas. There were also participants who mentioned not receiving any training around hearing aids. Some participants mentioned training available through private companies around care and maintenance of hearing aids. Some participants expressed the need for education to be specifically provided within nursing training regarding the use of hearing aids and how to maintain and care for them. The helpfulness of audiologists and the need for further training specifically by an audiologist was also suggested. Family members of residents were also reported to have proven to be helpful in explaining how to care for and use the hearing aids. One participant mentioned that they have never seen researchable hearing aids.

In regards to further information and training around communication strategies for the hearing impaired, 57.5% (*n = 23*) agreed for the need to have further development in this topic, 17.5% (*n = 7*) strongly agreed, 22.5% (*n = 9*) were neutral and one participant disagreed. Participants suggested that training on other ways to communicate with the severely hearing impaired should be offered to aged care facilities.

The participants were also asked to provide comments (if they had any) with regards to any further professional development for any of the topics. Less than half of the number of participants who completed the survey provided responses in one or more of the comments boxes. The comments provided were also thematically analysed. The themes generated from the data were education, specific training for specific groups within residents and difficulties experienced by the residents.

Education

Many of the participants who commented expressed a strong need for training around hearing aids and communication with people who have hearing loss for example, “It needs to be

given greater priority." and "It is important to be able to communicate with hearing." Availability and easy access to training programs have been highlighted by a few of the participants as a factor for their participation. An example of this is when one of the participants commented, "Would do it if easily available or online." In contrast to this, 2 participants mentioned that "There is training available…" and they have received training and support from local audiologists from private companies every now and then. Several of the nurses also indicated that regular provision of educational updates is needed due to the constantly advancing technology in the hearing aids participants work with for example, "Changes are occurring rapidly so regular education and updating important." One participant mentioned the importance of regular ear checks for residents and "if they still have hearing difficulties the family are recommended to get hearing aids for them" was mentioned by one participant and monitoring of hearing post ear cleaning so that timely recommendation can be provided if hearing aids are a beneficial option.

Specialised training for specific groups

Some participants also briefly discussed the importance of communication techniques for individuals with dementia as well as hearing impairment for example, "Effective communication techniques to people with dementia who has hearing loss." One of the participants mentioned that residents who have dementia sometimes remove and lose their hearing aids and so their families often feel that there is no benefit to constantly replacing lost hearing aids or regular hearing aids. Another participant suggested that alternative communication strategies should be provided particularly for those who are severely hearing impaired to the profoundly deaf such as sign language.

Difficulties experienced by residents

Participants expressed understanding regarding the frustration of residents not being able to communicate effectively. There were also comments on how small hearing aids are in size as well as the difficulties in insertion, care and maintenance for some of the residents for example, “Many new hearing aids are small and often difficult for older persons to insert, clean, change batteries etc.” and “many elderly...perceive them as too difficult to manage…”

Summary of the Results

The knowledge and perceived skills regarding hearing impairment, hearing aids and communications strategies for the hearing impaired were varied among the participants. The need for further professional development was strongly expressed by many of the participants.

5. Discussion

This study set out to examine the knowledge of registered nurses working in New Zealand rest homes about hearing impairment and supporting people through the use of hearing aids and strategies designed to enhance communication with hearing impairment. A total of 40 rest home nurses completed the full survey. The first research question asked about the participants' knowledge of hearing impairment. Consistent with Burnip and Erber (1997), Ruesch (2018) and Solheim et al. (2016), the findings demonstrate varying levels of knowledge among participant nurses regarding hearing impairment. The results suggest that more than half of the nurses know what type of hearing loss is associated with Presbycusis and can identify the medical term for hearing loss related to aging. This is greater in comparison to the findings in Ruesch's study which found only 35% of registered nurses correctly identified Presbycusis as the term for hearing loss related to age. It should be noted that the registered nurses in Ruesch's study worked in a variety of settings. However, the scores of the participants were widely spread which suggests a need for further education on hearing impairment. The findings also suggest that most nurses are aware of the risks of untreated hearing loss which is consistent with Burnip and Erber (1997) who reported that nurses know of the negative communicative and behavioural consequences related to hearing loss. However, less than half are aware of the illnesses that can lead to hearing loss which suggests a need for specific education on illnesses that can cause hearing loss. This also suggests that there is a need for nurses to be trained in knowing when to refer a resident to an audiologist for a hearing assessment or for hearing aid configuration. Therefore, knowledge of red flags may enable and enhance the confidence of nurses to advocate for audiological referral (Lamb & Jones, 2017). This is particularly beneficial for residents with

