EFFECTS OF A GERIATRIC OUTREACH PROGRAM ON THE CARE OF OLDER ADULTS IN NORTHERN BRITISH COLUMBIA

by

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Abstract

The Northern Health Authority's Geriatric Outreach Program provides consultations with geriatric specialists in-person and through videoconference. With Canada's population aged 65+ expected to increase over the next several years, there is precedent to explore service delivery methods and how they influence care of older adults. Using a multi-method research design, formal-care providers' perspectives of the Geriatric Outreach Program were explored, and the outcomes and costs of in-person and videoconferencing components were compared. Results revealed that the program supports care of older adults by providing access to geriatric care closer to patients' homes and by providing comprehensive care plans back to the referring general practitioners. Costs of videoconferencing consultations were lower than in-person costs due to the added expense of specialist's travel, and videoconferencing also resulted in more new diagnoses, medication changes, further testing, and requests for follow-up. However, further research is needed to fully understand these differences in outcomes.

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GLOSSARY

Older Adult. People aged 65 or older (Torcotte & Schellenburg, 2007).

Telehealth. The World Health Organization [WHO] (2010) who defines Telehealth as the following:

> The delivery of health care services, where distance is a critical factor, by all health care professionals using information and communication technologies for the exchange of valid information for diagnosis, treatment and prevention of disease and injuries, research and evaluation, and for the continuing education of health care providers, all in the interests of advancing the health of individuals and their communities. (p.9)

Telegeriatrics. A service within telehealth that provides a virtual connection between a geriatric patient and a geriatrician or geriatric psychiatrist, usually via videoconferencing technology.

Rural. Although there are varying definitions of rural, the 'rural and small town' definition will be used for the purpose of this research which describes rural as any community outside the commuting zone of an urban center with a population of 10,000 or more (du Plessis, Beshiri, Bollman, & Clemenson, 2001).

Aging in Place. The Government of Canada (2016) states "Aging in Place means having the health and social supports and services you need to live safely and independently in your own home or your community for as long as you wish and are able".

Northern Health Authority (NHA). The health authority responsible for health care delivery to the residents living within its jurisdiction in northern British Columbia.

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Chapter 1: Introduction

As Canada's health care system is publicly funded, it is in Canadian's interests that the services provided are efficient and meet the needs of Canadian citizens. A growing concern is that services are needed to address the unprecedented surge in Canada's population aged 65 and older. For rural communities that already have limited resources, and even urban centers where some specialist services are not offered, alternate modes of care delivery are essential to meet the needs of this growing population (Phillips & McLeroy, 2004). Without appropriate services to care for Canada's aging population there could be negative financial and health related implications for the health care system and the people it serves.

In the region of British Columbia (BC) that is serviced by the Northern Health Authority (NHA), there is currently a lack of geriatric specialists (geriatricians and geriatric psychiatrists) to meet the needs of older adults requiring this type of specialist care (S. Lau, personal communication, September 2018). To remedy this, the NHA implemented a Geriatric Outreach Program. This program combines in-person (face-to-face) care delivery and care delivery at-a-distance. This latter type of care delivery is achieved though telehealth, which is defined by the World Health Organization [WHO] (2010) as:

> The delivery of health care services, where distance is a critical factor, by all health care professionals using information and communication technologies for the exchange of valid information for diagnosis, treatment and prevention of disease and injuries, research and evaluation, and for the continuing education of health care providers, all in the interests of advancing the health of individuals and their communities. (p.9)

The telehealth service used in the Geriatric Outreach Program connects older adults (persons aged 65+) with geriatric specialists through videoconferencing technology. For this reason, this telehealth service has been dubbed telegeriatrics. Telegeriatrics could be considered an innovative mode of service delivery because it provides a virtual connection between those who do not have local access to geriatric care and health care providers in urban centers without the need for extensive travel. Although the Geriatric Outreach Program and the telegeriatric service within the program aim to meet care needs of older adults, the effects of telegeriatrics on the care of older adults in the NHA's jurisdiction has not been investigated. Therefore, the purpose of this work is to answer the two research questions: 1) how does the Geriatric Outreach Program affect the care of older adults in northern BC, and 2) how do the in-person and telehealth components within the program compare?

Canada's Aging Population

The life expectancy in Canada is expected to increase over the next 12 years from 83 to 86 years for women and 78 to 82 years for men (Statistics Canada, 2016). As the life expectancy in Canada increases, so too does the total population 65 years of age and older. In Canada, 16.9% of the population is aged 65 and older, a number that is expected to increase over the next six years (Statistics Canada, 2017a). By the year 2024, more than 20% of the Canadian population is estimated to be aged 65 and older, and by 2035, Canada is expected to become one of only a few countries whose population will be considered super aged (i.e. 30% or more of the population is aged 60+) (Canadian Institutes of Health Research [CIHR], 2017).

Although Canada's population is aging, not all of the provinces and territories are experiencing this same demographic trend (Range 3.8% – 19.9%). In Alberta, Saskatchewan,

Manitoba, Ontario and all three of the territories [Yukon, Northwest Territories, Nunavut], the proportion of those aged 65 and older is below Canada's overall proportion of 16.9% (Statistics Canada, 2017a). However, all of the other provinces are experiencing an unprecedented increase in their population aged 65+ and are above Canada's overall 16.9%; BC in particular is among the highest with 18.3% of its population aged 65+ (Statistics Canada, 2017a).

Effects of an Aging Population

Canada's aging population can have implications on the health care system, services and resources. One of the biggest challenges for the health care system is meeting the needs of the growing number of older adults and increasing size of this age cohort. Although aging does not necessarily mean a decline in health status; the prevalence of chronic conditions increases with age so that people over the age of 65 are more likely to be living with one or more chronic illnesses (Canadian Institute for Health Information [CIHI], 2011a). In fact, nearly 80% of older adults in Canada have one or more chronic conditions (CIHI, 2011b). Older adults with three or more chronic conditions use three times more health care than older adults without chronic conditions (CIHI, 2011a). This increased demand on the health care system also translates to an increased cost to the health care system. It is estimated that in 2017 Canada spent $242 billion on health care – nearly 12% of the gross domestic product (GDP) (CIHI, 2017). However, when this number is examined by age group, older adults are responsible for 46% of this cost. The Fraser Institute reported that health care spending increases with age with an average annual per government spending of $2,664 per person aged 15-64 years compared to an average annual per government spending of $11,625 for people aged 65 years and greater (Jackson, Clemens, & Palacios, 2017). Furthermore, the

total cost of health care is expected to increase at a rate of about 1% each year, which is about 2 billion dollars (CIHI, 2017). With higher health care costs for older adults and an increasing older adult population, it is predicted that the aging population in Canada could financially strain the health care system if changes are not made.

Health care services and resources may also be affected by an aging population. Traditionally, health services in Canada are designed for acute and preventative care for a younger population (Canadian Medical Association, 2016). Now services must focus on the maintenance and treatment of complex conditions and comorbidities that are commonly seen in the older population. The shift from a younger population with fewer chronic illnesses to an older population with more chronic illnesses could change the disease distribution and ultimately the demand on services (Arai et al, 2015). If there are not enough services to meet the needs of older adults, access to health care for this population could become challenging, and timeliness to care could also be affected. Therefore, it is imperative that Canada's health care system adapts to the needs of its aging population.

Considerations for Aging in Place

Increasingly, older adults are aging in place and want to access services that meet their needs in their home community. Aging in place provides older adults with a sense of connectedness and belonging; even older adults without family nearby want to age in place to retain their established social networks (Wiles et al., 2012). This connection to social networks is tied closely to a sense of community and belonging – both of which support mental health (Wiles et al., 2012). In this way, aging in place may help prevent social isolation by supporting connections to social communities that may not be possible if an older adult were to age out of place. Aging in place can also enable older adults to maintain

autonomy and independence through the continuation of hobbies and activities (e.g. owning a pet, taking care of a garden, taking the bus); for some older adults, there is a fear that aging out of their preferred community could negatively impact their lifestyle by restricting their choices (Wiles et al., 2012).

Aging out of place, conversely, can take a toll on the mental health and wellbeing of older adults; it takes time to adjust to new environments and establish new social networks, and that time can be distressing (Walker, Curry, & Hogstel, 2007). Older adults who do not want to move – but are forced out of necessity (e.g. unexpected health issue) – have a harder time adjusting than those who came to the decision to move on their own (Walker et al., 2007). These older adults often move in with family members or into specialized care facilities where they must downsize their belongings, and they can experience grief over the loss of sentimental items, a family home, and social networks (Walker et al., 2007). However, if older adults are supported to age in place, their experience of the aging process could be improved. In this way, health services for older adults that are offered in their home communities could support the growing number of older adults in Canada to age well.

Accessing Care in Rural and Northern Communities

Aging in place also calls into consideration the issue of access to health care. In developed countries, like Canada, there is sometimes a struggle between efficiency and equity in terms of allocation of health care resources. While equity is delivering health care where it is needed, efficiency suggests that services should be delivered where they provide the biggest health benefit at the lowest cost (Gatrell & Elliott, 2009). For example, there may be a need for a service in a number of rural communities, but due to the cost of the service, it

can only be implemented in one of the communities. The issue then becomes 'where will the service provide the greatest health benefits for the population?'.

Efficiency, or economy of scale, is often more achievable in urban centers with larger populations utilizing health services compared to rural communities. Rural communities frequently have a harder time recruiting and retaining general practitioners and specialists; new physicians are more likely to practice in urban centers where there are more resources, amenities, and support for their budding practice (Gatrell & Elliott, 2009). As a result, rural communities are often left with fewer health services than urban centers. For older adults in rural communities this lack of services – especially those serving aging populations with complex care needs – poses a substantial barrier to accessing care (Keating, Swindle, & Fletcher, 2011). In rural communities where necessary health services are not available to its older citizens, this population may need to travel out of community for care, or they might not seek appropriate care at all (Martin-Khan et al., 2015).

Despite often having fewer services, residents of rural communities have been known to come together to solve problems facing their community. Rural communities often have a strong sense of community and comradery; neighbours know each other and offer help if there are any apparent issues. A good example of this is the Better at Home Program supported by the United Way. Residents of rural communities come together and support non-medical related needs (e.g. grocery shopping, cleaning, lawn maintenance) of older adults within the community so that they can live better and remain in community (Sharp, 2015). In this way, rural communities can be quite resourceful.

However, many rural populations still face geographical barriers to accessing health care. For example, distance to services is a huge influence on the decision to access care

among rural populations (Regan & Wong, 2009). People who live closer to health care services are more likely to utilize services than someone who lives farther away, regardless of need (Gatrell & Elliot, 2009). Therefore, those living in rural communities that are already far from services in urban centers are less likely to access care. However, if people think they might benefit greatly from the service (usually secondary or tertiary services) distance is less of a deterrent to accessing services (Gatrell & Elliott, 2009). During winter months, residents in rural communities sometimes have to choose between compromising their safety by traveling to urban centers in dangerous road and weather conditions to meet their care needs or remaining in community and not having their care needs met (Regan & Wong, 2009). The barrier of travel to accessing health care is also further compounded in communities without public transportation to local care centers or to larger urban centers (Regan & Wong, 2009). This leaves patients in these communities to organize their own transportation and depending on the ailment or reason for accessing care, it is not always feasible for patients to drive themselves. Some older adults do not drive, and so they rely on family or friends to shuttle them to and from an appointment. Thus, distance to services in rural communities can be especially problematic for older adults.

Rurality Tax is another concern for older adults accessing health care services (Raphael, 2009). This Canadian concept suggests that there is an additional cost to patients for traveling (e.g. mileage, flights, accommodation, daycare, meals, etc.) to services only available outside their home community (Raphael, 2009). As 14% of older adults in Canada may be considered low income, cost could be a barrier to accessing care (Statistics Canada, 2018a). In rural BC specifically, cost has been found to discourage some patients from accessing health care services outside of their home community (Regan & Wong, 2009).

Rurality Tax is especially apparent for patients accessing specialist services only offered in regional areas, often much further way. Therefore, the combination of distance and cost of travel could create a barrier to accessing care for some older adults in rural communities.

Health Status of Under-Resourced Communities

Barriers to accessing health care like the ones discussed previously (i.e. cost, distance, availability) are partially responsible for the inequities in health status that exist between rural and urban communities (Sibley & Weiner, 2011). Lower socioeconomic status also contributes to a decrease in health status (CIHI, 2011b), and in general, rural older adults tend to have a lower socioeconomic status than their urban counterparts (Rapheal, 2009). Older adults with lower socioeconomic statuses are more likely to experience barriers to accessing health care (CIHI, 2011b).

Canada's rural populations are more likely to be older than urban populations because younger adults often move away from rural communities to find work in urban centers while older adults often stay in, or move to, rural communities once retired (CIHI, 2011b). Although the majority of older adults still live in urban centers, the higher proportion of older adults in rural communities needs to be considered as the population ages (CIHI, 2011b). If the demand for resources increases as the population ages, but there are fewer resources available, then it is reasonable to believe that under-resourced rural communities may continue to have a lower health status than urban centers, and older adults in under-resourced communities may experience more barriers to accessing care as the population ages.

The Context of Northern British Columbia

Whether a community is rural or urban is just one contributing factor to the overall health of its population. Geographical differences such as landscape and environmental

patterns like weather and pollution all contribute to the health of a population (Raphael, 2009). Some even consider geography itself a determinant of health (Raphael, 2009). For this reason, it is important to reiterate that the geographic area being considered for this research is the area of BC serviced by the NHA. In the nearly 600,000 square kilometers that make up the area of BC serviced by the NHA, the landscape is varied and includes mountain ranges, stretches of coastline, and glacial valleys (NHA, 2017a). This mixed landscape is home to approximately 300,000 people, more than 17% of which identify as First Nations (NHA, 2017a). Almost 25% (74,000/300,000) of the total population reside in the city of Prince George, while the rest of the population is dispersed throughout the remaining area (Statistics Canada, 2017b). Although not all of the communities in this area are considered rural, some specialist services are not always offered locally (i.e. geriatrics and geriatric psychiatry), and the next closest urban center with a particular specialist could be hundreds of kilometers away. Two main highways (Highway 16 and 97) connect the majority of the communities in this area, and while distances between them vary, some are as far away as a couple hundred kilometers from the nearest community. This poses an incredible challenge to deliver care to residents of this area, as well as creates geographical barriers to access care for its residents.

Among the population within the NHA's jurisdiction in 2018, there is an estimated 40,000 older adults living in this region (Statistics Canada, 2018b). However, only about 10,000 of these older adults live in Prince George (Statistics Canada, 2017b). Therefore, the remaining 30,000 older adults are dispersed between the remaining communities in this area. Considering the challenges to accessing care in rural communities and other communities without some specialist services – as is the case in the NHA's jurisdiction – telehealth has

been introduced as a way to meet the care needs of the population in this area when specialist services are not available.

Telehealth and Telegeriatrics Within the Northern Health Authority

Telehealth has often been thought of as a solution for challenges with care delivery in communities where certain services are not offered (Gatrell & Elliott, 2009). For example, telehealth technology can be used in some cases when local care providers are scarce, or when travel to urban centers is too costly, too far, or too dangerous for the patient. For these reasons, it is thought that telehealth could improve access to and timeliness to health care services, thereby narrowing the gap in health status between rural and urban populations (Gatrell & Elliott, 2009).

