Dementia and ageing in rural and remote communities: Using technologies for ageing in place

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Abstract

The Indigenous Technology Needs Exploration (ITNE) team, in collaboration with a Community Research Advisory Committee (CRAC), explored the use of technology among Indigenous older adults living in rural and remote communities in order to address barriers to ageing in place and living with dementia. Understanding older adults who live in rural and remote communities access to and use of technology can assist in removing barriers and promote the use of technology for ageing in place. This study examined a wide range of literature to consider a number of topics, including Canada's age structure, the health disparities between people living in rural and urban regions, how assistive technologies (e.g., home modifications) are helping older adults live independent lives, and the delivery of a variety of telehealth services to rural and remote communities using information and communication technology (ICT).

All older adults share many concerns in common, but Indigenous Peoples often have unique concerns regarding technology use in rural and remote areas of Saskatchewan, Canada. The results of this review identified there are more barriers to technology use for older adults living in Indigenous communities; technology is a viable method for ageing in place, and culturally relevant technology is needed.

Keywords: Indigenous older adults, older adults, technology use, rural and remote communities, dementia.

Indigenous Older Adults and Dementia

The rates of dementia among the Indigenous Peoples of Canada, including First Nations, Métis, and Inuit People, are steadily increasing (Women's Brain Health Initiative, 2018). Indigenous, as defined in this literature review, is summarised by José Martínez Cobo in his report "Study of the Problem of Discrimination Against Indigenous Populations" (1986):

> *To describe "Indigenous", they are those who are having a historical continuity with pre-invasion and pre-colonial societies that developed on their territories, consider themselves distinct from other sectors of the societies now prevailing on those territories... They form at present non-dominant sectors of society and are determined to preserve, develop and transmit to future generations their ancestral territories, and their ethnic identity, as the basis of their continued existence as peoples, in accordance with their own cultural patterns, social institutions and legal system (p. 17).*

The rising rates of dementia among Indigenous older adults is a concern for not only Indigenous Peoples but also for the federal government. In 2017, the Canadian Institutes of Health Research (CIHR) announced an investment of $1 million for two research projects in Saskatchewan that will bring new and culturally adapted approaches to address the needs of Indigenous Peoples living with or at risk of developing dementia (Canadian Institutes of Health Research, 2017). Similarly, the Alzheimer's Society has allocated a portion of a $3.4 million grant towards dementia research among First Nations in Saskatchewan. First Nations organisations are also working closely with researchers to better understand dementia in the community, including risk factors and preventative measures; however, the rising rates of dementia continue to be a concern for Indigenous Peoples (Graziano, 2017).

The Alzheimer's Society, in collaboration with First Nations communities, has developed the First Nations First Link program to help First Nations families living with dementia in Saskatchewan (The Canadian Press, 2010). Individual and family support, crisis intervention, and long-term care preparations are among the hallmarks of the program. First Link takes a holistic approach to the treatment of Alzheimer's by integrating elements of culture, tradition and spirituality in administering care. Ultimately, the objective of this program is to disseminate information about Alzheimer's and dementia to communities and develop screening tools and treatments that the communities can deliver themselves. This is one step in addressing a new concern amongst health professionals and caregivers in Indigenous communities.

In Canada, the proportion of older adults is rising steadily due to low fertility rates and increasing average life expectancies. The highest growth rate is in the 80 plus population that expanded nearly 3.5 times between 1984, when the number was at 215,100, and 2014 when it grew to 730,900 (Statistics Canada, 2016). In 2017/2018, Canada's overall annual population growth rate was 1.4%, which is the highest rate since 1989/1990 when it was at 1.5% (Statistics Canada, 2018). In the general Canadian population in 2014, it was estimated that 51.5% of females and 41% of males in Canada at the age of 65 years and older had dementia, and while age is not always a direct indicator of poor health or disabilities, the risk of developing each does become increasingly prevalent. Currently, the number of individuals living with dementia continues to increase and is expected to rise approximately 68% over the next 20 years among Canada's senior population (Canadian Institute for Health Information, 2018).