an undiagnosed hearing loss and is also useful for nurses to modify the way they communicate with these residents in the meantime.

The second question looked at the nurses' knowledge of hearing aids. The overall findings from this study suggest that nurses are not adequately educated and trained to provide the necessary service and support for hearing aids required by hearing impaired residents. This is consistent with Solheim et al. (2016) who found that only a small number of nurses have had training specifically on hearing aid use and upkeep. The results demonstrated that more than half of the nurses are very confident with inserting hearing aids and most have high confidence with removing hearing aids. Even though more than half indicated that they feel highly confident with their ability to insert hearing aids, the responses regarding the ability to tell the difference between the left and right hearing aid are widely spread which is also consistent with Solheim et al. (2016) results. This suggests that some nurses are possibly not inserting the correct hearing aid into the correct ear which highlights the importance to investigate whether or not nurses are genuinely able to correctly insert the hearing aids in practice. Improper insertion of hearing aids not only means the hearing aids are not able to provide the appropriate amount of amplification it has been programmed to but it can also result in whistling hearing aids which can lead to annoyance, pain, and the rejection of hearing aid use especially for new users. The confidence of inserting and removing hearing aids could be influenced by how involved they are in supporting the person they personally know with a hearing impairment.

The findings of this study indicated that while most nurses know the process to stop hearing aids from whistling, there were some who indicated less confidence in troubleshooting a

hearing aid that has stopped working. The mean of the item regarding the ability to troubleshoot was lower compared to the other items in this section and the scores of the participants were widespread. This suggests that the level of competence to provide basic hearing aid services is lower in general and varies greatly between nurses. It may also mean that while nurses may know the process to stop a hearing aid from whistling, there may still be a deficit in their broader understanding of what can cause a hearing aid to whistle or stop working which affects their ability to troubleshoot for other hearing aid problems that can arise. This is in line with Solheim et al. (2016) who found that only 24% of the registered nurses were able to identify the correct answer for the item on what causes a hearing aid to whistle. The possibility of a deficit in the nurses' broader understanding is also supported in the widespread of participant responses regarding their ability to check if a hearing aid is working properly. The data also indicates that compared to means of other items, the nurses are less confident in knowing how to and how often to charge rechargeable hearing aids. This supports the need for more regular training in different styles of hearing aids and their maintenance as well as the need for other solutions such as a short and easy to read guide for specific hearing aid use. Solheim et al. (2016) suggested a form of a collated hearing aid information book or special user notes in the resident's file available for nurses to utilise. The hearing aid information book is another possible solution that incorporates general hearing aid knowledge and collated information of specific hearing aids that are being used for the clients in the facility. The need for specific hearing aid training, regular hearing aid update training as well as other solutions was indicated by both this study's participants and of those in previous research (Solheim et al., 2016).

Most of the participants knew the function of an ear mould and most of them did not feel uncomfortable handling hearing aids because of fear of damaging them. This finding is not consistent with the results of Norwood-Chapman and Burchfield (2000) which indicated that nurses felt uncomfortable handling hearing aids due to fear of breaking them. The findings of this study indicate that nurses are not completely confident in their capacity to clean hearing aids and suggest that cleaning hearing aids may take longer because nurses are not confident with this task. This is analogous to the findings of Solheim et al. (2016) which demonstrated a lack of routine and proper hearing aid cleaning as only 30% of their participants indicated that ear moulds were cleaned regularly of ear wax.