The NHA currently offers several telehealth services, one of which is telegeriatrics which is a service within the Geriatric Outreach Program. This service is available to residents within the NHA's jurisdiction who are generally over the age of 65 and require specialist geriatric care from a geriatrician or geriatric psychiatrist. In northern BC there is a shortage of geriatricians and geriatric psychiatrists to care for older adults who need these specialized services (S. Lau, personal communication, September 2018). Before the inception of this service, patients had to travel great distances (e.g. Vancouver) to meet with a geriatric specialist, or they had to wait several months to see a traveling specialist who conducts outreach clinics in northern BC. Patients then had to travel or wait again for any follow-up appointments. With the addition of this service, the NHA can now provide patients with specialist geriatric care with consultations closer to home.

The telegeriatric service is based on a referral model – that is, general practitioners refer patients that they feel would benefit from seeing a geriatrician or geriatric psychiatrist

to the Geriatric Outreach Program (S. Lau, personal communication, September 2018). At this point, patients' names are placed on a list to see a geriatric specialist in person during an outreach clinic. These clinics occur generally every three to four months. Patients are then seen via telehealth for any follow-up. These telegeriatric sessions also occur approximately every 3 to 4 months (the months that the outreach specialist is not available in person). The appointments take place in a room either in the patient's local hospital or health center that has been fitted with videoconferencing technology (S. Lau, personal communication, September 2018). Usually the patient is accompanied by a family caregiver and one NHA staff (e.g. nurse). The geriatric specialist then calls into the room via videoconference from either Vancouver or Victoria. The specialists in Vancouver or Victoria must travel to a designated videoconferencing room that has been booked by the NHA (usually a room close to their practice managed by Vancouver Island Health Authority or Vancouver Coastal Health Authority) (S. Lau, personal communication, September 2018).

Although the Geriatric Outreach Program and the telegeriatric service within this program is one way to address the barriers to accessing care and could be a support for older adults wishing to age in place, not enough is known about how this service affects the care of older adults within the NHA area. Having a better understanding of this service could support the NHA in quality improvement efforts for this service as well as add to the limited literature on Geriatric Outreach and telegeriatric services. Therefore, the research questions for this thesis are: What are the effects of the Geriatric Outreach Program on the care of older adults in northern BC? And how do the telehealth and in-person consultations compare in outcomes and cost?

Chapter 2: Literature Review

A review of the literature was conducted based on Arksy and O'Malley's (2005) scoping review methodological framework to determine the current understanding of telegeriatric consultations with older adults, the cost effectiveness of these services, and to identify knowledge gaps in the literature. This review was guided by the research question – how do geriatric consultations through telehealth affect the care of older adults in rural areas? The Population, Intervention, Effect (PIE) search strategy was used to identify key search terms (Hoffman, Bennett, & Del Mar, 2017), and reporting methods were based on the PRISMA extension for scoping reviews (Tricco, Lillie, Zarin, O'brien, Coloquhoun, Levac, et al., 2018).

Literature Search Methodology

The population was identified as 'older adults', and the intervention was 'telehealth'. Because there was no particular effect identified in the question, 'effect' was the final term used in the PIE strategy, but as it is a broad term, with many synonyms, it was not used in the initial data base searches. Instead, 'effect' was used to help determine relevancy when screening articles and data charting. A 'rural' limiter was then included to narrow the population to older adults living in rural areas, and due to the time and cost of translating articles, only English language articles were included.

Keywords and MeSH terms were identified for each term (Figure 1.). Although search strategies differed slightly for each database, generally the PIE terms (solid outlined boxes in Figure 1.) were combined with their related terms (dash-outlined boxes in Figure 1.) using the Boolean operator "OR" and then each PIE term was combined with the Boolean operator "AND". Seven data bases were searched in total and included PubMed, CINAHL,

Cochrane Reviews, Econlit, Business Source Complete, PsycInfo, and Medline (Ovid). One potential article was found through Google Scholar, but the full article could not be retrieved. A list of the electronic search used in the database PubMed can be found in Appendix A.

After the final search, a total of 1855 articles were found. After duplicates were removed and level one screening of titles and abstracts, 71 articles remained. After level two screening of full articles, 22 articles were included in the final analysis. During level two analysis, articles were excluded if they were not original research (e.g. reviews, or editorials), did not involve primarily older adults, did not discuss outcomes, were not written in English, involved a specialty other than geriatrics, geriatric psychiatry, or geriatric mental health, was a different form of telehealth (i.e. not videoconferencing), or full article could not be retrieved. Articiles were organized by outcome, and after reading all articles three themes emerged: 1) studies that reported diagnostic outcomes of geriatric assessment through telehealth, 2) studies that reported clinical outcomes from consultations or assessments, and 3) studies that reported cost outcomes of geriatric consultations through telehealth. A literature matrix was created using Microsoft Excel to chart key elements of the studies including authors, title, publication date, study population, study purpose/questions, and main findings relevant to this literature review. The full literature matrix of studies included in the literature review can be found in Appendix B. The initial search was conducted in August 2019 and was run again in February 2020 to capture any articles fitting the criteria that were published since August 2019.

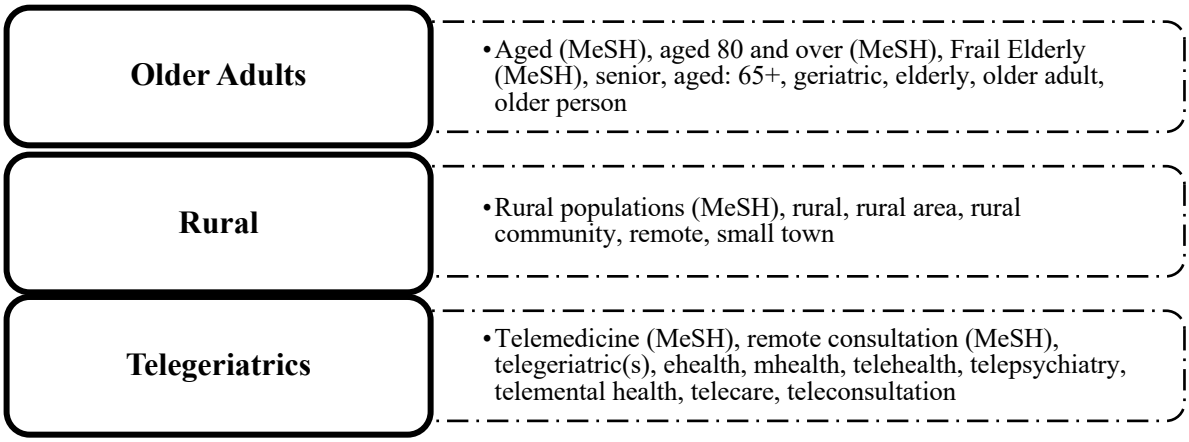

Figure 1. Search terms used in electronic databases. Solid outlined boxes are the PIE terms and the dotted outlined boxed contain the MeSH headings and key search terms.

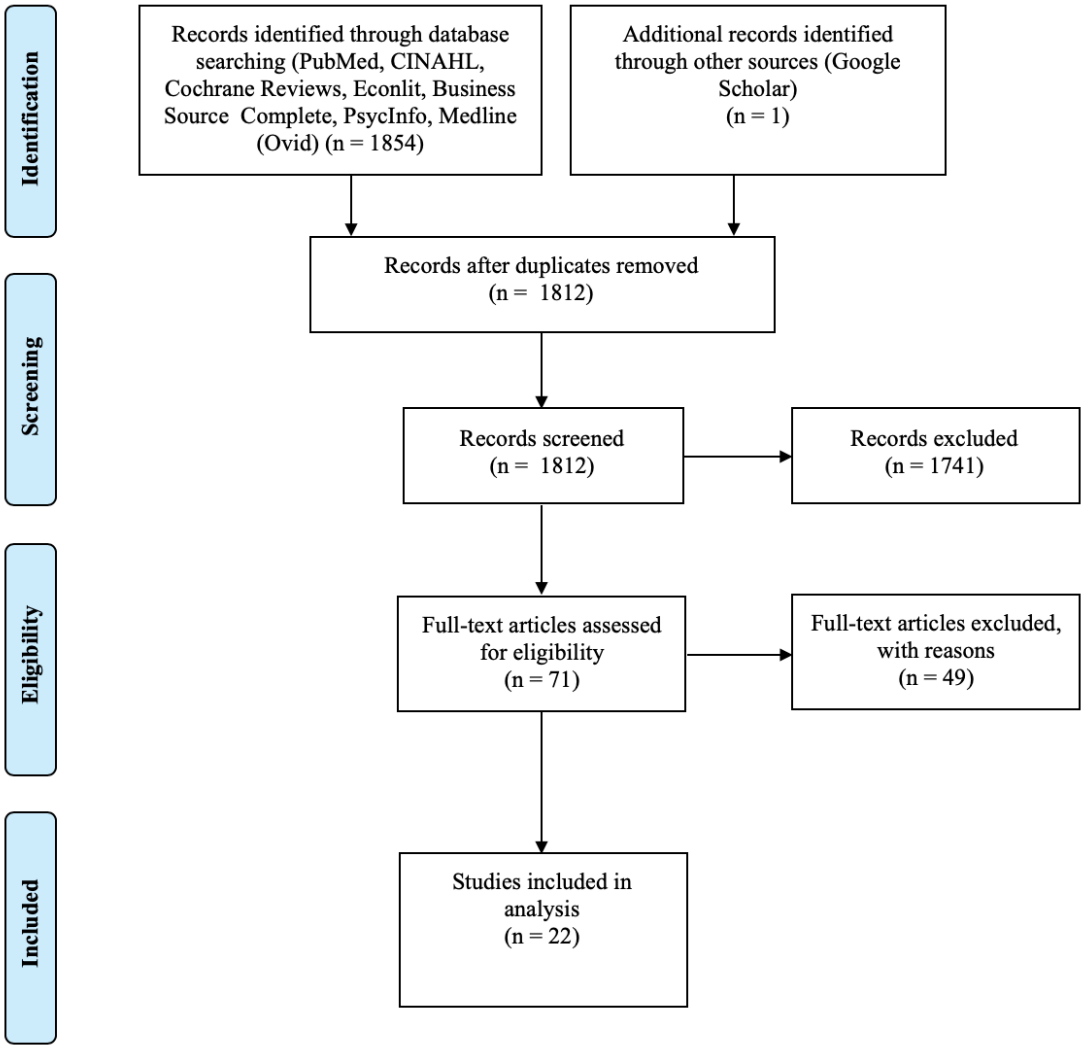

Figure 2. Flow diagram of the literature search and article selection process.

Findings

Publishing dates of included articles ranged from 2001 to the most recent in 2019. Study settings varied and included work from Australia, Canada, United States of America, and South Korea. Older adults involved in these studies varied and included those living in the community as well as those living in long term care facilities or admitted to the hospital. Studies were dominated by investigations of diagnostic accuracy of telehealth consultations compared to in-person consultations, but some studies also investigated the outcomes of geriatric consultations as well as costs.

Diagnostic Accuracy. Telegeriatrics is relatively new and has only emerged as a distinct area of telehealth within the past decade and a half (Brignell, Wootton, & Gray, 2007). Reports of consultations through videoconferencing with older adults have been documented since 2001 when Jones, Johnston, Reboussin, and McCall (2001) reported that psychiatric assessments of older adults through videoconferencing were just as effective as in-person assessments even when the assessment included both verbal responses and visual observations. This has since been more recently supported by Grosch, Weiner, Hynan, Shore, and Cullum, (2014). Neuropsychological evaluation of older adults with cognitive impairments have also been reported as effective through videoconferencing as early as 2006 (Cullum, Weiner, Gehrmann, & Hynan, 2006). Studies that look more specifically at geriatric consultations conducted by geriatric specialists such as geriatricians and geriatric psychiatrists have more consistently been published since the mid 2000's and focus heavily on ability to effectively diagnose dementia (Cullum et al., 2006; Dang, Gomez-Orozco, Zuilen, Levis, 2018; Martin-Khan, Flicker, Wootton, Loh, Edwards, Varghese, P., …Gray, 2012) and Alzheimer's Disease (Loh, Maher, Goldswain, Flicker, Ramesh, & Saligari, 2005)

through videoconferencing. For example, Martin-Khan et al (2012) investigated the accuracy of diagnosing dementia through videoconferencing compared to diagnosing dementia in-person and found that diagnosing dementia in using videoconferencing was just as accurate as in-person. Similarly, Loh et al (2005) found that diagnosing Alzheimer's Disease through videoconferencing was just as effective as in-person, with high sensitivity (90%) and sensitivity (100%).Over a period of more than a year, videoconferencing for the assessment and management of patients with cognitive decline was just as effective through videoconference as in-person (Kim, Jhoo, & Jang, 2017).

Accuracy of tests used during geriatric assessments have also been featured routinely in the literature and it has been reported that global cognition, attention, and visuospatial functioning tests for older adults are diagnostically accurate though videoconferencing (Grosch et al., 2014) as well as standardized tests such as the Mini Mental State Exam (Loh, Ramesh, Maher, Saligari, Flicker, & Goldswain, 2004; Ciemins, Holloway, Coon, McClosky-Armstrong, & Min, 2009), and Montreal Cognitive Assessment (DeYoung & Shenal, 2019) used for diagnosing cognitive disorders and dementia. Some language skills tests used during dementia assessments have also been found to be effective through videoconferencing and include picture description, Boston Naming test, multi-lingual aphasia examination, aural comprehension of words and phrases, and controlled oral word association test (Vestal, Smith-Olinde, Hicks, Hutton, & Hart, 2006). However, more recently it has been found that the cognitive deficit rating given to older adults with severe Alzheimer's disease during a geriatric assessment can be over-estimated when the assessment is conducted through videoconference compared to when it is conducted in-person, but that there are no differences between consultation types when the patient has mild

to moderate Alzheimer's disease (Carotenuto, Rea, Traini, Ricci, Fasanaro, & Amenta, 2018).

Outcomes from consultations. Medication changes have been reported as an outcome of geriatric assessment through telehealth (Conn, Madan, Lam, Patterson, & Skirten, 2013), but compared to initial assessment, follow-up assessments through videoconferencing result in fewer medication changes (Chang, Homer, & Rossi, 2018). Chang et al (2018) reported that potentially innapropriate medications were recognized and discontinued more often during initial assessments so that subsequent consultations resulted in fewer medication changes. Further testing (e.g. brain imaging) has been a common result of geriatric assessments through videoconferencing (Conn et al., 2013; Dang, Gomez-Orozco, Zuilen, & Levis, 2018) as well as new diagnoses and referrals to other specialties (e.g. social work) (Dang et al., 2018). Recently reported in the literature has been physician confidence in patient diagnosis and management planning from geriatric consultations leading to changes in care provision (Goodwin, McGuirk, & Reeve 2017). Goodwin et al (2017) reported that geriatric consultations through telehealth provided an opportunity for local doctors to learn from geriatric specialists and improved their competency in caring for older adults with similar health concerns in the future. Burnett and colleagues (2019) reported increased referrals as a result of a geriatric assessment program through video-phone that was implemented in rural Texas for assessment of mental health and signs of possible abuse among older adults; referrals reportedly increased substantially from 100 per year when the program did not inclide vide-phone assessments to 300 in only eight months.