The Indigenous population is younger, yet ages more quickly than the general population. Data suggests that nearly 1.5 million people in Canada reported an Indigenous identity in 2011, representing 4% of the total Canadian population. Between the years 2006 and 2016, the percentage of older Indigenous adults increased from 3.5% to 7.5% of the overall Indigenous population; these numbers are expected to increase by more than double by the year 2036 (MacDonald et al., 2018). If current trends continue, it is also anticipated that the proportion of the Indigenous populations aged 65 and older

may increase to 15% by 2031 (Statistics Canada, 2017). It is anticipated that the proportion of non-Indigenous Canadians aged 65 years and older will increase from 14% in 2006 to 23% in 2031 (Jacklin, et al., 2013). In Alberta, research revealed that the prevalence of dementia for Indigenous Peoples in contrast to non-Indigenous counterparts was 34% higher, wherein more recent studies it is suggested that the First Nation demographic may be experiencing the onset of dementia as much as ten years earlier than non-Indigenous people (Women's Brain Health Initiative, 2018).

Older Indigenous adults are a marginalised demographic in the Canadian population due to complex health issues that are linked to socio-economic factors and the deep-rooted impacts of colonial history. Some of these impacts include poverty, language and cultural barriers, geographic locations, and experiencing discrimination by healthcare providers. With these factors in place and for the sake of retaining traditional knowledge, many ageing Indigenous adults have a desire to stay at home and in their communities while they receive care from a family caregiver. This concept is known as "ageing in place".

Context for the Research

The research data collected for the Indigenous Technology Needs Exploration (ITNE) project addressed Indigenous older adults' technology user needs. The term older adults can often be described by a broad range of characteristics, including chronological age, changes in social and familial roles, physiological and functional capacities, or even in relation to retirement (World Confederation for Physical Therapy, 2012). In order to identify the technology user needs, it is important to understand the inequities affecting health, well-being, and access to services experienced by Indigenous Peoples living in rural and remote areas. Indigenous Peoples experience poorer health outcomes as a result of inequitable health care services, living in geographically isolated communities, a lack of culturally appropriate health services, and experiencing discrimination and racism. Experiences of racism and discrimination in health care settings can also deter people from accessing health care, further contributing to poor health outcomes. Health

equity ensures individuals can attain their optimal health and have access to high-quality services that are appropriate and meet personal needs, regardless of the individual's demographic or cultural background (Richardson & Murphy, 2018). Due to the wide range of factors affecting health care quality and lack of services within Indigenous communities, it is imperative to conduct research on the technology needs of Indigenous older adults.

Methods

The research data collected for the ITNE project included an ongoing literature review investigating specific issues identified and chosen by the Community Research Advisory Committee (CRAC). The CRAC consists of approximately fifteen members of the eleven First Nations in the File Hills Qu'Appelle Tribal Council (FHQTC) in Saskatchewan, Canada. This came to be from the FHQTC's research partnership with Morning Star Lodge, an Indigenous, community-based health research lab under the leadership of Dr Carrie Bourassa. Literature review with the fifteen CRAC members and Morning Star Lodge research staff began the ITNE partnership and literature review in 2018 and worked together on a number of projects relating to ageing Indigenous populations and other community-specific health research needs to the current day. Research projects in FHQTC are suggested and directed by the CRAC. In turn, all knowledge distribution materials are given to CRAC members so that they may distribute these materials in their communities. All Morning Star Lodge research in partnership with FHQTC is done with the CRAC's consent and verbal/written agreement signed research agreements with FHQTC and ethics approval through the University of Saskatchewan's Ethics Board. One of the topics identified by CRAC is the role of the social determinants of health in healthy ageing and access to technology. A World Health Organisation (2018) webpage defines social determinants of health as:

> Social determinants of health are defined as the conditions in which people are born, live, play, work, and age. These factors are also impacted by broader scope factors of daily living such as the distribution of resources and money at

international, national, and local levels of government, which in turn determine and shape health inequities.

Indigenous Peoples in Canada are known to face a broad range of social determinants of health that can affect each community to varying degrees. Some of the social determinants of health affecting older adults include lack of employment opportunities, overcrowding, poor drinking water quality, imbalanced political systems, poor and underdeveloped health services, as well as poor health education infrastructure. More specifically, when it comes to health, Indigenous Peoples also believe in a holistic health model where the physical, emotional, spiritual, and intellectual components of an individual are what constitutes and determines health (Reading & Wien, 2009). The social determinants of health and holistic health model provide insight into the factors affecting the health of Indigenous older adults and access to health technology.