The third question of this study was the knowledge of the nurses regarding communication strategies particularly for the hearing impaired. The findings suggest inconsistent levels of knowledge in communication strategies in this population with some who demonstrated extensive knowledge while others demonstrated minimal knowledge. This indicates a need for further education and training in this which is in line with Ruesch (2018) who also found inadequate knowledge regarding communication strategies. The results show that most participants know what can make it more difficult for a person with hearing loss to lip read therefore there may not be as great of a need for extended education about this in a training program. This is consistent with Burnip and Erber (1997) who found that staff was aware of some obstacles to effective communication with the hearing impaired. However, education on barriers to allow for facial and lip reading should not be left completely untouched as some have demonstrated that they are not knowledgeable in this. Again, this is in line with Burnip and Erber

(1997) whose findings demonstrate moderate levels of optimism in staff with regards to their skills in effective communication.

There were six themes identified from the text box responses. Environment was a theme identified from the results and found that most participants are aware of the need for communication to occur in quiet environments where background noise is eliminated or kept to a minimum. This is not consistent with the results of Burnip and Erber (1997) that demonstrated a divided response when asked whether or not residents with hearing impairment can ignore noise when communicating in noisy environments. Only one participant reported standing where there is good light as a communication strategy for the hearing impaired. This indicates the need to elaborate on the importance of facial cues for hearing impaired residents which is inconsistent with findings from Burnip and Erber (1997) who found that most staff members indicated the importance of good lighting when communicating with this particular population. Focusing on communication instead of completing other tasks at the same time was not one of the aspects that participants identified as important to successful communication. This highlights the need for this to be emphasised as previous research expressed that nurses are very busy and typically multi-task in order to get tasks done in a timely manner (Bowers et al., 2001). Refraining from multitasking can be tricky to emphasise because often there is a lack of staff and nurses and other staff members are expected to achieve more work in less time. The balance between getting things done in a timely manner and ensuring that communication with the resident is efficient and successful is a challenge to be explored in order to find the most efficient solution for both parties.

Speech was another theme identified in the results. While many of the participants expressed that clear speech was important to successful communication, it was not elaborated on by many i.e., did not explain what they meant by clear speech. The results indicate that many are aware that speaking fast is not helpful to successful communication which may mean that this is a strategy already utilised by the nurses. Another communication strategy is to speak on the side with better hearing (if there is a better side), this was only mentioned by one of the participants which indicates that this is another communication strategy that is not well utilised by many rest home nurses.

Another theme identified was the message of the speaker. The results indicate that not many rest home nurses know to rephrase, repeat, allow for extra time and confirm that the resident has understood what was said. The lack of participants who mentioned keeping verbal messages short and simple suggests that rest home nurses communicate with their residents using longer and more complex sentences which are not recommended by previous research (Wendt et al., 2015).

Body language was a theme identified in the results. The results indicated that nurses are aware that facing the person with the hearing impairment when communicating is important for the listener's comprehension. Closing in the distance between listener and speaker was mentioned by only one participant which suggests that nurses are not consciously aware of this strategy. Hand gestures were a well-known strategy by most of the participants which suggest that this is a strategy that is already utilised by many nurses which is consistent with previous research (Benbenishty & Hannink, 2015; Wanko Keutchafo et al., 2020).

The results also indicate that the other communication strategies known by many of the nurses are writing keywords and phrases on a whiteboard which is consistent with previous studies (Britto & Samperiz, 2010). This indicates that this is a strategy that may not need as much emphasis when designing a training program for rest home nurses. Sign language was a mode of communication that was included by a few participants and is a mode of communication used globally (Britto & Samperiz, 2010) however this is not an easily accessible way of communicating as both the parties need to be able to understand sign language and the nurse must also know how to sign. It is a mode of communication that should be utilised if both parties are able to use this language fluently otherwise it is recommended that other modes of communication be used instead.