Costs. A number of studies have compared the cost of videoconferencing consultation to in-person consultation for telehealth services involving older adults with each

study reporting different costs based on the travel requirements specific to their area. However, the common factor among them is that telehealth consultations are cheaper than in-person consultations when in-person consultation involves travel to rural sites (Rabinowitz, Murphy, Amour, Ricci, Caputo, & Newhouse, 2010; Gray, Wright, Cutler, Scuffham, & Wootton, 2009; Conn, Madan, Lam, Patterson, & Skirten, 2013; Comans, Martin-Khan, Gray, & Scuffham, 2013; Versleijen, Martin-Khan, Whitty, Smith, & Gray, 2015). For example, Comans and colleagues (2013) found that the cost for a videoconferencing memory clinic was $881 (Australian dollars [AUS]) while the base cost of an in-person clinic was $522 (AUS), however if travel to conduct the in-person clinic was any amount of time above two hours, the additional cost of travel ($2.62 AUS per minute) increased the cost of in-person clinics so that they were more expensive than videoconferencing. Similarly, Gray et al. (2016) found that it was less expensive to host geriatric consultations through videoconference if there were four or more consultations needed than to have a specialist travel more than 76 minutes round trip to provide the service. Although some of the studies did indicate that in-person consultations were less expensive in circumstances with fewer patients or fewer kilometers and travel time (Gray et al, 2009; Vesleijen et al., 2012; Comans et al., 2013), these circumstances are less likely, ultimately resulting in telehealth as the cheaper option.

Summary

The effectiveness of geriatric assessments to diagnose cognitive disorders, dementia, and Alzheimer's disease supports care of older adults by providing them with accurate diagnoses that can then be managed. If these tests were not accurate, patients could end up with management plans that are not effectively treating their disease. Since so many aspects

of geriatric assessments seem to be accurate through videoconference, telehealth-enabled geriatric assessments could also improve management of complex geriatric caseloads and prevent transfers of patients out of community (Gray, Fatehi, Martin-Khan, Peel, & Smith, 2016) and lead to fewer face-to-face referrals since the majority of consultations can be completed accurately through telehealth so that in-person follow-up is unnecessary (Castanho et al., 2017).

Although only a few outcomes of geriatric assessments through telehealth have been reported in the literature, medication changes made during geriatric assessment support patients who are on too many medications (polypharmacy) or have been under prescribed – both of which are common among older adults (Chang, Homer, & Rossi, 2018). The other outcomes of geriatric assessments via videoconferencing – further testing and referrals to other specialties – may support care by confirming diagnoses (further testing) or partake in patient management once diagnosed (e.g. referral to social work).

Cost analyses of telegeriatric services have shown that videoconferencing is a cost-effective way of delivering care in rural areas under most circumstances, thereby supporting implementation of these services in rural areas and increasing access to specialist geriatric care for rural older adults.

Conclusion

The literature indicates that the effects of telehealth (specifically videoconferencing) on the care of older adults is similar to that of in-person geriatric consultations and includes effective diagnoses of Alzheimer's, dementia, and cognitive decline. Many of the relevant diagnostic tests associated with geriatric assessments are also just as accurate and reliable as in-person geriatric assessments and can contribute to appropriate diagnoses. In contrast to the

well-documented diagnostic accuracy of telehealth is the relative lack of literature pertaining to outcomes of telegeriatric consultations. If telehealth is the way of the future, more research on the outcomes of these services is needed. While a number of cost comparisons have demonstrated that telehealth consultations with older adults are more cost effective than in-person consultations depending on how far specialists have to travel to reach the rural communities, due to variations in travel and equipment costs, a cost analysis for each telegeriatric service may be warranted.

Limitations

It should be noted that this literature review was conducted by only one researcher (lead author) so inter-rater reliability of the article screening process cannot be reported. However, the reporting methods for this work including the example data base search for PubMed and the literature matrix (provided in Appendix A and B, respectively) were included to improve transparency and trustworthiness of the literature review.

Chapter 3: Methods

This work employed a multi-methods research design. This design was chosen because it allowed for the collection of both qualitative and quantitative data (Morse, 2003). Together, the collection of qualitative and quantitative data provided a holistic view of the research question (Creswell, 2008). Quantitative data provided insight on demographic trends and outcomes of consultations, while qualitative data provided an in-depth description of formal-care providers' perspectives and experiences with the Geriatric Outreach Program (Creswell & Poth, 2018). Each research method was completed separately and then was considered together in the final summary.

Participants/Sample

For the qualitative portion of this work, general practitioners who referred patients to the Geriatric Outreach Program and geriatric specialists (geriatricians and geriatric psychiatrists) who provided care through the service were invited to take part in a semi-structured interview. A total of 6 participants were interviewed, including general practitioners (n = 4) and geriatric specialists (n = 2).

The quantitative portion of this work used data from consultations letters written by geriatric specialists to the referring general practitioner following consultation with the patient. This was a retrospective examination of patients' first follow-up through the Geriatric Outreach Program during the 2017/2018 fiscal year. A total of 95 consultation letters were analyzed including n = 33 from those who had been seen in-person and n = 62 from those who had been seen through telehealth (videoconferencing).

Recruitment for Interviews

General Practitioners and geriatric specialists for this work were identified for interviews by the Regional Coordinator for Geriatric Outreach Services at the NHA. Recruitment for interview participants was supported by the Regional Coordinator for Geriatric Outreach Services as well. This NHA partner approached physicians and sought initial consent to participate in the study. Participants were then asked to follow up with the lead author directly so that decisions to participate were confidential. Snowball sampling was also used, and participants were asked to recruit peers who they knew had referred patients to the Geriatric Outreach Program.

Data Collection

The two elements of data collection – semi-structured interviews and retrospective letter reviews – were conducted concurrently for this project. Interviews were conducted either via telephone or videoconference (BlueJeans) depending on the preference of the interviewee and an interview guide was used for each interview (see appendix C for interview guide). As many of the interviewees were located in another community this method of data collection was convenient and economical. Interviews were recorded and transcribed for analysis.

Following ethics approval from both the UNBC Research Ethics Board and the NHA Research Ethics Board, the NHA granted access to the consultation letters. An NHA partner trained the lead author to identify the applicable consultation letters within the current letter storage system, and then the lead author de-identified the relevant letters before analysis. Particular attention was payed to indications in the consultation letters that changes in care had been made during the health event. This included notes such as change in medication,

change in current treatment, referrals to other specialties, new diagnosis made, and follow-up requested.

Data Analysis

Data analysis was conducted in two parts. The first part was content analysis of the semi-structured interviews. Content analysis followed Erlingsson and Bysiewicz's (2017) guide for content analysis and Creswell and Poth's (2018) methods for qualitative analysis were used to determine patterns and themes in the data that describe the care provider experience with the Geriatric Outreach Program as well as their perceptions of how the program influences care of older adults. Themes started emerging after the third interview, and after the sixth interview, data saturation was achieved as no new themes were discussed in the interviews. Interviews were recorded and transcribed and then the authour (GB) read and re-read the transcripts several times to get a sense of the data as a whole. Transcripts were then loaded onto Nvivo 12 (QSR International, Australia) to track coding and organize data. The coding and theming process was iterative until no new themes emerged in the data. The analysis process was recorded in a log book, and the thoughts, impressions, and decisions made during analysis were also recorded in a diary. The log book and diary made up the audit trail to improve trustworthiness of the study and document rigor (Creswell & Poth, 2018).

The second part of analysis was the retrospective review of consultation letters. Consultation letters were anonymized and then variables were extracted from the consultation letters. This process was overseen by a Northern Health Authority partner to ensure accuracy and appropriate use of the data. Analysis was conducted using SPSS

statistics software (IMB SPSS Version 24, Armonk) to determine descriptive statistics and understand the differences in outcomes between the telehealth and in-person consultations.

Chapter 4: Effects of a Geriatric Outreach Program on the Care of Older Adults in Northern British Columbia

Background: Telehealth is a recognized mode for delivering health care, especially in communities with limited resources. Telegeriatrics, a branch of telehealth, utilizes videoconferencing to provide specialist geriatric care to older adults in rural communities. In northern BC, a Geriatric Outreach Program that includes an in-person and a telegeriatric component has been established. However, not a lot is known about how the program influences the care of older rural adults.

Objective: The goal of this chapter was to investigate provider perspectives of the Geriatric Outreach Program in northern BC and to better understand the effects this program has on the care of older adults in this area. A secondary goal was to compare the in-person and telegeriatric delivery methods within this program.

Methods: A total of 6 participants were interviewed, including 4 general practitioners who referred patients to this program and 2 geriatric specialists who provided care through this program during the 2017/2018 fiscal year. Interviews occurred over the months of July and August 2019 and were recorded and transcribed for content analysis. Erlingsson and Brysiewicz's (2017) guide for content analysis as well as methods for qualitative analysis from Creswell and Poth (2018) were followed.

Results: Analysis revealed 3 major ways that the Geriatric Outreach Program affects care of older adults in northern BC, including care planning for patient management, providing formal-care provider support, and improving access to geriatric specialists for patients. Differences in telegeriatric consultations compared to in-person consultations revealed that

telegeriatric consultations required additional resources (in-person personnel) during the appointment and that physical examinations could not be performed.

Conclusion: From the perspective of care providers, the Geriatric Outreach Program is positively affecting the care of older adults in northern BC and fostering rapport between referring physicians and geriatric specialists. However, the challenges to providing care through the telegeriatric services without appropriate level of in-person personnel should be addressed.

Introduction

Canada is currently experiencing an unprecedented surge in its population aged 65 and older. Over the next several years, this age group in Canada is projected to increase from 16.9% of the total population to 20% in 2024 and to 30% in 2035 (Canadian Institutes of Health Research [CIHR], 2017). Once 30% is reached, Canada's population will be considered a super aged nation (CIHR, 2017).

The health care system at the time of writing is designed to address the acute care needs of a younger population and implement preventative care strategies (Canadian Medical Association, 2016). Therefore, there is growing concern that the health care system will not be able to support the expected increase of older adults if it remains the same (Canadian Medical Association, 2016). Since older adults are more likely to be living with multiple chronic conditions and require more care than persons without chronic conditions (CIHI, 2011a), an aging population would likely require more focus on the treatment and maintenance of complex conditions and comorbidities (CIHI, 2011a).

As health care spending increases with age, it is likely that the population 65+ could increase the financial strain on the health care system (Jackson, Clemens, & Palacios, 2017). In 2017, Canada spent an estimated 242 billion dollars on health care, with nearly 46% of this budget going towards the care of older adults (CIHI, 2017).

Another challenge for health authorities arising from the aging population is the desire of older adults to age in place and the trend to remain in their chosen community as they age (Wiles et al., 2012). For rural communities especially, where resources are already limited, there may be little support from the health care system for older adults aging in place. Rural communities often lack specialized medical services such as geriatrics that

would benefit older adults. During winter months residents in rural communities are less likely to travel out of community for services due to unsafe road and weather conditions and it becomes increasingly difficult for people to travel out of community to access services as they age and become frail (Regan & Wong, 2009). Therefore, alternate modes of care delivery that can improve access to specialized care for older adults in rural communities could be essential to supporting older adults who wish to age in place.

Telehealth has often been thought of as a solution for challenges to access and care delivery in communities where some medical services are scarce (Gatrell & Elliott, 2009). Telehealth is defined by the World Health Organization [WHO] (2010) as:

> The delivery of health care services, where distance is a critical factor, by all health care professionals using information and communication technologies for the exchange of valid information for diagnosis, treatment and prevention of disease and injuries, research and evaluation, and for the continuing education of health care providers, all in the interests of advancing the health of individuals and their communities. (p.9)

In this way, telehealth could overcome issues like costly or dangerous winter travel and improve access to and timeliness to health care services thereby supporting older adults to age in place in rural communities (Gatrell & Elliott, 2009).

In rural northern BC, the health authority responsible for this area has recognized challenges associated with its aging rural population, and they have implemented a Geriatric Outreach Program. This program started nearly 20 years ago as a way to increase access to geriatric care for older adults living in northern BC (S. Lau, personal communication, November 2019). The initial design of this program brought geriatric specialists

(geriatricians and geriatric psychiatrists) into communities for outreach (face to face consultations with patients) approximately four times a year. In 2014, a telehealth component was added to improve access to this service between outreach appointments and during winter months when travel may not be possible (S. Lau, personal communication, November 2019). The telehealth component provides a videoconferencing connection between the patient and the geriatric specialist (whose regular practice is hundreds of kilometers away) approximately four times a year and is primarily used for follow-up consultations with patients. In most cases, the first consultation with a patient occurs in-person. To improve continuity of care, geriatric specialists provide service to the same communities each time they provide consultation services. To date, there are 17 geriatric specialists involved in the outreach program, but only four of them also provide telehealth consultations (S. Lau, personal communication, November 2019). In the 2017/2018 fiscal year, this program provided 752 geriatric consultations, and 177 (24%) of those were through telehealth, heretofore referred to as telegeriatrics.

Having a better understanding of this program from the provider perspective and how it influences care of their older patients could support quality improvement efforts for this service as well as add to the limited literature on geriatric outreach and telegeriatric services. With that in mind, the two research questions that will be answered are: 1) how does the Geriatric Outreach Program affect the care of older adults in northern BC? And, 2) how does the videoconferencing component of the Geriatric Outreach Program compare to the in-person component?

Methods

Study design. This study took a qualitative research approach as part of a multi-methods research study.

Participants. Participants, identified by a health system partner, included general physicians who had referred patients to the Geriatric Outreach Program and specialist physicians (a geriatricians and a geriatric psychiatrist) who had provided care through the Geriatric Outreach Program during the 2017/2018 fiscal year.

General physicians were located in different communities in northern BC and included representatives from each region of the health authority (north east, north west, and northern interior). Since the health authority is so vast (approx. 600,000 square kilometers), the experiences of physicians from the different regions were captured to provide a more accurate representation of the area as a whole.

Participants were sent a recruitment email by a health system partner and asked to follow-up with the first author directly if they were interested in participating in the study. A total of six participants were recruited for the study including four general practitioners and two geriatric specialists (50% of the eligible geriatric specialists).

Data collection. Semi-structured interviews were conducted with participants over the months of July and August 2019. Four interviews were conducted via telephone and two were conducted through the computer application Bluejeans, based on the participant's preference. Interviews averaged 28 minutes 19 seconds in length with the longest interview taking 59 mins 24 second and the shortest interview taking 17 minutes and 43 seconds, and were all conducted by the same researcher (GB). Interviews were recorded and transcribed.

Data analysis. Content analysis was conducted based on Creswell and Poth's (2018) qualitative analysis methodology. Transcripts were read and reread multiple times to get familiar with the data. NVivo 12 (QSR International, Australia) was then used to code data, pull out themes and analyze the contents of the transcripts. Coding was iterative until data saturation was achieved and no new themes emerged in the analysis. A codebook was created to record meaning and justification for each code and add to the auditability of the analysis process. Field notes were also used to record thoughts, processes, and emerging themes and develop an audit trail. Regular peer debriefing opportunities were used to make sure findings were robust. During the interviews, key points were summarized back to participants for validation and to support the credibility of the analysis.

Ethical considerations. This study was approved by the University of Northern British Columbia research ethics board and the Northern Health Authority Ethics board in a harmonized ethics review process. The ethics approval certificate is attached in Appendix A (REB H19-01162).