Ageing and Technology

Advances in Information and Communication Technologies (ICTs) are inspiring alternatives to traditional approaches to health care. Home technologies, including ICTs such as videoconferencing, smartphones, web-based resources, and remote presence technology that connect outlying and urban areas, are all an integral part of healthy ageing (Bernhardt, et al., 2012). Research suggests that Assistive Technology (AT), services that modify one's home, also help older adults live safely and independently. The results of the literature review looked at identifying the most common needs of AT for individuals living alone with dementia which include social interaction, safety, activities of daily living, independence, and control. Conclusively it is recognised that 77% of persons living with dementia are in denial of their cognitive impairments, which is coupled with the desire for independence. These results suggest two things: one is that those living with dementia are reluctant to admit themselves when it comes to seeking help; the second is that persons with dementia have motive and desire to improve their social outcomes. This suggests that the social component of AT service interaction may improve the quality of life for people living with

dementia. (Manteau-Rao & Levenson, 2018). AT advancements are expected to improve the social interaction and motivation.

ICTs, such as telemedicine, help older adults who live in outlying areas by increasing access to health care services (Manteau & Levenson, 2018). ICTs provide several services, including monitoring, education, health data management as well as telehealth technologies that provide long distant patient/clinician contact. A literature review was conducted in 2018 to assess how smart home technologies can help older people living with dementia.

An example of an organisation developing technologies to assist older adults living with dementia is Best Buy Health (formerly Healthsense, https://healthcare.bestbuy.com/). Best Buy Health is a leading provider of remote monitoring services that deliver health and safety information to health care providers. Sensors placed in different rooms of the home can monitor a client's daily activities and detect changes in normal routines. If a change is detected, the monitor sends a phone call or text alert to a caregiver who can provide prompt care to a client. For example, if a client has not slept in his or her bed or used the toilet for an unexpected period, a bed/bathroom sensor can send out an alert to a client's caregiver. Another example of a technology to assist with safety monitoring is global positioning systems (GPS). Personal alert systems, such as GPS, offer two-way voice communication at the touch of a button to alert an emergency contact. Similarly, a mobile emergency medical system (e.g., wrist system) that works at home or remotely also allows a patient to summon help instantly. Utilising GPS technology and nationwide cellular coverage, the above alert systems allow patients to use their medical alert system anywhere that offers cellular coverage (MobileHelp, 2017).

Videoconferencing is a highly useful technology for real-time telemedicine and telenursing applications, such as diagnosis, consultations, and transmission of medical images. Videoconferencing allows patients to contact physicians and nurses in emergency or routine situations so that physicians and other paramedical professionals can discuss cases across large distances. For example, VideoCare is

a system that allows remote caregivers to provide face-to-face support and companionship to older people. The care recipient interacts with an extremely simple interface on a touch-screen system with no keyboard or mouse. All the management of the system is handled remotely through VideoCare's cloud servers. The VideoCare system also handles medication reminders as well as health data tracking (VideoCare, 2017). Telehealth Saskatchewan links patients to health care teams using videoconferencing and operates more than 345 sites in 134 communities across the province; among these are 29 First Nations sites. Some of the main service areas that use telehealth include mental health, oncology, surgery, and rehabilitation services (eHealth Saskatchewan, 2017). Mental health alone can be divided into a number of chronic conditions such as Alzheimer's, depression, anxiety, and dementia; and it has been noted that when patients rely solely on primary care services rather than a collaborative approach to treatment, the result will be overall lower health outcomes (Hearn, et al., 2015). Mental health research suggests that patients and clinicians are generally satisfied with videoconference treatment, believing that it can lead to improved treatment outcomes (Basran et al., 2009).

The use of smartphones and mobile apps means that health programming can be accessed in real-time and are always available, regardless of geographical location (Mendez & Van den Hof, 2013). This flexibility has been associated with increased engagement with in-app programming for smartphone-compatible medical devices among smartphone users. For example, smartphone-compatible medical devices such as weight scales, blood pressure cuffs, and pulse oximeters are making their way into patients' homes. Smartphones are also being used by urban physicians to control remote presence technologies (e.g., medical robotics) in outlying regions (Mendez, 2016). Other mobile devices such as tablet computers are becoming more important to physicians, who are using tablets to access electronic health records.

Physicians can also use smartphones to remotely control robots to interact with a patient via video-link. Another option is for the physician to connect to diagnostic equipment such as stethoscopes, ultrasounds, and electrocardiograms, with the assistance of a local health professional, to fully assess a patient (Allen, 2015). Providing care through remote presence technology may also have financial benefits for Saskatchewan residents. For example, researchers have concluded that remote presence technology in the North can deliver cost-effective health care to underserved remote communities (Mendez, 2016). CBC News (2013) reported that remote presence technology (RPT) has the potential to save Saskatchewan taxpayers millions of dollars and revolutionise medical care in outlying regions in the province. Mendez (2016) noted that Saskatchewan spends $50 million a year on medical transport, much of which could be saved by RPTs (Mendez, 2016).