The results indicate the need for training to further emphasise these strategies as well as discuss and problem solve for the time constraints that nurses face daily in order to find a balance as time is a well-known factor that majorly influences how nurses spend their time. Hand-on-hand guidance was mentioned by one of the participants who expressed that it is useful for those who also have vision impairment. Many residents live with more than hearing loss alone and due to the lack of participants who described this in their response, it is clear that communication strategies for those who have dual impairment should be covered when designing a training program as many residents live with dual impairment. While not a communication strategy in itself, one or two of the participants mentioned the need to do a hearing aid check. This suggests that this may not be a strategy utilised by many nurses to ensure efficieny and ease of communication for the resident. It is very useful to check the resident's

hearing aids as the very purpose of these aids is to amplify sounds so that the wearer is able to hear the speaker and environmental sounds.

The fourth research question was what is the perceived need regarding further professional development in hearing impairment, hearing aids and communication strategies. The majority of the participants have not been given any specific training in hearing impairment, hearing aid use and maintenance and strategies for supporting communication with the hearing impaired. This is consistent with the findings of Ruesch (2018) and Solheim et al (2016). The growing population of elderly and particularly the prevalence of hearing impairment is a glaringly obvious indication of the need to better prepare nurses as well as other rest home staff and healthcare workers for interaction with the hearing impaired.

This is further supported by the results which found most nurses perceive that they need further professional development in hearing impairment, hearing aids, and communication strategies particularly for those with severe hearing impairment. The comments revealed that nurses understand the importance of communication for their residents and believe that there should be more priority in being more educated and updated in this field as many of their residents come into the home with hearing aids already. These findings are consistent with Norwood-Chapman & Burchfield (2000) whose participants also indicated the need for further education and training in these areas.

For most NZ rest home nurses, further training on hearing aids is needed. They expressed the need for less time in between refresher training sessions due to the fast-changing development of hearing aid technology. However, it is arguably unrealistic to expect rest home

staff to be up-to-date with all hearing aid technology advances. A focus on increasing staff confidence in their ability to refer residents to an audiologist in a timely manner is possibly more achievable (Solheim et al., 2016). According to some of the participants, some training has been made available to them through private practices which they had found very helpful however they felt that once a year was not regular enough. This presents a question on who should and can provide training services to rest home nurses. The comments regarding care, maintenance and difficulties in use support the need for providing further education and training regarding care, maintenance and use of the hearing aids.

NZ rest home nurses have indicated the need for more communication strategies for specifically the severely hearing impaired which indicates that this should be an area elaborated on when providing training. For the nurses who work in dementia level care, one challenge that may present itself would be when the resident removes hearing aids and misplaces. This indicates the need for nurses and staff working interacting with hearing impaired residents with dementia-specific training in the use and care of hearing aids.

Availability and ease of access to training programs is one of the challenges faced by many NZ rest home nurses who have indicated this as one of the barriers they face when trying to provide adequate support to their hearing impaired residents. Some commented on the need for having regular hearing checks for their residents so that timely recommendations can be provided. This indicates that the provision of regular hearing checks for residents living in aged care rest homes is not consistent between facilities and suggests that there is a need for research in this area to find out what is being provided, how consistent or inconsistent this is and should

there be a more consistent provision of ear care and monitoring across all aged care facilities in New Zealand.

The comments showed some differences in what type of hearing aids participants have seen. Some have commented that they have not seen any of the new ones in particular the rechargeable hearing aids. Others have commented that they have come across newer hearing aids and require regular education around the advancements in the new hearing aids. These differences may indicate a need for the education provider to initially find out the needs of particular rest homes and modify the training provided as required. An example of how this could be carried out is putting together a training resource that can be easily modified by adding specific parts to a general hearing training template on Powerpoint that would be presented to facility staff. Staff would tick boxes off a list of what they would specifically like training on which then determines what the current staff need for their professional development session.