Effects on Care

Results were examined by research question – how does the Geriatric Outreach Program affect the care of older adults in northern BC? And how does the videoconferencing component of the Geriatric Outreach Program compare to the in-person component? Three major themes including care planning, access, and provider support emerged from the data to answer the first question, and two major themes – resources and testing – emerged to answer the second question. Specific attention was also paid to three particular effects: change in medical management of patients, change in rapport between specialist and referring general

practitioners, and change in level of care provided through telehealth compared to in-person consultations.

When examining the effects of the Geriatric Outreach program on the care of older adults in northern BC, three themes emerged including: care planning, provider support, and access. Each theme had a number of subthemes as demonstrated in dotted boxes in Figure 1.

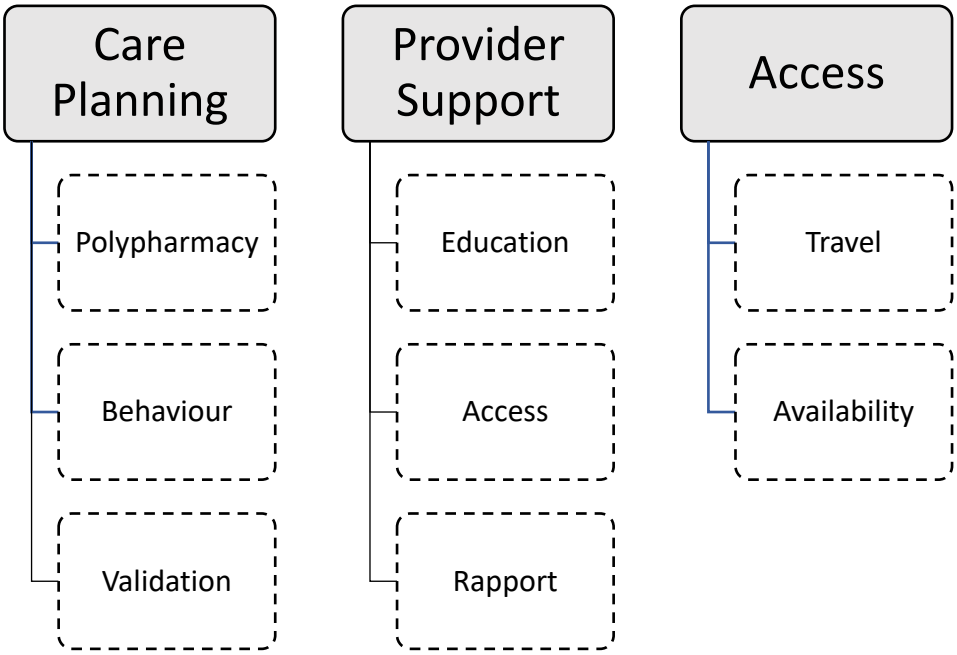

Figure 1. Major themes and subthemes of the effects that the Geriatric Outreach Program has on the care of older adults in northern BC. Major themes are above in solid outlined boxes, and subthemes are listed below in dotted outlined boxes.

Care planning. After geriatric specialists consult with patients through the geriatric outreach program, they send consultation letters to the referring physician that includes an overview of what occurred during the assessment and a care plan with suggestions for the referring physician on how to move forward to support the patient. General practitioners

discussed these care plans as an important way that the Geriatric Outreach program supports the management of their patients as they provide anticipatory guidance that they can trial and learn from to continuously improve how they care for their older patients. One general practitioner stated, “It certainly dictates or changes the way I manage patients. They obviously give me suggestions and guidance, so ultimately it does change the way I practice, of course”. General practitioners explained that the consultation letters were thorough and exceeded expectations so that even if they had referred a patient for one reason, the specialist considered many issues and patient concerns and reported back to the referring physician with a holistic view of how to move forward with care. One general practitioner described this with an example of a patient that they had referred for polypharmacy:

> There are about five or six recommendations here. Not just regarding medications but everything, activity, catheter care, cognitive functioning, etcetera. So, you kind of get a very thorough assessment of the patient and then it’s not just one thing that you look at.

In this way, care plans developed through the Geriatric Outreach Program affect the care of older adults by providing detailed guidance to the patient’s general practitioner that the practitioner can then use to improve the care that the patient is receiving.

Polypharmacy. One of the ways that general practitioners have been using the care plans to improve care is to change or decrease medications for patients who are on multiple medications or experiencing polypharmacy; general practitioners described being able to improve the pharmacological profile of patients by following the recommendations set out by the geriatric specialists. Information in the care plans also helped general practitioners explain to patients and their families when medication adjustments were needed especially

when the patient and/or family members were hesitant about the change. A general practitioner noted that, “the report doesn’t just act as telling me what recommendations to do, but I can also use the reports in telling the patients and showing them that certain medications should be avoided or decreased.”

Behavior. As well as using the geriatric specialists’ medication knowledge provided in the care plans, general practitioners also use the specialists’ expertise to manage concerning patient behavior. Following the recommendations made in the care plans, general practitioners have been able to manage patient behavior through cognitive behavioral therapy with fewer or no medications. One general practitioner stated:

> The care management plans have really paid off so much that one [doesn’t] have to use medications specifically but using the psychiatrist’s experience of cognitive behavioral therapy… we don’t have to medicate the patient for that behavior, the behavior has turned around.

Validation. Care plans also acted as validation for the general practitioner in some cases when the geriatric specialist agreed with the general practitioner’s existing plan of care. Although this might not affect patient’s care directly, it does confirm that the care they are already receiving is appropriate. One physician noted “they make small changes, small recommendations, or they validate what we were doing, or we were thinking”.

Provider support. The Geriatric Outreach Program also provided the general practitioners with support to feel confident caring for their older patients. One general practitioner stated, “I feel more reassured and more confident in providing geriatric care because I know I have an excellent support system”. Three subthemes emerged from the data to explain how providers feel supported by the Geriatric Outreach Program and included:

education through continuing medical education (CME), having access to the outreach program, and the ability to build rapport with the specialists.

Education. One of the main ways that the Geriatric Outreach Program supported provider practice was through CME learning opportunities presented by the geriatric specialists and advice and recommendations made in the care plans. General practitioners who had participated in CME with the geriatric specialists reported that it had contributed greatly to their knowledge and ability to care for their older patients. Participants explained that this education gave them more confidence to manage patient families and care givers as well as communicate recommendations with more assurance. One physician noted, "I definitely feel that having learned more and having more confidence that I can be more confident in verbalizing, communicating", and another mentioned that "if you can actually have a report saying – look the recommendation is we need to either change or cut back – and you can actually show that to the family, it makes the whole process of dealing with it a lot easier".

Access. Having access to the geriatric specialists through the Geriatric Outreach Program was another way that the general practitioners felt supported in the care of their older patients because some of them did not specialize in geriatric care when they were in medical school. Without this program in northern BC, general practitioners mentioned that they would not feel as comfortable caring for their older patients due to the added complexity of their care needs. General practitioners also noted that having access to the geriatric specialists when they visit the community in-person as well as knowing that they can contact the specialists though phone for questions or concerns helped them feel supported to care for

their older patients in northern BC. One physician explained, “if we ever run into trouble with someone or if you need help, you know the team is there and they are accessible.”

The design of the program and its inclusion of both in-person and videoconferencing components was credited with improving access to specialist support for the general practitioners because it provides another mode of communication with the specialists. One physician explained “the outreach program plus the videoconferencing, plus the telephone access makes it like those two geriatric specialists feel like they’re part of our medical community”. Some general practitioners referred patients more often or were more likely to refer patients because the availability of the videoconference component allows for more continuity of care for their patients in the winter. One general practitioner stated that they were more likely to refer patients because “the geriatric program has reliable follow-up” in the form of the videoconferencing component and that they did not have to wait as long for the specialists to return to community. Videoconferencing also helped providers care for their older patients during the winter months when the outreach team does not travel to community. However, one participant stated that their referral pattern was the same and that the availability of the videoconferencing component did not factor into their decision to refer patients.

Rapport. Through the Geriatric Outreach Program, general practitioners and the geriatric specialists have been able to build rapport and feel comfortable connecting with each other if necessary, to discuss a patient. Referring general practitioners felt that the geriatric specialists were available to provide them with guidance and having opportunities to meet some of the specialists during CME presentations also helped solidify rapport between the two parties. One general practitioner mentioned, “I’ve actually phoned some of the

specialists on the team and asked them as well about certain things, so I know they are available with that." The geriatric specialists noted that the CME events and the outreach trips to the communities also helped them understand the level of resources that the general practitioners have access to in the northern communities which influences some of the recommendations they make for patients; knowing which resources were and were not available, helped them develop a realistic care plan for the general practitioners to follow that would still support patient care.

Patient Access. Another way the Geriatric Outreach program influenced the care of older adults in northern BC is by increasing access to geriatric specialists and decreasing the need to travel out of community to access geriatric care. Since the specialists do outreach in the community and are also available through videoconferencing for follow-up or emergent cases, patients do not have to travel as far, if at all, to receive this type of care.

Travel. General practitioners emphasized that some patients would likely not access geriatric care if they had to travel out of their community, so having the Geriatric Outreach Program means that more older patients receive care. One general practitioner noted, "many of my patients, I don't know if I would be able to get them to see geriatricians if they [had] to travel out of town". The videoconferencing component of the program was credited with supporting care throughout the winter when specialists cannot travel as frequently to community. Adverse weather and driving conditions can be prohibitive during winter making traveling to the northern communities dangerous. One physician stated, "our biggest fear up here is traveling, especially in the winter months, so ya, the [video]conference part definitely makes it easier". Another physician explained that travel was not always realistic for some patients, "many of them are more frail, elderly patients, so it is easier for them to have a

consultation via videoconference in the wintertime". In this way, the Geriatric Outreach Program supports the care of older adults in northern BC by providing geriatric care closer to home all year round.

Availability. Although general practitioners agreed that the combination of the outreach visits and the videoconferencing increased accessibility to geriatric specialist care for their patients, they also suggested that more visits throughout the year would be beneficial. The geriatric specialists mentioned that the frequency of visits is often not appropriate, meaning that some patients should be seen sooner but that there are not enough patients to justify increasing frequency of visits. Although the Geriatric Outreach Program is supporting the care of older adults by providing geriatric care closer to home and limiting the need to travel, more frequently available geriatric consultations may support care even more.

Videoconferencing Versus In-person Consultations

When examining provider perspectives of the differences between videoconferencing and in-person consultations, two themes emerged from the data and included resources and testing. Although neither of the specialists felt that they were providing a lower level of care through the videoconferencing component, they both discussed some challenges they faced providing care in this way that included a lack of resources and difficulties performing physical testing.

Resources. Additional resources are required for videoconferencing appointments compared to in-person appointments involving an additional person in the room with the patient who can assist the specialist with the consultation. Consultations that have this person present – who is usually a nurse – are much more successful because the person knows the patient and can answer questions about the patient to help them through the consultations. As

a number of the patients have cognitive deficits and memory decline, the extra person in the room also helps ensure that the information collected from the patient is as accurate as possible. One specialist stated, “Sometimes I’ve had a person from the community who knows the patient join the telehealth session which is super, super helpful and I think it always provides a more holistic experience for the patient and just allows us to get more things done.” However, it was noted that while this extra resource is helpful during in-person appointments, it is not always necessary because nurses and other onsite personnel are available to give more information about certain patients if needed.

Another challenge for videoconference consultations was the slight time delay with the technology so that it seemed like the videoconference appointments took longer to complete than the in-person consultations. This delay also affected the fluidity of the conversation and somewhat depersonalized the appointment. One specialist stated, “It is slower because there’s a technology delay, there’s a slight lag in the videoconferencing and so when you ask the question you have to wait a little bit longer before the answer comes back.” It was also suggested that videoconferencing consultations were not suitable for some patients due to sensory issues, although this group of patients was suspected to be quite small. One specialist described this when they stated:

> I think most people are okay to continue to be seen in telehealth, I would say there is probably a handful of people that it’s just not working, so either they have really significant sensory problems or really poor hearing, poor visions, or they have some behavioral symptoms of dementia or they may have some psychosis related to their dementia particularly that makes telehealth impossible. Or their cognitive impairment

> does not allow them to actually kind of identify what's on the screen is me and that we're having this conversation.

Therefore, for some older adults, telehealth might not be the ideal service delivery method and alternative accommodations may be needed. Updated technology that does not have a time delay or a specific person in the room who can facilitate and support the patient through the consultation (or both) may be required for this group of older adults.

Testing. Assessments that included physical elements as with cognitive testing were reportedly more difficult through videoconferencing than in-person. However, it was also mentioned that cognitive testing can be done by anyone, and that if it is done by someone (e.g. a nurse) before the videoconference consultation, the appointment is more successful. One specialist emphasized this when they stated:

> Having someone ahead of time doing the cognitive testing for example, makes the experience a lot better because if I'm seeing patients with cognitive issues with no cognitive testing, really makes it very difficult to make me feel like I'm doing appropriate assessments.

Physical exams were also discussed as tests that cannot be done through telehealth. One specialist stated:

> What you're really missing when you do telehealth is you can't actually touch the patient, so you can't do a proper physical exam and so if they're coming with a lot of medical issues, it becomes very difficult to do the assessment.

Due to the challenges associated with testing through videoconference, specialists preferred to conduct initial consultations in-person so that they could perform any necessary physical examinations. Follow-up consultations were preferred for videoconferencing as long as there

was an extra person in the room for on-the-ground support and ahead-of-time cognitive testing. This might suggest that videoconferencing may not have as many uses as traditional in-person consultations if it is primarily being used for follow-up.

Discussion

The Geriatric Outreach Program affects the care of older adults in northern BC by supporting care planning for patients, providing patients with access to geriatric specialists, and supporting general practitioners to appropriately care for their older patients. Care planning occurs in many countries, including Canada, as a way to discuss current medical issues and related factors and develop a way forward with the patient using a care plan (Burt et al., 2014). Care plans that are developed by the geriatric specialists during consultation are a valuable tool for the referring physicians in their ongoing care of older adults by providing guidance to the physician or validating the current plan that is in place. This study presents evidence that care planning can also help decrease unnecessary medications and improve behavior issues among older adults. Since older adults are more likely to be on multiple medications and are more likely to experience adverse drug reactions (Dagli & Sharma, 2014), care planning through the Geriatric Outreach Program could help identify or prevent these reactions.

The Geriatric Outreach Program is also a way to decrease travel for patients by providing care closer to home thereby increasing patient access to geriatric care. Frailty and complex health issues facing some geriatric patients means that access to the Geriatric Outreach team is extremely important for ongoing health management. If patients did not have access to this program in northern BC, they would likely not travel out of community for care due to the challenges associated with travel at an advanced age and risks traveling in

harsh winter conditions (Regan & Wong, 2009). This is consistent with findings from Gatrell and Elliot (2009) who found that people who are closer to health services are more likely to access them than when the services are farther away, regardless of need, suggesting that without the Geriatric Outreach Program older adults in northern BC might not receive the geriatric care they need.

This work also confirms that the Geriatric Outreach Program supports general practitioners in their ongoing care of older adults through education and access to geriatric expertise, which is in line with the initial objective of the Geriatric Outreach Program to support care providers in their care of older adults (NHA, 2018). Education through the program (e.g. formal continuing medical education presentations, discussions with the geriatric specialists, and guidance from the care plans) can lead to a change in practice and an increase in knowledge and ability to care for patients in the future. This is supported by Cervero and Gaines (2015) who reported that effective continuing medical education can change physician practice and improve patient outcomes. The rapport between the referring general practitioners and the geriatric specialists was also facilitated through the Geriatric Outreach Program and supports ongoing care of patients through open communication and an understanding of the northern context within which the general practitioners work. Open communication between health care professionals supports patient care and prevents adverse patient outcomes (Coomber, Clavarino, Ballard, & Leutsch, 2018).