The range of mobile apps available to older adults is prodigious. As older Canadians become more familiar with mobile devices, including smartphones and tablets, developers continue to create apps ideal for this portion of the population. While an app cannot replace a counsellor, it can go a long way in collecting client information, educating clients on mental health topics, and assisting clients in a moment of need. While some apps are for clinical purposes, others are for education or entertainment. Apps can be used to gather mental health information, counselling intervention, client education, or as tools for clinical practice. Self-help apps come in several varieties and can be used to monitor one's symptoms or moods and provide information on mental health resources (Forchuck, et. al., 2014; Durham Mental Health Services, 2017).

Telemental health is a medicine practice that involves using telemedicine for the provision of mental health services at a distance, such as assessments and treatments, and has been shown to improve satisfaction among users (Hilty et. al., 2013). A variety of telemental health apps can be helpful to older adults with dementia. For example, there are special clocks for those with dementia. The clock gives both visual and vocal cues ("It is 9:00 p.m.") for people with various forms of dementia or other cognitive impairments, helping them remain oriented in time. Other apps provide information to caregivers to alert them to the behavioural changes that occur as impairment increases; caregivers can learn to deal with difficult

behaviours, deal with families, or access local services. Other apps can create personal tasks with a reminder alarm as well as a profile page containing information should a user be found confused or lost by a member of the public.

Technological developments can positively affect individuals living with dementia and their families, caregivers, and healthcare team. Assistive technology devices (ATDs) can promote social interaction, remind individuals about appointments or medications, and respond to emergency situations through electronic tracking. These advances allow individuals living with dementia to be cared for at home for a longer duration, therefore delaying institutionalisation and preventing caregiver burnout (Burmeister, 2016).

Ageing in Place

The Canadian Association of Retired Persons (CARP) reported that 92% of seniors aged 65 and older are living at home rather than in collective dwellings such as nursing homes. This is otherwise known as "ageing in place" (CARP, 2014). Although most seniors remain active and independent in their homes, others need assistance. In 2011 a literature review was conducted in order to assess e-health interventions for cognitive illnesses in older adults such as anxiety, depression, and dementia. Technical innovations such as ambient-assisted living, smart homes, game-based applications, and training programs were applied in order to assess the resulting overall quality of life and mental state of the participants. These intervention methods were also used to foster and assess active ageing and to promote a sense of independence for the patients. The overall results for each of the groups demonstrate promising applications for each of the three conditions. For example, it was found in this review that the online game *Second Life* has been used as an intervention to entertain older adults and overcome isolation and loneliness. However, it is important to acknowledge that all AT applied as interventions by this organisation were accepted by the patients before the time of application (Forstmeier, et. al., 2011). It has also been noted that with the access and use of the internet by patients, there seems to be improvements and satisfaction with the services.

Approximately 75% of older adults using e-services with chronic conditions had reported that the service had empowered them when it came to decision-making regarding how to treat their ailments, and 69% of users developed new ideas that prompted them to ask new questions to their primary healthcare providers. These service advances have led to an overall increase in internet e-health services within the past ten years (Bernhardt, et al., 2012).

Ageing and the Internet

Web-based programming also can reach large numbers of people regardless of geographic location. Older adults and their families can learn about Alzheimer's Disease or other forms of dementia and make informed choices about long-term care. Individuals can learn more about the importance of early illness detection. Older adults can also access information about physical, verbal, sexual, or financial abuse (Healthlink BC, 2016).

Websites offer information and encouragement to seniors and families affected by late-life depression (Baycrest Health Sciences, 2014). *Caring.com* is a leading website and senior care resource company headquartered in San Mateo, California. The site draws about three million visitors each month and provides caregiver information and support, including more than 3,000 articles and answers to common senior care questions from professionals in geriatric medicine, law, finance, housing, and other key areas of eldercare including mental health.