Clinical Implications

Findings from this study highlight a need for a collaborative approach between healthcare providers particularly audiologists and rest home staff which is consistent with previous literature recommendations (Solheim et al., 2016). Moreover, collaboration to create a training program that can either be assimilated into the pre-service training of nurses in New Zealand. This training should cover the basics of hearing impairment types, causes and symptoms as well as what to do when there is reason to believe a resident has an undiagnosed hearing impairment and requires an audiologist's input. Hearing aid information such as basic parts of hearing aids and different styles, the role and influence of hearing aids and the importance of regular care and

maintenance as well as communication strategies for hearing impaired residents are other important aspects to include in pre-service training. In-service training can include a brief refresher on hearing impairment the role of hearing aids as well as the care and maintenance of hearing aids. The focus of the in-service training should be on hearing aid practical training and updates on new styles. Due to the varying levels of knowledge among registered nurses, it is likely that the in-service training needs will also vary among facilities therefore it may be useful to send a scoping survey to facility staff in order to gauge the specific needs in a particular facility. Communication strategies specifically for hearing impaired persons could be covered by an audiologist or a speech language pathologist from the local DHB. Assistance from a speech language pathologist for communication strategies would allow for the audiologist to focus their time on hearing impairment and hearing aid education and training. However, it is likely to require collaboration between professionals as well as extra time from another professional to provide education and training. There is also scope to support the residents and their families around the hearing loss which can be incorporated into training programs.

Study Limitations

During the time of data collection, New Zealand had recently come out of lockdown due to COVID-19. Rest homes were under immense pressure and closely watched by the nation because of the number of elderly who were at high risk of catching and dying from the virus or due to complications that emerged. Many eligible nurses did not feel as though they had time to participate in completing the survey. This caused difficulties in recruiting even up to the minimum sample size throughout most of the recruitment period.

The study also did not include as many questions in the survey regarding knowledge of hearing impairment. The inclusion of questions that related to the risk factors for hearing loss and other types of hearing losses that are common in older people such as Noise Induced Hearing loss may have provided relevant information. However, the design of the survey attempted to strike a balance between anticipated completion time and comprehensiveness.

Future Research

There is scope for additional research to expand on our understanding of the knowledge of hearing impairment among health and allied health professionals. Specific education on illnesses that can cause hearing loss is one of the main areas that could be covered to a greater degree as well as an understanding of what the resident is likely to be able to hear or not hear according to the severity of their hearing loss. The findings of this study also suggest a need for more research in what nurses believe they can do and what they can clinically practice adequately. This will assess whether or not what they are practicing regarding hearing aids and communication strategies match what they believe they can do and if not, what further training is required to align this. Once these areas are further researched, a training programme could be designed based on the collective results of the research and tested for validity. Other areas of research could attempt to understand the most effective modes for the provision of training, particularly considering the busy lives that nurses and other health practitioners lead.

Conclusion

In summary, this study identified that registered nurses working in New Zealand rest homes have not been adequately trained in hearing impairment and supporting residents with hearing aids and strategies to enhance communication. Many of the nurses in this study have indicated a need for further development in at least one or more of the categories in the survey and collaboration between audiologists and nurses was also indicated.

The current events particularly regarding COVID-19 highlight the value of the lives of the older population. There has been a great movement to protect the older population which gives rise to the question of what is being done to not only protect the lives of these people but also to promote their quality of life. The importance of ensuring residents living in aged care facilities can connect with their world and those around them should now be more evident than ever. Nurses along with other facility staff members have a vital role in supporting residents as well as their families through changes in the resident's hearing. It is hoped that this thesis gives rise to the idea of working towards designing and implementing training services for staff working in aged care residential facilities. It is also hoped that training programs will be consistent across aged care facilities in New Zealand to provide equal quality care and support for all residents.

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7. Appendices

Appendix 1 – Ethics Application: Approval Letter

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

HUMAN ETHICS COMMITTEE

Secretary, Rebecca Robinson
Telephone: +64 03 369 4588, Extn 94588
Email: human-ethics@canterbury.ac.nz

Ref: HEC 2020/49

5 August 2020

Celine Bergonia
Psychology, Speech and Hearing
UNIVERSITY OF CANTERBURY

Dear Celine

The Human Ethics Committee advises that your research proposal "Rest Home Nurses' Knowledge of Hearing Impairment, Hearing Aids and Communication Strategies" has been considered and approved.

Please note that this approval is subject to the incorporation of the amendments you have provided in your emails of 13th July and 3rd August 2020.