However, telehealth may not be the perfect solution to issues of health care access for rural older adults with severe cognitive deficits or sensory issues who may struggle with this type of service design. Volume of the videoconference can only be turned up so loud and if there is no trained individual in the room to facilitate the appointment, an in-person

consultation might better serve patients with cognitive and sensory issues. Additionally, geriatric specialists discussed some challenges associated with conducted consultations via videoconference, but they have already developed some informal solutions to these challenges. For instance, to overcome testing challenges during videoconferencing consultations, specialists have been requesting a nurse or other care worker to be in the room to assist with the appointment and requesting that cognitive testing be completed by a local health care professional before the patient is seen by the geriatric specialist. However, while it is easier for specialists to conduct a consultation if there is on-the-ground support in the room with the patient to answer questions and assist with assessment (Narasimha et al., 2017), there is evidence that in-person physical examination may play only a minor role in diagnosing dementia (Martin-Khan, Varghese, Wootton, & Gray, 2008), and diagnostic accuracy of dementia through videoconferencing is just as accurate as in-person (Martin-Khan et al., 2012). In this way, the telehealth consultations may not be being used to their full potential. If challenges to the videoconference consultations can be overcome, telehealth consultations could be used more often for initial assessments as well as follow-up consultations. This could improve patient access to geriatric care in rural communities even more if patients did not have to wait and rely on initial assessments in-person.

Strengths and Limitations

Although the sample size was small, there was a participant from each health service delivery area so that each area was represented. Data saturation was achieved with this sample size however, so a larger sample size may not be necessary in the future. Another strength is that referring physicians and geriatric specialists were interviewed, so that perspectives of patient care on both sides of the service were included in this study

supporting a more holistic view of the service and its effects on patient care. A limitation of this work was that both specialists were geriatricians, so it is unclear whether a geriatric psychiatrist (the other type of geriatric specialist) would have had a different experience with the Geriatric Outreach Program and telegeriatric service.

Conclusion

The Geriatric Outreach Program improves access to specialist geriatric care to older adults in northern BC by providing both in-person and telehealth consultations. The care plans that are developed during these consultations provide necessary guidance to referring general practitioners that is crucial to the ongoing care of their older patients. The Geriatric Outreach Program provides general practitioners with opportunities to learn and develop their practice of caring for older adults via recommendations made by the specialists and through continuing medical education sessions with the specialists. In these ways, general practitioners in northern BC have increased confidence to care for older adults, their families and care givers. This program is also an avenue for specialists and referring physicians to build rapport which can further support patient care by promoting open communication between general practitioner and specialist.

One of the main differences between the telehealth and in-person consultations is that in-person consultations are primarily used for initial consultations due to the challenges associated with the telehealth consultations such as a lack of resources and testing. However, specialists involved with the telehealth consultations have mitigated some of these issues by requesting that some testing is completed before the consultation, having a support person in the room, and primarily using videoconferencing for follow-up appointments.

This study provides insight into the perspectives of care providers on the Geriatric Outreach Program and how it is designed with both in-person and telehealth consultations. Investigation into the patient experience of the Geriatric Outreach Program, patient outcomes from each consultation type, and a cost analysis are warranted next steps so that the effects of the Geriatric Outreach Program on the care of older adults is understood from the provider perspective as well as the patient perspective, clinical perspective, and financial perspective.

Chapter 5: Comparison of In-person and Videoconferencing Geriatric Follow-up Consultations

Introduction: Telehealth has the potential to support the care of Canada's growing number of older adults and their desire to age at home by providing a videoconferencing connection to specialist geriatric care. Although this service exists within a Geriatric Outreach Program in northern BC more information is needed about this program to support the continuation, expansion and overall support of this service and program. The aims of this study were to compare telehealth and in-person consultations and to examine the effects of the Geriatric Outreach Program on the care of older adults in northern BC.

Methods: A retrospective chart analysis of secondary data was conducted with consultation letters from patients' first follow-up appointment with the Geriatric Outreach Program during the 2017/2018 fiscal year (N = 95). Univariate and bivariate analyses were conducted in SPSS software (IMB SPSS Version 24, Armonk).

Results: Patients seen through telehealth and in-person were similar in mean age (M = 79.1 and M = 78.1, respectively) and both had gender distributions that were predominately female. Telehealth consultations resulted in more requests for further testing and screening (p = 0.003), new diagnoses (p = 0.002), medication changes (p = 0.009), and requests for follow-up (p = 0.03) compared to in-person consultations. An average one-day clinic with one geriatric specialist providing consultations through videoconferencing cost $1,684 - $1,859 less than a one-day in-person clinic with one specialist.

Conclusion: Additional research is needed to confirm the differences in outcomes between telehealth and in-person consultations found in this work to fully understand the effects of telehealth on older adults living in northern BC. NHA decision makers may want to explore

offering more videoconferencing consultation because they cost substantially less than providing an in-person clinic with a specialist.

Introduction

Telehealth's ability to deliver health care services "where distance is a critical factor, by all health care professionals using information and communication technologies" (World Health Organization [WHO], 2010, p. 9) makes it an appealing solution to improve health care access in rural and low resourced communities (Sibley & Weiner, 2011). Telehealth has expanded over the last 30 years from phone, to real-time health care visits using videoconferencing technology, and has evolved to serve busy urban residents (Martin-Khan, Freeman, Adam, & Betkus, 2017). Advances in telehealth technologies and streamlining of technical processes, can decrease health care costs by reducing spending on specialist travel to rural communities (Jong, Mendez, & Jong, 2019). With Canada's booming aging population expected to put strain on the health care system (Canadian Medical Association, 2016), health care services that can improve access to care while decreasing costs are necessary.

A telehealth service known as telegeriatrics could be a cost-effective way to increase access to geriatric services by providing a videoconferencing connection between older adults in one community and specialist geriatric care in another community. Studies have indicated that this service is just as effective as in-person consultations for diagnosing dementia (Martin-Khan, Flicker, Wootton, Loh, Edwards, Varghese… & Gray, 2012) and assessment of persons with dementia using the Standardized Mini Mental Status Exam (SMMSE) and Geriatric Depression Scale (GDS) (Loh, Ramesh, Maher, Saligari, Flicker, & Goldswain, 2004). Telegeriatric services have also been found to be cost effective in scenarios where the alternative would require a specialist to drive as little as 76 minutes to see patients in-person (Versleijen, Martin-Khan, Whitty, Smith, & Gray, 2015). Reduced

acute care costs may also be possible with telegeriatrics as it has been associated with reduced unnecessary hospital admissions by older adults in long term care homes (Toh, Chia, Koh, Lam, Magpantay, De Leon, & Low, 2015).

A Geriatric Outreach Program in northern BC includes a telegeriatric component to support the delivery of specialist geriatric care to communities that do not have local geriatric specialists. The Geriatric Outreach Program was designed nearly 20 years ago and employs geriatric specialists from urban centers to travel to communities within the health authority to deliver in-person geriatric consultations approximately four times a year (S. Lau, personal communication, November 2019). In 2014, the health authority added a telehealth component to their program to further improve access to geriatric expertise between in-person visits and during winter months when harsh weather conditions make travel difficult (S. Lau, personal communication, November 2019). This component of the program, primarily used for follow-up, connects the patient within a designated health authority setting to a geriatric specialist via videoconferencing technology. As the geriatric specialists reside approximately 674 kilometers away from the closest community and 1800 kilometers from the farthest community (by road), traveling to a community for an in-person consultation is not always feasible, making videoconferencing a viable solution.

Since the Geriatric Outreach Program in northern BC is well established and has been in operation for a number of years, there is an opportunity to examine the effects of this program on the care of older adults and how the two delivery methods for consultations compare in outcomes and costs. This information could be useful to support quality improvement, continuation of this service, and any potential for expansion. This work presents a comparative review using the Geriatric Outreach Program in northern BC to

investigate the outcomes of in-person geriatric consultations and geriatric consultations through telehealth. This study also takes a rudimentary look at the cost of in-person and videoconference consultations to demonstrate differences in cost and potential cost savings.

Methods

Study design. This study was a retrospective chart analysis of secondary data and was part of a multi-methods research study.

Sample. Data were collected through chart reviews of consultation letters completed by geriatric specialists following Geriatric Outreach appointments. The specialists included geriatricians and geriatric psychiatrists who had provided care through the Geriatric Outreach Program in northern BC during the 2017/2018 fiscal year. These letters were written for the referring physician. Consultation letters all followed the same basic structure with the first part of the letter describing the patient and what occurred during the appointment, and the second part of the letter including a care plan and recommendations regarding care for the referring physician.

At the time of writing, 17 geriatric specialists were involved with the Geriatric Outreach Program, but not all of them used telehealth (S. Lau, personal communication, November 2019). To ensure continuity of care, specialists typically serviced the same communities each time they visited in-person or provided care through telehealth (S. Lau, personal communication, November 2019). According to the health authority's annual report, during the 2017/2018 fiscal year the Geriatric Outreach Program supported 752 geriatric consultations with nearly a quarter, 23.5% (N = 177/752) of those conducted through telehealth (2018). While 752 Geriatric Outreach Consultations were reported by the health authority in the 2017/2018 fiscal year, this number includes initial consultations as well as

multiple follow-ups for the same patient. This paper focuses on a cross-section of the total consultations and only includes first follow-up for unique patients, excluding initial consultations. Consultation letters were excluded if they only served to let the referring physician know that the patient did not show up to the appointment and no consultation occurred. Consultation letters were included if the patient did not show up for the consultation, but a caregiver did show up and a consultation still occurred (n = 2). Of the 752 consultations, 95 were unique first follow-up consultations and were included in analysis. These follow-up consultations included 62 telehealth consultations and 33 in-person consultations.

Data collection. Access to the consultation letters was granted and overseen by health system partners. A health system partner trained the lead researcher to access the consultation letters and identify the applicable ones for this research. This ensured that only the consultation letters appropriate for this work were included. Data were de-identified prior to analysis.

Data analysis. Data elements were extracted from the narrative consultations letters and categorized. The first half of the consultation letters were analyzed for demographic variables including age, gender, and follow-up service type (in-person or telehealth). The first half of the consultation letter also described concerns mentioned by the patient and/or caregiver present at the appointment. These concerns were labeled primary concerns and divided into six categories (variables): cognitive, physical health, pain, mental health, falls, and behavior. Cognitive concerns related to dementia, Alzheimer's disease, or issues with memory. Physical health included chest pain, constipation, edema, dizziness, and shortness of breath (but excluded general pain, as chronic pain was a separate category). Mental health

included depressive mood, anxiety, delusions, and hallucinations. Falls included recent falls or fears of falling, and behavior included changes in normal behavior (e.g. wandering or aggression).

The care plans provided at the end of the consultation letters were analyzed for outcomes of the consultation. Outcomes were divided into eight variables. These were 1) new diagnosis, 2) medication change, 3) further testing or screening, 4) recommendation of referral to another medical specialty, 5) change in level of care, 6) safety recommendations, 7) anticipatory guidance, and 8) further follow-up requested. Change in level of care included any suggestions of respite, day programs, transition to a long-term care facility (or other level facility) or an increase in home support[1]. Safety recommendations included recommendations such as driving tests, use of Lifeline, getting a home assessment, use of GPS tracker, or ways to prevent falls. Anticipatory guidance included any guidance from the specialist to the patient, their caregivers, or the referring physician as to what to expect from certain medications, or treatments or strategies to try in the future, recommendations of resources for further guidance, and for caregivers especially, what to expect with progression of disease.

Univariate and bivariate analyses were conducted using SPSS software (IMB SPSS Version 24, Armonk). A description of the patients who were seen through the Geriatric Outreach Program was generated through univariate analyses. Bivariate analyses included a t-test for continuous variables (age), and Pearson's chi-square or Fisher's exact test for

[1]Defined by the Government of British Columbia (https://www2.gov.bc.ca/gov/content/health/accessing-health-care/home-community-care/care-options-and-cost/home-support), "home support services are direct care services provided by community health workers to clients who require personal assistance with activities of daily living".

nominal variables (the remaining variables). Chi-square test was used unless the assumption of minimum expected value was violated (more than 25% of the expected values were less than 5), then Fisher's exact test was used (McHugh, 2013). Bivariate analyses were used to determine any statistically significant differences between the outcomes of telehealth and in-person consultations, and the two groups of patients: those who had been seen in follow-up in-person and those who had been seen in follow-up through telehealth. An alpha of 0.05 was used to indicate statistical significance.

A framework was developed with a Northern Health Authority partner to calculate the approximate cost per videoconference call and included hardware costs at the patient site, hardware costs at the specialist site, and the network infrastructure costs (i.e. network appliances, maintenance, support, staffing). Due to the range in costs associated with a videoconferencing call, the projected cost per veideoconferencing call was provided as a range of $7.50 - $25 (F. Flood, personal communication, January 2020). In-person costs were calculated for each community (n = 14) and took into account the actual number of patients from the total sample who were seen in those communities. In-person costs were based on basic travel costs including airfare, taxi, car rental, accommodation, and per diem costs. Airfare was calculated using Google Flights and was based on the average price of a roundtrip ticket to the airport closest to the outreach community (https://www.google.com /flights). Taxi fare was based on average price roundtrip from downtown Vancouver to Vancouver International airport according to TripAdvisor (https://www.tripadvisor.com /Travel-g154943-c128007/Vancouver:British-Columbia: Airport.To.Downtown.Made.

Easy.html). Car rental was based on the average price for a standard size car from recognized car rental companies including National Car Rental, Hertz, Budget, and Enterprise depending on what was available in the community. (https://www.nationalcar.com/en/car-rental/locations/ca.html; https://www.hertz.ca/rentacar/reservation/; https://www.budget.ca/en/home; https://www.enterprise.ca/en/home.html). Accommodation was based on the average cost of a government rate room in the community (http://csa. pss.gov. bc.ca/businesstravel/). The amount paid to specialists for their travel time and per diem was also included in cost calculations and was based on the Northern and Isolation Travel Assistance Outreach Program (NITAOP) policy (2013). In-person costs were then calculated considering the average number of patients that can be seen by a specialist in a one-day clinic (approximately 6-10 patients) (S. Lau, personal communication, December 2019). Depending on community needs, a geriatrician and a geriatric psychiatrist or medical resident can travel to the community together and are then able to see more patients during a clinic. Most communities had less than 10 patients, so they only required one specialist for a one-day clinic. However, one community had 12 patients so it was assumed that these patients could be seen by one specialist in a one-day clinic, and for economic reasons if all patients could not be seen in one day, any remaining patients could be seen the next day before the specialist flew home, therefore not requiring a second full day of clinic. One community had 23 patients so it was assumed that two specialists for a one-day clinic was required and any remaining patients could be seen the next day before the specialists flew home. Similarly, one community had 43 patients, so it required two specialists for a two-day clinic with the assumption that a few patients could be seen the next day without incurring additional travel costs by requiring another full day of clinic. One-day clinics were calculated with a two-night

stay, and two-day clinics were calculated with a three-night stay in community. Cost calculations did not include remuneration to specialists for seeing patients as they would have been paid whether they saw patients in-person or through telehealth. It was also assumed that for instances where more than one specialist visited the community, they shared a rental car but did not share any other costs.