Many websites are designed to appeal to an older demographic. Older adults can utilise the internet to learn about topics such as bone health, nutrition, and exercise. They may also learn about specific illnesses and prevention, home modifications, and mental health. They may also find innovative tools such as the latest news on age-related health issues and even information about enjoying a healthy sex life well into old age (eHealth Saskatchewan, 2017). Leading websites include the Canadian Association for Retired Persons (CARP) as well as the American Association of Retired People (AARP). The CARP website lists hundreds of websites covering key areas of eldercare. CARP is also very involved in advocating on behalf of older adults

and actively makes policy recommendations involving local and regional issues. Both associations educate and advocate on behalf of older adults on issues that are important to them and their families. In addition, online companies such as *Parentgiving* offer over 5,000 home healthcare products such as bathroom safety, bedding products, and mobility devices. The Government of Canada has websites for older adults that provide information on food safety, vision care, oral health, mental health as well as the importance of physical activity (Government of Canada, 2014).

Telepsychiatry is a method of improving services to under-resourced sectors and includes geriatric mental health care that is both cost and time-effective. The Baycrest Centre for Mental Health, located in Ontario, Canada, uses videoconferencing to connect patients with therapists remotely (Baycrest Health Sciences, 2014). For those geriatric patients with mental health concerns who find it difficult to access care due to mobility issues or the costs and risks associated with travel, the Ontario Shores Centre for Mental Health Sciences provides teleconferencing for e-visits (Ontario Shores for Mental Health Sciences, 2017). Once a patient has been clinically assessed, a clinician can arrange a psychiatrist consult via videoconferences (this is done mainly for patients in rural/remote areas). The London Health Sciences Centre in Ontario also provides an e-visit clinic to patients, care providers, and families. The program is especially helpful to rural/remote patients (London Health Sciences Centre, 2017). Most often, a videoconference with a psychiatrist will be arranged by a family doctor in a rural or remote area who seeks the assistance of a psychiatrist in diagnosing and managing common mental health disorders. The psychiatrist can suggest a treatment plan, prescribe medication when required, and make follow-up video appointments with patients (Glauser, et al., 2015).

Video consultation technology can bring together nursing home staff and hospital-based clinical experts to improve the treatment of patients with dementia. It encourages interactive learning opportunities and professional development (O'Donnell, et al., 2007). Videoconferencing is even associated with significant reductions in the use of physical restraints and medication among patients with dementia (Samuel, 2016). It is also important to note that although positive outcome measures are the target for patients receiving the support, the social well-being of the caregiver is another benefit. This must not be overlooked because as interventions and services intensify for caregivers over long periods of time, the process can lead to negative social implications for the caregiver (Chappell & Funk, 2011). Primary healthcare providers are also recognised to often take prescribed medications and often make more trips to their own physicians (Burns & Rabins, 2000). Telegerontology and videoconferencing with an interdisciplinary team assists in delivering dementia care to rural communities, which decreases the demand for caregivers (Wallack, et al., 2018). These results are evident and demonstrated by the increase in the use of interactive media and technology, which is engaging, empowering, and educational to older adults. This technology provides a greater sense of independence and assistance to the primary caregivers (Bernhardt, et al., 2012). This promotes equal access to dementia care in areas where the services have been previously unavailable or unsuitable to patient and caregiver needs (Kosteniuk, et al., 2016).

Technology, Readiness, & Challenges

Two significant factors that can influence an older person's willingness and ability to adopt new technology are rural versus urban home-dwellings, which have serious impacts on readiness for technology use. In some cases, older adults need to be persuaded to adopt new technology, which may involve learning new skills and changing familiar daily routines. Other factors that can influence the use of technology can include the availability of alternatives (e.g., help by family or spouse), social influences (e.g., persuasion by family or friends) as well as the older adult's desire to age in place (e.g., the stronger the desire to live at home and the acceptance of their condition, the greater the motivation to learn a new technology). The list of factors that can influence the use of technology can also be extended to physiological concerns.

While standard keyboards are often compact for easier positioning, the small size can pose difficulties for those with vision problems or difficulties using their fingers. This challenge can be assisted by keyboards with bigger keys. Those users who are easily confused by a cluttered keyboard can purchase uncluttered designs where the keys can be colour-coded and easier to see. On-screen keyboards are commonly used on smartphones and other mobile devices. It is possible to remap a standard computer keyboard with a layout designed for a one-handed user, with one layout for left and another for right-handed users.

Older adults with communication difficulties can use a text-to-speech communication app, which forms grammatically correct sentences when a series of pictograms are clicked and then speaks these sentences aloud. If necessary, users can purchase keyboards that use braille and printers with braille output. A computer mouse can be difficult to control for those who struggle with hand tremors. There are computer mice available in a variety of forms and sizes that might be useful, such as rollerballs/trackballs, joysticks, head pointing, and eye gaze. Some people have common age-related eye changes, including difficulty seeing small print clearly; cataracts can make it hard to see; glaucoma can damage the optic nerve, or macular degeneration can cause a blind spot to form in your central vision (Mayo Clinic, 2017). To deal with such eye changes, various operating systems include a high contrast feature that makes objects appear larger using a contrast colour screen. For those people with hearing difficulties, electronic mail and instant messaging help them communicate over the internet.