Best wishes for your project.

Yours sincerely

pp. R. Robinson

Professor Geoffrey Rodgers
Deputy Chair
University of Canterbury Human Ethics Committee

Appendix 2 – Ethics Application: Amendment Approval Letter

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

HUMAN ETHICS COMMITTEE

Secretary, Rebecca Robinson
Telephone: +64 03 369 4588, Extn 94588
Email: human-ethics@canterbury.ac.nz

Ref: HEC 2020/49 Amendment 1

2 September 2020

Celine Bergonia
Psychology, Speech and Hearing
UNIVERSITY OF CANTERBURY

Dear Celine

Thank you for your request for an amendment to your research proposal "Rest Home Nurses' Knowledge of Hearing Impairment, Hearing Aids and Communication Strategies" as outlined in your email dated 28th August 2020.

I am pleased to advise that this request has been considered and approved by the Human Ethics Committee; **subject to the following:**

- *In the Facebook post, please amend the sentence to "The survey is open to all nurses working in rest homes…".*

Yours sincerely

R. Robinson
pp.

Professor Geoffrey Rodgers
Deputy Chair, Human Ethics Committee

APPENDIX 3 - Survey

SURVEY

SURVEY INFORMATION AND CONSENT FORM

School of Psychology, Speech, and Hearing
Email: celine.bergonia@pg.canterbury.ac.nz
1 June 2020
HEC Ref: TBC

New Zealand rest home nurses' knowledge of hearing impairment, hearing aids and communication strategies

Kia ora, my name is ***Celine Bergonia.*** I am a student at the University of Canterbury studying towards a Master of Audiology. This research project aims to investigate the knowledge and experiences of registered nurses working in New Zealand rest homes about hearing impairment, hearing aids and communication.

What is involved in taking part?

Taking part in this study involves answering a range of questions in the following online survey. This is estimated to take around 10 to 15 minutes. These questions explore your knowledge and experiences of hearing impairment, hearing aids and communication strategies for residents who experience hearing difficulty.

What happens to the information I provide?

The responses obtained via this online survey will remain anonymous. The institution in which participants work will not be identified in any way. This means that the research team will not be able to identify participants and will not be able to know who provided what information. All data will be stored in password-protected files on the University of Canterbury computers. Only the researcher and supervisors involved will have access to the information. All data collected as part of this study will be retained and then destroyed after 5 years.

The survey is being carried out as a requirement for a Master's thesis which is a document which is available to the public via an online repository, through the UC library. In addition, results might be published in an academic journal or presented at a conference. You will not be identified in any publication related to this study.

What is the prize draw?

After completing the survey, you can choose to enter a random prize draw for one of ten $50 gift vouchers. This will involve clicking a link which will take you to another survey where you can enter your contact information. These details will be stored separately and will not be able to be linked with your survey responses.

Can I get a summary of the study?

At the end of the survey, you will be also be asked if you would like a summary of the research. If you indicate that you wish to receive a summary you will be taken to a separate link where you can include your email address that I can use to email you a copy of the summary at the conclusion of the study (early 2021). These details will be stored separately and will not be able to be linked with your survey responses.

What else might be involved?

In that separate link, you will also be asked to indicate if you would be willing to be contacted about participating in an online interview about this topic (you may or may not be contacted about being interviewed). If you are contacted to participate in an interview, a separate study information sheet and consent form will be provided at that time. The interview is estimated to take up around 30-60 minutes to allow time for you to provide in-depth answers.

Do I have to participate?

Participation is voluntary and you have the right to withdraw without any penalty. If at any stage you decide not to proceed, simply close the survey browser window. All data that you have entered up to that point will be deleted. Once you have submitted your responses at the end of the survey it will not be possible to withdraw your data.

If any of the questions cause you to feel upset, offended or stressed, you can either contact the research team or contact a free helpline at www.1737.org.nz (text or call 1737).

Who is doing this research?