Ethical considerations. Ethics approval for this work was granted by the University of Northern British Columbia research ethics board and the Northern Health Authority Ethics board in a harmonized ethics review process prior to the start of research activities. The ethics approval certificate is attached in Appendix A (REB H19-01162).

Results

Demographic characteristics. A total of 95 patient cases were analyzed, and for comparison, the total sample was divided into two groups – patients who had been seen through telehealth (n=62/95) and patients who had been seen in-person (n=33/95). The total sample was predominantly female (56.8%) and ages ranged from 57 to 96 years (M = 78.7, SD = 8.78). One patient's age was missing.

Comparing the groups, persons seen through telehealth and those seen in-person were predominately female (51.6%, and 66.7%, respectively). Ages between groups were also very similar as those seen through telehealth ranged in age from 58 to 96 years (M = 79.1, SD = 8.01), and those seen in person ranged in age from 57 to 91 years (M = 78.1, SD = 8.78).

Primary concerns. Among the 95 patients who were seen in follow-up through the Geriatric Outreach Program during the 2017/2018 fiscal year, 70.5% had cognitive concerns followed by concerns of mental health (36.8%), pain (20.0%), physical health (9.5%), behaviour (6.3%), and falling (6.3%). Although not statistically significant, participants seen

through telehealth had slightly more cognitive concerns than those seen in-person (74.2% vs 63.6%), slightly more concerns of falling (6.5% vs 6.1%) and more pain concerns (25.8% vs 4.8%). Conversely, but also not significant, patients seen in-person had more physical health concerns (12.1% vs 8.1%) and mental health concerns (39.4% vs 35.5%) than those seen through telehealth. The only significant difference between the two groups with respect to their primary concerns was that in-person consultations had more cases of behavior concerns (21.2% vs 1.6%) than telehealth consultations ($p = 0.002$, Fisher's Exact Test) with a medium statistical effect ($\varphi = .336$) (Table 1).

Consultation outcomes. Of the 95 total consultations, 81.1% resulted in medication changes, followed by anticipatory guidance and further follow-up requests (both 57.9%), further testing/screening (45.3%), change in level of care (31.6%), new diagnoses (28.4%), safety recommendations (10.5%) and referrals to other specialties (7.4%). Comparing the groups, telehealth consultations resulted in more referrals to other medical specialties than in-person consultations (9.7% vs 3.0%) and more recommendations for safety than in-person consultations (12.9% vs 6.1%), although these differences were not statistically significant. Also not significant, in-person consultations resulted in proportionately more cases of anticipatory guidance (60.6% vs 56.5%) than telehealth consultations, but only a slightly higher proportion of suggestions to change patient's level of care (33.3% vs 30.6%) (Table 1). Four outcomes did differ significantly between telehealth and in-person consultations with telehealth resulting in more new diagnoses (38.7% vs 9.1%) X^2 (1, N = 95) = 9.29, p = 0.002) with a medium significant effect ($\varphi = .313$), more medication changes (88.7% vs 66.7%) X^2 (1, N = 95) = 6.8, p= 0.009) with a medium statistical effect (φ .268), more suggestions of further testing/screening (56.5% vs 24.2%) X^2 (1, N = 95) = 9.02, p = 0.003)

with a medium significant effect (φ = .308), and more requests for follow-up (66.1% vs 42.4%) than in-person consultations X^2 (1, N = 95) = 4.97, p = 0.03) with a small significant effect (φ = .229) (Table 1).

Table 1. *Differences by Service Delivery Type of Patients' First Follow-up Geriatric Consultation in 2017/2018 Fiscal Year (N = 95)*

Variables	Total Sample (N = 95)	Seen through telehealth 65.3% (N = 62)	Seen in-person 34.7% (N = 33)	*P* value
Demographic Characteristics				
Mean Age (range)	78.7 (57-96)	79.1 (58-96)	78.1 (57-91)	0.05
Gender				0.16
Female	56.8 (54)	51.6 (32)	66.7 (22)	-
Male	43.2 (41)	48.4 (30)	33.3 (11)	-
Primary Concerns				
Cognition	70.5 (67)	74.2 (46)	63.6 (21)	0.28
Physical health	9.5 (9)	8.1 (5)	12.1 (4)	0.72
Pain	20.0 (19)	25.8 (16)	4.8 (3)	0.52
Mental health	36.8 (35)	35.5 (22)	39.4 (13)	0.71
Falls	6.3 (6)	6.5 (4)	6.1 (2)	1.00
Behaviour	8.4 (8)	1.6 (1)	21.2 (7)	0.002
Outcomes of Consultation				
New diagnosis	28.4 (27)	38.7 (24)	9.1 (3)	0.002
Medication change	81.1 (77)	88.7 (55)	66.7 (22)	0.009
Further testing/screening	45.3 (43)	56.5 (35)	24.2 (8)	0.003
Referral to other specialty	7.4 (7)	9.7 (6)	3.0 (1)	0.42
Change in level of care	31.6 (30)	30.6 (19)	33.3 (11)	0.79
Safety recommendations	10.5 (10)	12.9 (8)	6.1 (2)	0.49
Anticipatory guidance	57.9 (55)	56.5 (35)	60.6 (20)	0.70
Further follow-up	57.9 (55)	66.1 (41)	42.4 (14)	0.03
No outcomes reported	1.1 (1)	-	3.0 (1)	-

Costs. Since the hardware and network infrastructure costs for a videoconferencing session range in price, the cost per videoconferencing session was provided as a range of $7.50 - $25 by an NHA partner (F. Flood, personal communication, January 2020). Therefore, the costs that follow in this section were calculated as a range from low ($7.50/videoconferencing session) to high ($25/videoconferencing session).

The average cost of a one-day in-person clinic with one specialist was $1,948 (Table 2, column G) while the average cost of a similar telehealth session (one-day and one specialist) was $75 - $250, assuming 10 patients were seen per clinic (Table 3, scenario 1). In this scenario, an average one-day telehealth clinic with one specialist cost $1,684 - $1,859 less than an average one-day in-person clinic with one specialist (Table 3, scenario 1). In comparison, if all consultations in this sample (N = 95) had been conducted in-person, the total cost would have been approximately $31,014 (Table 2, column H) due to the differences in travel costs to reach patients in different communities and the differing number of specialists and clinic length needed to accommodate the amount of patients. Table 1 column H shows the different costs per community to have specialists travel to see all patients (N = 95) in-person with the lowest cost of travel to a community at $1,783 (required one-day, one-specialist clinic) and the highest cost of travel to a community at $3,775 (required a two-day, two-specialist clinic). Conversely, if all consultations in this sample (N = 95) had been conducted through videoconference, the cost would have been approximately $713 - $2,375 resulting in an overall cost savings of approximately $28,639 – $30,301 (Table 3, scenario 2).

Taking into consideration the number of in-person consultations in this sample (n = 33) and that the consultations took place in multiple different communities requiring different trips, clinic lengths, and number of specialists, the total cost of the 33 in-person consultations

was approximately $15,447 (Table 2, column I). Considering the number of videoconference consultations in this sample (n = 62), and the cost range of a videoconferencing session ($7.50 - $25), the total cost of 62 videoconference consultations was $465 - $1550 (Table 3, scenario 3). In this scenario, conducting 62 of the consultations through videoconferencing cost $13,897 – $14,982 less overall than the 33 in-person consultations (Table 3, scenario 3).

However, since the 62 videoconference consultations were for patients in different communities with different travel costs to each community, the potential costs saved were higher than the difference in costs noted in scenario 3. It is demonstrated in Table 2 column J that the 62 patients seen through telehealth were from eight different communities with a range of travel costs from $1,827 (required a one-day, one-specialist clinic) to $3,775 (required a two-day, two-specialist clinic). To see all 62 of the patients in-person who had originally been seen through videoconference, it would have cost approximately $18,997 (Table 2, column J). Therefore, conducting those 62 consultations through videoconference rather than in-person potentially saved an overall total of $17,447 – $18,532 (Table 3, scenario 4).

Table 2. *Cost Calculations for In-person Geriatric Consultations During the 2017/2018 Fiscal Year*

Comm-unity	**(A)** Total sample (N=95)	**(B)** Patients seen in-person (n=33)	**(C)** Patients seen through telehealth (n=62)	**(D)** Round trip Flights	**(E)** Hotel Per night	**(F)** Car Rental Per day	***(G)** Average cost of 1-day 1-specialist clinic	***(H)** Total travel costs to see patients in column A	***(I)** Total travel costs to see patients in column B	***(J)** Total travel costs to see patients in column C
A	43	12	31	$276	$112	$39	$1,746	$3,775[i]	$1,746	$3,775[i]
B	5	5	0	$955	$119	$43	$2,447	$2,447	$2,447	-
C	23	3	20	$276	$156	$42	$1,684	$3,596[ii]	$1,684	$3,596[ii]
D	4	4	0	$271	$137	$35	$1,783	$1,783	$1,783	-
E	4	4	0	$431	$95	$45	$1,879	$1,879	$1,879	-
F	3	0	3	$345	$119	$38	$1,827	$1,827	-	$1,827
G	2	2	0	$571	$105	$35	$2,019	$2,019	$2,019	-
H	2	2	0	$554	$120	$50	$2,062	$2,062	$2,062	-
I	2	0	2	$571	$105	$45	$2,039	$2,039	-	$2,039
J	1	0	1	$345	$134	$38	$1,857	$1,857	-	$1,857
K	3	0	3	$571	$105	$44	$2,037	$2,037	-	$2,037
L	1	0	1	$345	$119	$38	$1,827	$1,827	-	$1,827
M	1	0	1	$571	$105	$45	$2,039	$2,039	-	$2,039
N	1	1	0	$345	$119	$38	$1,827	$1,827	$1,827	-
Total							**$1,934**	**$31,014**	**$15,447**	**$18,997**

*Calculation formula: [flights + (hotel X number of nights) + (per diem of $49 X number of days) + (round trip taxi to airport of $70) + (Northern Isolation Travel Assistance Outreach Program remuneration of $1,000)] X (number of specialists) + (car rental X number of days). Unless indicated otherwise, calculations assumed 1 specialist for 1-day clinic with a two-night stay (i.e. arrive in evening, stay night, full one-day clinic, stay night, fly home) and used the following calculation: [(D) + (E x 2) + (49 x 2) + (70) + (1000)] x (1) + (F x 2)

[i]Two-day clinic with 2 specialists assumed three-night stay and used the following formula: [(D) + (E x 3) + (49 x 3) + (70) + (1000)] x (2) + (F x 3)

[ii]Two-day clinic with 1 specialist used the following formula: [(D) + (E x 3) + (49 x 3) + (70) + (1000)] x (1) + (F x 3)

Table 3. *Cost Differences Between In-person and Videoconferencing Geriatric Follow-up Consultations*

Scenario	**A** In-person cost totals (from Table 2)	**B** Number of videoconferencing consultations	**C** Videoconferencing cost**	**D** Total (column A – column C)
1. Cost difference between average 1-day in-person clinic and average 1-day telehealth	$1,934	10*	$75 –$250	**$1,684 –$1,859**
2. Costs saved if all consultations (N=95) through videoconference	$31,014	95	$713 – $2,375	**$28,639 – $30,301**
3. Cost difference between total in-person (n = 33) and total telehealth (n = 62)	$15,447	62	$465 – $1,550	**$13,897 – $14,982**
4. Cost saved by conducting n = 62 consultations via videoconference	$18,997	62	$465 – $1,550	**$17,447 – $18,532**

*Assuming that one telehealth session with 1 specialist will see 10 patients (the higher end of average patients that can be seen in one clinic), and therefore 10 videoconferencing calls will take place.
**Videoconferencing cost calculation formula: (number of videoconferencing consultations X cost per videoconference of $7.50 - $25)

Discussion

The two service delivery methods (telehealth and in-person) within the Geriatric Outreach Program were similar when comparing patient age, gender, and primary concerns at consultation including mood, cognition, falls, physical health, and pain. However, the two delivery methods differed in behavior concerns, as those seen in-person were more likely to discuss this as a concern. One hypothesis for this is that the behavior is more easily observed in-person. However, there is substantial evidence that suggests that observation for diagnosis is just as effective through videoconferencing as in-person (Jones, Johnston, Reboussin, and McCall, 2001; Grosch, Weiner, Hynan, Shore, and Cullum, 2014), so further research into this difference is required.

Telehealth and in-person consultations differed in outcomes as telehealth resulted in more new diagnoses, medication changes, recommendations of further testing and screening, and follow-up requests for patients. Previous studies have reported new diagnoses (Dang, Gomez-Orozco, Zuilen, & Levis, 2018), medication changes, and recommendations for further testing (Conn, Madan, Lam, Patterson, & Skirten, 2013) as common outcomes of geriatric consultations through telehealth, but few have compared outcomes with in-person geriatric consultations. Since research that compares outcomes of the two consultation methods is limited, it is not yet clear why these differences are significant, however some hypotheses can be made. First, since Alzheimer's and other forms of dementia are progressive, diagnosis of these diseases may occur after a number of assessments and tests have ruled out other possibilities (Wang, Black and Zukotynski, 2016). It is possible that more new diagnoses were made through telehealth consultations because patients seen through this delivery method had more previous consultations (prior to their first follow-up

of the 2017/2018 fiscal year) than those who were seen in-person so that specialists had more opportunities to rule out other possibilities and provide a new diagnosis. Second, it is possible that more medication changes were made during telehealth visits than in-person visits if these patients were referred more often for medication management and monitoring – a common experience among adults aged 65 and older who are on multiple medications (polypharmacy) (Charlesworth, Smit, Lee, Alramadhan, & Odden, 2015). Third, telehealth consultations ending with more requests for further testing may be explained by the nature of telehealth and the inability to conduct certain tests requiring extensive hands-on examination. This is consistent with Narasimha et al. (2017) who reported that some physical examinations (e.g. palpations) could not be completed through telehealth, but by completing testing ahead of time, telehealth consultations could be more successful. It is possible that some of the tests recommended were ones that the geriatric specialist could not complete during the appointment or need to be completed before the next consultation. Similarly, further testing such as brain imaging has been reported as a common outcome of geriatric consultations through telehealth (Conn, Madan, Lam, Patterson, & Skirten, 2013; Dang, Gomez-Orozco, Zuilen, & Levis, 2018) which might help explain why further follow-up was requested more often after telehealth consultations; if specialists recommended further testing, it is likely that they would want to follow-up with the patient after testing had been completed.

Telehealth consultations also cost less than in-person consultations with an average one-day clinic cost of $75 - $250 compared to an average one-day clinic in-person at $1,934 for a cost difference of $1,684 - $1859. This comparatively lower cost of telehealth consultations to in-person consultations is consistent with what has been reported in the literature (Rabinowitz, Murphy, Amour, Ricci, Caputo, & Newhouse, 2010; Gray, Wright,

Cutler, Scuffham, & Wootton, 2009; Conn, Madan, Lam, Patterson, & Skirten, 2013; Versleijen, Martin-Khan, Whitty, Smith, & Gray, 2015). This case comparison also demonstrates that cost savings are even greater when travel is required to multiple different locations to see patients in-person due to the varying cost of travel compared to the relatively constant cost of telehealth. This is consistent with Comans and colleagues (2013) who found that in-person geriatric consultations cost more than telehealth consultations due to the additional travel costs for specialists to see patients in communities two or more hours away.