Many older adults face yet another challenge when using computers: computer literacy. In the United States, 2010 research was conducted to analyse if there was a direct correlation between health literacy skills and health outcomes, and the results revealed adults ages 60 and over as a major vulnerable group. This was discovered through the estimation of approximately two-thirds of the population of this demographic profile had inadequate health literacy, literacy skills, which were directly linked to overall poorer health (Dreher & Oldfield, 2010). Differences in access to formal education, work/computer experience,

the complexity and technical nature of digital information as well as the natural processes of ageing may compromise an older adult's capacity to use computers. Fortunately, older adults can access many resources that can help them get started. For example, public libraries offer courses to older adults with directions on how to use computers and navigate the internet. Adult learning centres across Canada support the delivery of adult-focused computer programs. A time-honoured approach is to learn with the help of family members or friends. For novices who can already navigate the internet, there are scores of online tutorials to enhance one's computer skills.

As of 2011, about 19% of the Canadian population lived in rural or remote communities (Currie et al., 2014). According to the Government of Canada's website (2005): "eHealth involves the use of information and communications technology to improve access, offer support and enhance the efficiency and effectiveness of health care, health education, health information, and allowing practitioners to connect with patients.". Khan et al. (2017) also states that: "In First Nations and Inuit communities, eHealth using digital technologies and portable diagnostic devices increases; access to expert medical advice, online resources, links health care professionals, and remote diagnostic interventions" (Government of Canada, 2005).

However, users are unable to properly connect to websites, discussion boards, and social networking forums unless they have reliable and relatively fast Internet access. Infrastructure is a collective term for all hardware and software systems that constitute essential components for internet and mobile connectivity. Infrastructure is key to accessibility. Although the federal government wants to make Canada the most connected nation on earth, many rural/remote communities do not benefit from this objective because they do not possess the input prerequisites to take full advantage of the opportunities that telehealth can provide (Currie et al., 2014; Kimery, & Amirkhalkhali, 2011). The modern standards of Internet service continue to elude many rural/remote communities.

Discussion - Community Technology Needs Research

This portion of the study has emphasised the technical advances for supporting older adults and concerns influencing rural/remote access to ICTs to support their health and well-being. It is important to explore other social aspects about the relationship that Indigenous older adults have with ICTs and the patient-health professional relationship and for further research. In addition, the personal touch is also important to some people, which can make Telehealth services off-putting to some patients since they are provided at arms-length. This impersonal touch can extend to family members and caregivers.

Furthermore, systemic racism resulting from colonisation acts not only as a barrier to care but also as a determinant of health, preventing equitable health outcomes for Indigenous Peoples (Bourassa, 2018). Stress associated with systemic racism, discrimination and stereotyping contributes to negative health outcomes (Cusack, 2012). Although technology can increase access to health care services (Burmeister, 2016), care delivery must be culturally appropriate in order to contribute to equitable health outcomes. Anti-racism and the provision of culturally safe care promote these outcomes. Culturally safe care shifts the power differential between health care provider and patient contributes to equitable distributions of power and resources and is defined by the patient (Cusack, 2012). Technological developments must also include cultural safety as a means for providing dementia care.

Conclusion

It is often assumed that the perspectives of caregivers of people living with dementia would be generally negative; however, research has shown that many caregivers maintain positive outlooks while they care for family or community members (Branger et al., 2014). Familial relationships show that people are often happy that they can take care of loved ones themselves, rather than someone else not related to the family or community at all. The data collected for the ITNE study identified technology use as a way to age in place well; however, many barriers to technology prevent ageing in place. Access to

technology varies according to demographics, but most communities face issues around accessibility and readiness. Research has identified certain possibilities for the use of technology to explore the impacts of Indigenous cultural factors. The protection of Indigenous knowledge is critical to this exploration. Culturally relevant and safe technology use is key. Indigenous communities want to become more familiar with technology such as mobile apps, web-based applications, and the use of devices such as tablets to mobilise knowledge for individuals living with dementia and their caregivers. More work is required to identify and incorporate technology for these communities, and it needs to be done by the direction and sovereignty of the communities. Community needs to be asked what their culturally safe technology needs are, not told.

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