If you have any questions about this survey, you can contact

Researcher: Celine Bergonia (celine.bergonia@pg.canterbury.ac.nz)

Supervisors: Dr Dean Sutherland (dean.sutherland@canterbury.ac.nz)

Nicole Borland (nicole.borland@canterbury.ac.nz)

This project has been reviewed and approved by the University of Canterbury Human Ethics Committee. If you have any complaints, please email to The Chair, Human Ethics Committee, University of Canterbury, Private Bag 4800, Christchurch (human-ethics@canterbury.ac.nz).

Thank you for considering participating in this study.

Consent Statement

I have read this study information and understand what is required of me to participate. By selecting the "Yes" response option below, I give my consent and am willing to participate.

Yes

No

Demographics	Are you a registered nurse? • Yes, I am a New Zealand registered nurse • No, I am not a registered nurse Yes, I am a registered nurse but not New Zealand registered
	Select your age. *Drop down box*
	How many years have you been practicing as a registered nurse? *Dropdown box of years*
	In what country did you complete your nursing qualification? (e.g., Bachelor in Nursing). • New Zealand • Australia • India • Philippines • China • Other, please state _____

	What levels of care does your facility provide? ● Rest home level care ● Hospital level care ● Dementia level care
	What are the living arrangements of the residents in your care? ● Independent apartments ● Serviced rooms / apartments ● Hospital level care. ● Other. Please describe your facility's living arrangement.
	How many residents in your facility? ● Less than 20 ● 20 to 50 ● 50 to 100 ● 100+

	How often do you interact with residents who you believe have hearing impairment? ● Several times daily ● Several times per week ● Several times per month
	In relation to the previous question, of those people who you believe have a hearing loss, how many of them own and/or wear hearing aids? Please indicate your best estimate. ● 0 – 25% ● 26 – 50% ● 51 – 75% ● 76 – 100%
	The following question(s) are included in this survey to identify if you (the participant) have any background knowledge of hearing impairment and hearing aids due to your own personal experience with hearing loss. Do you have a hearing impairment? ● Yes

	● No If yes, do you wear hearing aids? ● Yes ● No
	Do you know anyone personally who is deaf or hearing impaired? ● Yes ● No
	Have you ever had any specific training in hearing loss, hearing aids and / or communicating with people with hearing loss? ● Yes ● No ● I don't remember
	Which gender do you identify with – - Female - Male - Diverse - Prefer not to say

Hearing Impairment *The following questions are designed to gauge your general knowledge around hearing impairment.*	The type of hearing loss associated with ageing is known as a A. Conductive Loss B. Mixed Loss C. Non-organic Loss D. Sensorineural Loss
	The medical term of hearing loss due to aging is A. Achondrogenesis B. Mastocytosis C. Presbycusis D. Otosclerosis
	Research has shown that untreated hearing loss can increase the risk of A. Falls, depression and cognitive decline B. Cognitive decline, diabetes and depression C. Otosclerosis, depression and cognitive decline
	Which illnesses can cause hearing loss? ● Meningitis, varicella, diabetes ● Diabetes, meningitis, rubella ● Shingles, diabetes, meningitis
Hearing Aids	I can insert hearing aids for residents 0% -----10-----20-----30-----40-----50-----60-----70-----80-----90-----100% Not at all confident Completely confident
	I can remove hearing aids for residents 0% -----10-----20-----30-----40-----50-----60-----70-----80-----90-----100% Not at all confident Completely confident

	I can tell the difference between a right and left hearing aid 0% -----10-----20-----30-----40-----50-----60-----70-----80-----90-----100% Not at all confident Completely confident
	I can check if a hearing aid is working properly. 0% -----10-----20-----30-----40-----50-----60-----70-----80-----90-----100% Not at all confident Completely confident
	I can troubleshoot a hearing aid that has stopped working. 0% -----10-----20-----30-----40-----50-----60-----70-----80-----90-----100% Not at all confident Completely confident
	I can stop a hearing aid from whistling. 0% -----10-----20-----30-----40-----50-----60-----70-----80-----90-----100% Not at all confident Completely confident
	17. I can insert hearing aid batteries 0% -----10-----20-----30-----40-----50-----60-----70-----80-----90-----100% Not at all confident Completely confident
	17. I can remove hearing aid batteries 0% -----10-----20-----30-----40-----50-----60-----70-----80-----90-----100% Not at all confident Completely confident
	I know how often to change hearing aid batteries 0% -----10-----20-----30-----40-----50-----60-----70-----80-----90-----100%