In terms of effects on care, both service delivery types provided comprehensive geriatric assessments that resulted in medication changes, new diagnoses, changes in level of care, anticipatory guidance, safety recommendations, referrals to other specialties, further testing, or further follow-up. This is consistent with the goal of comprehensive geriatric assessment to be a "multidimensional interdisciplinary diagnostic process focused on determining a frail older person's medical, psychological and functional capability in order to develop a coordinated and integrated plan for treatment and long term follow up" (Rubenstein, Stuck, Sui, & Wieland, 1991). If a plan for treatment is not created for a patient following an assessment, it can be reasonably assumed that the assessment was not necessary as it could not provide any additional value to care. Therefore, the Geriatric Outreach Program in this study affects the care of older adults in northern BC by providing opportunities for geriatric assessments that result in diagnoses and development of goal-oriented management plans for the on-going care of geriatric patients. Although one patient (seen in-person) did not have any recommendations or request for follow-up after their geriatric consultation, the vast majority of consultations resulted in one or more of the outcomes listed in Table 1, thereby fulfilling the goal of a geriatric assessment.

Limitations

This work had a number of limitations that should be noted. First, patient charts could not be retrieved, so new diagnoses mentioned in the consultation letters could not be confirmed with what was recorded in the patient chart. Therefore, it could not be determined whether existing or new diagnoses contributed to any of the observed outcomes. Second, reasons for referral were not available so whether outcomes of consultations reflected the reasons for referral or whether reasons for referral contributed to any of the observed outcomes could not be determined. Third, primary concerns do not reflect the actual reasons why patients were referred, only their (or their caregiver's) concerns at the time of the consultation. Fourth, travel costs can vary depending on time or year and how far in advance travel is booked. To mitigate this last issue, travel costs were calculated based on the same days for each community assuming the booking occurred about one month in advance of travel.

Conclusion

Patients who are receiving geriatric care through the Geriatric Outreach Program are quite similar in age, gender, and care concerns regardless of whether they are being seen in follow-up through telehealth or in-person. However, outcomes of consultations and costs do differ between telehealth and in-person; telehealth consultations result in more requests for further testing and screening, more new diagnoses, more medication changes, and more requests for follow-up than in-person consultations. In this case comparison, the total cost of the 62 telehealth consultations was approximately $15,341- $16,426 less than the total cost of providing the 33 in-person consultations.

Overall, the Geriatric Outreach Program affects the care of older adults by providing them with access to specialist geriatric care that provides robust recommendations (e.g. changes in medication, referrals to other specialties, recommendations around safety, and anticipatory guidance) to support the ongoing care of that patient by their family physician. While this work provides a starting point for understanding how the Geriatric Outreach Program supports the care of older adults in northern BC, and the differences in costs and outcomes between telehealth and in-person consultations with geriatric specialists, more research is required to provide an in-depth understanding of these differences.

Next Steps

Considering the limitations of this work, the ability to retrieve additional patient information including existing diagnoses and confirmation of new diagnoses will be beneficial. This information will help determine whether the consultation letters reflect what is recorded in the patient's chart and whether existing diagnoses contributed to any of the observed outcomes (e.g. are people with certain diagnoses more likely to be requested for follow-up?). Reasons for referral will also be retrieved to help determine whether outcomes from the consultations reflect the reason for referral and whether those seen through telehealth were referred for polypharmacy more often than those in-person. Why patients who were seen in-person had more behavioral concerns than those seen through telehealth will also be investigated and may require interviews with patients to better understand this phenomenon.

Chapter 6: Summary and Implications for Practice

The dual purpose of this research was to describe the effects of the Geriatric Outreach Program on the care of older adults in northern BC and the difference in outcomes and costs between in-person and telehealth consultations within this program. This thesis research was guided by two questions: 1) how does the Geriatric Outreach Program affect the care of older adults in northern BC? and 2) how do in-person and telehealth consultations compare within the Geriatric Outreach Program?

This work revealed that the Geriatric Outreach Program influences the care of older adults by providing comprehensive geriatric assessments in-person and through telehealth that result in detailed patient care plans. These care plans support general practitioners in the ongoing care of their older patients and were particularly helpful for patients experiencing polypharmacy – a common issue among older adults (Conn, Madan, Lam, Patterson, & Skirten, 2013). Indeed, the review of consultation letters revealed that medication changes were a main outcome of the geriatric consultations. The consultation letters also revealed that new diagnoses, referrals to other specialties, and requests for further testing were common outcomes of the consultations, which are all outcomes that have been reported in the literature (Dang, Gomez-Orozco, Zuilen, & Levis, 2018).

Indirectly, the care plans facilitated learning opportunities for the general practitioners by providing recommendations and guidance that they could use to adapt their practice to address the uniqueness of caring for older adults. This was also confirmed during consultation letter reviews as anticipatory guidance was a common outcome of both consultation types. As well, the program offered CME events to the referring general

practitioners where they could learn from the geriatric specialists, ask questions, and build rapport, helping them to feel more supported in their practice.

The program also influenced care of older adults by improving access to geriatric assessment by offering in-person consultations in local communities and by offering videoconferencing follow-ups that decreased the need to travel for care. General practitioners were more likely to refer patients to this program because its availability in northern BC meant that their patients were more likely to access it. This increase in referrals is consistent with Burnett and colleagues (2019) who found that referrals for geriatric assessment increased dramatically when videoconferencing consultations were an option.

Despite the challenges associated with the videoconferencing consultations, such as requiring additional support in the patient's room and the inability to perform hands-on testing, the program has made efforts to mitigate these issues by having a designated consultation support person at the remote site who can answer questions about the patient and support the specialists by conducting some of the hands-on testing. As well, specialists have requested some testing to be completed before the consultation so that the results are available at the time of consultation. This challenge with testing may explain why videoconferencing consultations resulted in requests for further testing and follow-up more often than in-person consultations, especially if the testing had not been completed beforehand.

The telehealth (n = 62) and in-person (n = 33) consultations differed noticeably in costs to the health authority with an average 1-day telehealth clinic costing $1,684 - $1,859 less than an average 1-day in-person clinic. Although costs are unique to each telehealth program due to differing travel costs, videoconferencing has been consistently reported in the

literature as a cheaper option compared to in-person consultations (Rabinowitz et al., 2010; Gray et al., 2009; Conn et al., 2013; Comans et al., 2013; Versleijen et al., 2015), and this work supports those claims.

Implications for Practice

This research was developed in partnership with decision-makers from the Northern Health Authority to provide practical implications and to fulfill the requirements for a Masters of Interdisciplinary Studies at the University of Northern British Columbia. As such, this work provides Northern Health Authority decision-makers with valuable insights about their own Geriatric Outreach Program. Although this research is different from quality improvement and evaluation, the results of this work could lend to those priority aspects of a health jurisdiction. This study describes formal care providers' perspectives of the Geriatric Outreach Program and how it supports care of patients which could be used as a baseline to monitor and evaluate the program if subsequent changes are made. Additionally, the comparison of telehealth and in-person consultations acts as a baseline for the two consultation methods. The described similarities between the methods can be utilized to promote the program to patients, their families, and general practitioners. Since lack of awareness is a barrier to accessing services for maintenance of chronic conditions (Jerant, Frederichs-Fitzwater, & Moore, 2005), promotion of this program would be a practical use of this work. As well, the cost savings of telehealth for geriatric consultations cannot be ignored by the Northern Health Authority as cost optimization is an essential aspect of its Triple Aim strategy to improve health care systems (NHA, 2017b).

This work also uncovered some challenges to data collection for researchers and barriers to operational managers who want to evaluate their program or identify and examine

how best to remediate gaps in service. Currently, information about the program and patients is stored in separate Word or Pdf files, and while this method for data storage may be useful for program purposes, it is challenging for researchers to use and extract meaningful information. This program could benefit from an electronic data base so that data can be recalled quickly and with more ease and accuracy. As well, the program could benefit from a standardization of data (e.g. consistent terms, identification of useful minimum data) that could be coded and presented in a numerical format to promote accuracy and allow for more inferential statistics, as most of the currently available data is narrative.

It must also be noted that the literature on geriatric assessment through telehealth has reported reliability of videoconferencing in initial assessment and diagnoses of dementia (Cullum et al., 2006; Martin-Khan et al., 2012; Dang et al., 2018;), Alzheimer's (Loh et al., 2005) and neuropsychological evaluation (Cullum et al., 2006), and that some forms of physical examination may not contribute much to dementia diagnosis (Martin-Khan, 2009). Since the videoconferencing component of the Geriatric Outreach Program is primarily being used for follow-up instead of initial assessment due to some difficulties with physical exams, it may not be being used to its full potential. Offering initial geriatric assessments through videoconferencing could increase the frequency of patients being seen and may save considerable costs. The Northern Health Authority's policymakers may want to consider looking at the barriers to performing initial assessments through videoconference and whether they can be overcome altogether.

Strengths and Limitations

One of the strengths of this work is that it is one of the first of its kind to investigate provider perspectives of a Geriatric Outreach Program that utilizes both in-person and

telehealth consultation methods, providing insight into this particular program design from the point of view of the specialists who provide care through the program and general practitioners who refer patients to the program. By capturing the perspectives and experiences of care providers within this program, this work moves beyond the Triple Aim by observing the additional aim of 'provider experience' in the Quadruple Aim strategy for improving health care systems (Bodenheimer & Sinsky, 2014) thereby supporting the health authority in their goal of continuous quality improvement (NHA, 2017b). Another strength of this work is that it adds to the limited research on the effects of Geriatric Outreach programs on the care of older adults and the differences between the outcomes of geriatric consultations through videoconferencing and in-person. The multi-method design of this research is also a strength of this work because it provides both qualitative and quantitative perspectives of the research questions. A multi-method research approach provides both the depth of a concept and more generalizable information (Creswell, 2008) that is useful for answering questions in the social and health sciences (Brewer & Hunter, 2006).

A limitation of this work is that variables for the quantitative portion of this work were extracted from a narrative, and while a trained researcher completed this work, there is some possibility of error. To mitigate possible errors, clear definitions for each variable were created. Another limitation is that this work cannot be generalized to populations beyond northern BC. However, future research may find similarities between this work and other populations in rural and northern communities.

Conclusion

Overall, this work suggests that the Geriatric Outreach Program in northern BC is positively affecting the care of older adults by providing comprehensive geriatric

assessments closer to home and by providing learning opportunities for referring physicians to adapt their practice to better suit the unique needs of older adults. As well, in this program design, videoconferencing consultations cost the health authority less money than delivering in-person consultations. However, there are differences between the outcomes of videoconferencing consultations and in-person consultations that cannot be explained at this time; further research is needed to definitively determine why telehealth consultations resulted in more medications changes, more new diagnoses, more recommendations for further testing, and more requests for further testing than in-person consultations.

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Appendix A : Full Search Used in PubMed Database

((((((((("telemedicine"[MeSH Terms] OR "remote consultation"[MeSH Terms]) OR telegeriatrics[All Fields]) OR ("telemedicine"[MeSH Terms] OR "telemedicine"[All Fields] OR "ehealth"[All Fields])) OR ("telemedicine"[MeSH Terms] OR "telemedicine"[All Fields] OR "mhealth"[All Fields])) OR ("telemedicine"[MeSH Terms] OR "telemedicine"[All Fields] OR "telehealth"[All Fields])) OR telepsychiatry[All Fields]) OR (telemental[All Fields] AND "health"[MeSH Terms]) OR telecare[All Fields]) OR ("remote consultation"[MeSH Terms] OR ("remote"[All Fields] AND "consultation"[All Fields]) OR "remote consultation"[All Fields] OR "teleconsultation"[All Fields])) OR video-consultation[All Fields]) AND ((("rural population"[MeSH Terms] OR rural[Title/Abstract]) OR (rural[All Fields] AND ("geographic locations"[MeSH Terms] OR ("geographic"[All Fields] AND "locations"[All Fields]) OR "geographic locations"[All Fields] OR "area"[All Fields]))) OR ("rural population"[MeSH Terms] OR ("rural"[All Fields] AND "population"[All Fields]) OR "rural population"[All Fields] OR ("rural"[All Fields] AND "community"[All Fields]) OR "rural community"[All Fields]))) AND ((((((((("aged"[MeSH Terms] OR "aged, 80 and over"[MeSH Terms]) OR "frail elderly"[MeSH Terms]) OR senior[All Fields]) OR geriatric[All Fields]) OR ("aged"[MeSH Terms] OR "aged"[All Fields] OR "elderly"[All Fields])) OR ("aged"[MeSH Terms] OR "aged"[All Fields] OR "elderly"[All Fields])) OR ("aged"[MeSH Terms] OR "aged"[All Fields] OR ("older"[All Fields] AND "adult"[All Fields]) OR "older adult"[All Fields])) OR (older[All Fields] AND ("persons"[MeSH Terms] OR "persons"[All Fields] OR "person"[All Fields]))) AND ("humans"[MeSH Terms] AND English[lang] AND "aged"[MeSH Terms])

Appendix B : Literature Matrix of Relevant Articles Included in Literature Review

Title and Authors	Purpose and participants	Relevant Findings
Burnett, J., Dyer, C. B., Clark, L. E., & Halphen, J. M. (2019). A statewide elder mistreatment virtual assessment program: Preliminary data. Journal of the American Geriatrics Society, 67(1), 151-155. doi:10.1111/jgs.15565	"To describe the Texas Elder Abuse and Mistreatment Institute Forensic Assessment Center Network (TEAM-FACN), a novel statewide elder mistreatment (EM) virtual assessment program using low-cost videophone technology and innovative web-based coordination to connect an Adult Protective Services (APS) agency and its clients, rural and urban, to a centralized geriatric and EM expert medical team for virtual in-home assessments."	Older adults were referred to program where they saw geriatric specialists via video-phone for assessment of mental health and signs of possible abuse. Referral to program increased from 100/year to 300 in 8 months.
Carotenuto, A., Rea, R., Traini, E., Ricci, G., Fasanaro, A. M., & Amenta, F. (2018). Cognitive assessment of patients with alzheimer's disease by telemedicine: Pilot study. JMIR Mental Health, 5(2), e31. doi:10.2196/mental.8097	To evaluate reliability of MMSE and Alzheimer's Disease Assessment scale cognitive subscale when used during videoconference. 28 patients (average age 73.9 years)	When older adults with more severe cognitive deficits were assessed through videoconferencing, the psychologist assessing the patient over-estimated the cognitive deficit. For mild to moderate, this study did not find any differences between videoconference or in-person for MMSE or the Alzheimer's Disease Assessment scale cognitive subscale

Chang, W., Homer, M., & Rossi, M. I. (2018). Use of clinical video telehealth as a tool for optimizing medications for rural older veterans with dementia. Geriatrics (Basel, Switzerland), 3(3), 44. doi:10.3390/geriatrics3030044	comparing medication changes between initial consults and follow-up. Older adults in rural Texas, USA	Fewer medication changes were made in follow-up appointments compared to initial consultations
Cheong, C., Lim, K., Jang, J., & Jhoo, J. H. (2015). The effect of telemedicine on the duration of treatment in dementia patients. Journal of Telemedicine and Telecare, 21(4), 214-218. doi:10.1177/1357633X14566571	To determine effectiveness of telehealth for long-term follow-up of dementia patients. South Korea, older adults diagnosed with dementia N = 442 (259 in-person and 168 telemedicine	Patients seen through telehealth had significantly longer treatment periods than in-person (almost twice as long, lasting over a year) suggesting that telehealth is helpful for long-term treatment of dementia patients
Ciemins, E. L., Holloway, B., Coon, P. J., McClosky-Armstrong, T., & Min, S. (2009). Telemedicine and the mini-mental state examination: Assessment from a distance. Telemedicine Journal and e-Health : The Official Journal of the American Telemedicine Association, 15(5), 476-478. doi:10.1089/tmj.2008.0144	to determine the reliability of the Mini-Mental State Examination (MMSE) administration via telehealth with a focus on the auditory and visual test components. Rural older adults. Videoconference, Eastern Montana Telemedicine Network	Useful for cognitive assessment by MMSE through telehealth
Comans, T. A., Martin-Khan, M., Gray, L. C., & Scuffham, P. A. (2013). A break-even analysis of delivering a memory clinic by videoconferencing. Journal of Telemedicine and Telecare, 19(7), 393-396. doi:10.1177/1357633X13506532	Break-even analysis of costs for in-person versus video-conference consultations. Memory clinic	"The total fixed cost of a conventional clinic was $522 and the total fixed cost of a videoconferencing clinic was $881, see Table 1. The additional variable cost of the specialist travelling to the conventional clinic was $2.62 per minute of the specialist's travelling time. The break-even point is the specialist's travel time at which the cost of the two

		modalities is the same. The extra cost of a videoconferencing clinic is $359, so the travelling cost must be at least as much in order to break even. Therefore the break-even point is just over two hours (138min round trip). If the specialist's total travelling time is greater than this, it is more efficient to provide the service by videoconferencing; if the travelling time is less than this, it is more efficient to provide a conventional face-to-face service."
Conn, D. K., Madan, R., Lam, J., Patterson, T., & Skirten, S. (2013). Program evaluation of a telepsychiatry service for older adults connecting a university-affiliated geriatric center to a rural psychogeriatric outreach service in northwest Ontario, Canada. International Psychogeriatrics, 25(11), 1795-1800. doi:10.1017/S104161021300118X	Evaluation of psychiatry service for older adults via videoconference. Chart reviews. Mean age 76.7 years.	"Medication management was the suggested course of action in 95% of the patients followed by psychotherapy/psychosocial interventions in 31% of the patients and additional investigations were suggested in 33% of the patients."
Cullum, C. M., Weiner, M. F., Gehrmann, H. R., & Hynan, L. S. (2006). Feasibility of telecognitive assessment in dementia. Assessment, 13(4), 385-390. doi:10.1177/1073191106289065	To determine effectiveness of videoconferencing for neurocognitive assessment. 14 participants with cognitive impairment and 19 participants with Alzheimer's disease.	"Highly similar test scores were obtained when participants were tested in-person or via VC. Telecognitive assessment appears to be a valid means to conduct neuropsychological evaluation of older adults with cognitive impairment. "

Daly, J. M., Jogerst, G., Park, J., Kang, Y., & Bae, T. (2005). A nursing home telehealth system: Keeping residents connected. Journal of Gerontological Nursing, 31(8), 46-51. doi:10.3928/0098-9134-20050801-14	To determine usability of telehealth system in a long term care home. Residents of long term care home	Video telehealth system could be used for consultation with older patient residing in long term care home.
Dang, S., Gomez-Orozco, C., Zuilen, M., Levis, S. (2018). Providing dementia consultations to veterans using clinical video telehealth: results from a clinical demonstration project. Telemedicine and e-Health, 24(3), 203-209. doi:10.1089/tmj.2017.0089	To examine feasibility of video-consultations for older veterans with dementia. 94 Patients (average age 74.7)	Resulted in new diagnoses and referrals to other specialties and testing
DeYoung, N., & Shenal, B. V. (2019). The reliability of the Montreal Cognitive Assessment using telehealth in a rural setting with veterans. Journal of telemedicine and telecare, 25(4), 197–203. https://doi.org/10.1177/1357633X17752030	To determine reliability of Montreal cognitive assessment through videoconferencing. Rural veterans	Montreal cognitive assessment effective through videoconferencing

Goodwin, S., McGuirk, M., & Reeve, C. (2017). The impact of video telehealth consultations on professional development and patient care. Australian Journal of Rural Health, 25(3), 185-186. doi:10.1111/ajr.12297	To determine physician's confidence in patient's diagnosis after they had been seen through telehealth, and to determine how they feel about managing the patient. 14 medical officers.	"In general, telehealth consultations increased participant confidence in diagnosis, management and clinical knowledge and resulted in changes in patient management " "Having a local doctor involved in the consultation added value by supporting the implementation of the management plan and providing continuity of care."
Gray, L. C., Wright, O. R., Cutler, A. J., Scuffham, P. A., & Wootton, R. (2009). Geriatric ward rounds by video conference: A solution for rural hospitals. Medical Journal of Australia, 191(11-12), 605-608. doi:10.5694/j.1326-5377.2009.tb03345.x	Cost analysis	Videoconferencing was less expensive than in-person consultation for a telehealth service in Toowoomba Base Hospital when videoconferencing was needed a minimum of 5 hours/week and travel was 125km or longer.
Grosch, M. C., Weiner, M. F., Hynan, L. S., Shore, J., & Cullum, C. M. (2014;2015;). Video teleconference-based neurocognitive screening in geropsychiatry. Psychiatry Research, 225(3), 734-735. doi:10.1016/j.psychres.2014.12.040	To determine usability of video-conference for cognitive screening and compare mean test scores to in-person. 8 participants aged 67-85	Global cognition, attention, and visuospatial function was assessed and mean scores between videoconference and in-person were similar. Videoconferencing can be used for neurocognitive assessment of older adults
Jones, B. N., Johnston, D., Reboussin, B., & McCall, W. V. (2001). Reliability of telepsychiatry assessments: Subjective versus observational ratings. Journal of Geriatric Psychiatry and Neurology, 14(2), 66-71. doi:10.1177/089198870101400204	To test visual observations of behaviour and verbal responses via videoconferencing. 30 geriatric patients	Just as effective for tele psychiatry with older adults compared to in person psychiatric assessments with older adults. For both elements that required verbal responses and visual observations by the assessor on the Brief Psychiatric Rating Scale (BPRS).

Kim, H., Jhoo, J. H., & Jang, J. W. (2017). The effect of telemedicine on cognitive decline in patients with dementia. Journal of telemedicine and telecare, 23(1), 149–154. https://doi.org/10.1177/1357633X15615049	To determine if telehealth affected patients with dementia overtime. 90 in-person and 98 telehealth	Telemedicine effective for ongoing management and assessment of cognitive decline as average changes in MMSE score between in-person and telehealth groups were similar.
Loh, P. P. K., Maher, S., Goldswain, P., Flicker, L., Ramesh, P., & Saligari, J. (2005). diagnostic accuracy of telehealth community dementia assessments. Journal of the American Geriatrics Society, 53(11), 2043-2044. doi:10.1111/j.1532-5415.2005.00479_8.x	To determine accuracy of dementia assessments. 20 participants 65+	Telehealth can be used to diagnose Alzheimer's disease with high specificity and sensitivity
Loh, P. K., Ramesh, P., Maher, S., Saligari, J., Flicker, L., & Goldswain, P. (2004). Can patients with dementia be assessed at a distance? the use of telehealth and standardised assessments. Internal Medicine Journal, 34(5), 239-242. doi:10.1111/j.1444-0903.2004.00531.x	To determine reliability of MMSE and GDS via videoconferencing	Standardized MMSE and Geriatric Depression scale just as effective through videoconferencing as in-person
Martin-Khan, M., Flicker, L., Wootton, R., Loh, P., Edwards, H., Varghese, P., . . . Gray, L. C. (2012). The diagnostic accuracy of telegeriatrics for the diagnosis of dementia via video conferencing. *Journal of the American Medical Directors Association, 13*(5), 487.e19-487.e24. doi:10.1016/j.jamda.2012.03.004	"to determine the validity of the diagnosis of dementia via videoconferencing using inter-rater agreement". 205 participants aged 50+ years of age (mean age of 76) who had been referred for cognitive assessment	There was overall agreement between specialists. Diagnosis of dementia through videoconferencing was just as valid as in-person

Rabinowitz, T., Murphy, K. M., Amour, J. L., Ricci, M. A., Caputo, M. P., & Newhouse, P. A. (2010). Benefits of a telepsychiatry consultation service for rural nursing home residents. Telemedicine Journal and e-Health : The Official Journal of the American Telemedicine Association, 16(1), 34-40. doi:10.1089/tmj.2009.0088		Cost for psychiatric care via videoconferencing for older adults in long term care homes. "A total of 843.5 hours (105.4 8-hour workdays) of travel time was saved compared to in-person consultation for each of the 278 encounters if they had occurred separately. If four resident visits were possible for each trip, the time saved would decrease to 26.4 workdays. Travel distance saved was 43,000 miles; 10,750 miles if four visits per trip occurred. More than $3,700 would be spent on gasoline for 278 separate encounters; decreased to $925 for four visits per roundtrip. Personnel cost savings estimates ranged from $33,739 to $67,477. Physician costs associated with additional travel time ranged from $84,347 to $253,040 for 278 encounters, or from $21,087 to $63,260 for four encounters per visit. The telepsychiatry approach was enthusiastically accepted by virtually all residents, family members, and nursing home personnel, and led to successful patient management. Providing psychiatric care to rural nursing home residents by videoconference is cost effective and appears to be a medically acceptable alternative to face-to-face care."

Versleijen, M., Martin-Khan, M. G., Whitty, J. A., Smith, A. C., & Gray, L. C.(2015)A telegeriatrics service in a small rural hospital: a case study and cost analysis	“this study examined the costs of providing a telegeriatrics service by videoconference in a rural hospital, compared to the costs of a visiting geriatrician that travels to undertake in-person consultations”. Geriatric patients (aged 65+).	"The telegeriatric service was calculated to cost $354 per patient per round. The in-person consultation was calculated to cost $486 per patient per round if the traveling specialist travels round-trip for more than 76 minutes. However, depending on the number of patients seen, travelling for in-person consultation can cost similar to tele-consultation. For 1 patient to be seen in-person, the travelling physician cannot travel for more than 48 mins round trip but for 7 patients the travelling physician can travel up to 105 minutes before reaching break-even point."
Vestal, L., Smith-Olinde, L., Hicks, G., Hutton, T., & Hart, J., John. (2006). Efficacy of language assessment in Alzheimer’s disease: Comparing in-person examination and telemedicine. Clinical Interventions in Aging, 1(4), 467-471. doi:10.2147/ciia.2006.1.4.467	For assessment of older adults diagnosed with mild Alzheimer’s disease	Provides evidence that language skills tests that can be used during dementia assessments are effective through videoconferencing including picture description, Boston Naming test, multi-lingual aphasia examination, Aural comprehension of words and phrases, and controlled oral word association test.

Appendix C: Semi-Structured Interview Guide

Participants will be sent the information letter and consent form prior to the interview so that they have an opportunity to read and sign it. When scheduling the interview, the interviewer will explain the information letter and consent form and give the participant an opportunity to ask any questions. The participant will then return the signed consent form by email or post to the interviewer before the interview takes pace. At the interview, participants will be welcomed, and the interviewer will orally re-confirm that the participant consents to participate. Probing questions will be asked where appropriate.

Questions for referring general practitioners:

1. How did you learn about the Geriatric Outreach Program?
2. Approximately how long have you been referring patients to the program?
    a. Did you refer patients to the program before the addition of the telegeriatric component of the program? If no, please explain?
3. How has having the Geriatric Outreach Program affected how you refer your geriatric patients to a geriatric specialist?
    a. Has the telegeriatric component of the outreach program affected your referral practice? Please explain.
4. Do you think that you make different decisions about your geriatric patients as a result of the geriatric outreach program? Please explain.
    a. If yes, are any of these decisions a result of the telegeriatric component of the outreach program? Please explain.
5. Have you noticed a difference in outcomes of patients who have received care through the Geriatric Outreach program? Please explain.

6. Do you feel supported by the geriatric outreach program in your care of your geriatric patients? Please explain.
    a. If yes, how has the program supported your care of your geriatric patients?
    b. If no, what are some ways that the program could support your care of your geriatric patients?
7. Through the Geriatric Outreach Program, have you been able to interact with the geriatric specialists? Please explain.
    a. If yes, in what ways? Do you feel that you have developed rapport with the specialist? (e.g. relationship where you can pick up the phone and call them if you have a question/concern about a patient)
    b. If yes, has the telegeriatric component of the program supported this rapport?
8. Have you recommended this program to your collogues as a way to support their care of geriatric patients? If not, would you recommend this program?
9. Do you have anything that you would like to add?

Questions for geriatric specialists:

1. How long have you been providing care through the Geriatric Outreach Program?
    a. How long have you been providing care through videoconferencing, the telehealth portion of the outreach program?
2. How do you decide which patients are seen in-person versus telehealth?
3. Please describe any differences in how you consult when the appointment is in-person versus videoconference?

a. Please explain whether or not you have any concerns about consulting through videoconference? If yes, do any of these concerns affect the level of care you feel able to provide?

4. Is there anything else that you would like to add about in-person versus videoconference consults?

*Participants are then thanked for their participation and reminded that they can contact the researcher at any time if they have any questions about the study, or if they decide to withdraw their information from the study.

Appendix D: Certificate of Ethical Approval

University of Northern British Columbia

Certificate of Ethical Approval for Harmonized Minimal Risk Behavioural Study

Research Ethics Board
University of Northern British Columbia
3333 University Way
Prince George, BC V2N 4Z9
Tel: 250-960-5555

Also reviewed and approved by:

- **Northern Health**

Principal Investigator:	**Primary Appointment:**	**Board of Record REB Number:** **Board of Record:**	**UBC REB Number:**
Shannon Freeman		University of Northern British Columbia	H19-01162

Study Title:
Northern Telegeriatrics: Examining a Telegeriatric Telehealth Service in Northern British Columbia

Study Approved: July 18, 2019 **Expiry Date: July 18, 2020**

Research Team Members: Georgia A. Betkus

Sponsoring Agencies: - Northern Health Authority

Documents included in this approval:

Document Name	Version	Date
Protocol:		
Project Plan/Research Proposal	N/A	May 1, 2019
Consent Forms:		
Information letter and consent package	V3	July 1, 2019
Questionnaire, Questionnaire Cover Letter, Tests:		
Interview guide	N/A	May 1, 2019
Letter of Initial Contact:		
Recruitment email script	V3	July 1, 2019
Other Documents:		
Data request form	N/A	June 1, 2018

This ethics approval applies to research ethics issues only and does not include provision for any administrative approvals required from individual institutions before research activities can commence.

The Board of Record (as noted above) has reviewed and approved this study in accordance with the requirements of the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans (TCPS2, 2014).

The "Board of Record" is the Research Ethics Board delegated by the participating REBs involved in a harmonized study to facilitate the ethics review and approval process.

The application for ethical review and the document(s) listed above have been reviewed and the procedures were found to be acceptable on ethical grounds for research involving human subjects.

This study has been approved either by the Board of Record's full REB or by an authorized delegated reviewer.