	Not at all confident Completely confident
	I know how to charge rechargeable hearing aids 0% -----10-----20-----30-----40-----50-----60-----70-----80-----90----- 100% Not at all confident Completely confident
	I know how often to charge rechargeable batteries 0% -----10-----20-----30-----40-----50-----60-----70-----80-----90----- 100% Not at all confident Completely confident
	I can turn the volume up and down on a hearing aid as the resident needs it. 0% -----10-----20-----30-----40-----50-----60-----70-----80-----90----- 100% Not at all confident Completely confident
	I can identify different parts of a particular hearing aid (i.e., microphone, speaker, volume control, battery door etc.) 0% -----10-----20-----30-----40-----50-----60-----70-----80-----90----- 100% Not at all confident Completely confident
	I can clean hearing aids when necessary. 0% -----10-----20-----30-----40-----50-----60-----70-----80-----90----- 100% Not at all confident Completely confident
	An earmould is a piece of plastic that is moulded to a person's ear and attaches to a behind-the-ear hearing aid. The main function of an earmould is to:

	● Deliver sound from the hearing aid to the person's ear canal ● Prevent bacteria/dust etc. from getting into the ear canal ● Stop the hearing aid whistling ● Provide extra amplification on top of what the hearing aid can provide
	I am uncomfortable handling hearing aids because I am scared of damaging them. Strongly Agree ---- Agree -----l'm not sure-------- Disagree------- Strongly disagree
Communication Strategies *The following questions are designed to gauge your general knowledge around communication strategies.*	Which of the following can make it more difficult for the person with hearing loss to lip read? When the person speaking is: ● A. Standing in front of a source of light. ● B. Shouting ● C. Speaking while doing other tasks in the room ● D. Both B and C. ● E. All of the above.
	Briefly describe some communication strategies that would help a hearing-impaired person to understand your message. i.e. what can you do to help a person with hearing loss understand what you are trying to communicate? ● Comment box.
Professional Development	I need more information regarding hearing impairment. Strongly Agree ---- Agree -----l'm not sure-------- Disagree------- Strongly disagree
	I need more information regarding hearing aids.

	Strongly Agree ---- Agree -----l'm not sure-------- Disagree------- Strongly disagree
	I need more information regarding how to communicate with hearing impaired persons. Strongly Agree ---- Agree -----l'm not sure-------- Disagree------- Strongly disagree
	You are coming towards the end of the survey, please **feel free to leave comments** regarding each topic below if you have any. **Please click on the *right* red arrow button to record your survey responses**. Any further comments with regards to hearing impairment? - Comment box Any further comments with regards to hearing aids? - Comment box Any further comments with regards to communicating with people who have a hearing impairment? - Comment box Any further comments with regards to further professional development for any of these topics? - Comment box.
	Lastly, would you like to enter for the prize draw and/or receive a summary report of this study? *If you answer 'yes' to this question, you will be redirected to a separate (unlinked) survey, where you will be able to provide contact details, and also have the option of being sent a copy of the results, as well as the opportunity to register your interest in a follow-up online interview.* ● Yes ● No If yes, the participant is redirected to Prize draw survey. Please see the following table for more details. If no, end of survey message pops up.

END OF SURVEY MESSAGE.

PRIZE DRAW

If you would like to receive a report summary or go in the draw for a gift voucher, please provide your email below.
- Text Box -

Please tick all that applies to you.

- I would like to go in the draw for a gift voucher.
- I would like to receive the summary
- I am interested to be involved in an interview should the researcher require it – I can be contacted using the email I provided above.

  You will only be contacted regarding the interview via email if you have been randomly chosen to participate in the interview.

SUBMIT RESPONSE