THE ROLE OF TECHNOLOGY ON THE EXPERIENCES OF LONG-TERM CARE FACILITY PAID EMPLOYEES DURING THE COVID-19 PANDEMIC

by

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Abstract

The COVID-19 pandemic led to substantial changes in technology use within the long-term care (LTC) sector in Canada. The purpose of this research was to describe the use of technology and its impact on the experiences of LTC staff working in northern British Columbia (B.C.) during the COVID-19 pandemic. A secondary analysis of one-hour semi-structured interviews from 53 participants was conducted. Data was analysed thematically guided by Braun and Clarke's thematic analysis approach. The experiences of LTC staff varied across disciplines and work roles. LTC staff reported using technologies for inter-department, intra-department or inter-professional communications, as well as to enhance residents' social interactions. Findings provide insight into the perspectives of LTC staff who had to adopt new technologies and new work processes during COVID-19, thus informing and providing actionable insights for those working in northern B.C.

Keywords: telecommunication, telehealth, internet, digital infrastructure, nursing home, homes for the aged, pandemic, rural, remote

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Glossary of Acronyms

B.C.	British Columbia
CDC	Centers for Disease and Prevention Control
CDN	Canadian Dollars
CIHI	Canadian Institute for Health Information
CIRA	Canadian Internet Registration Authority
CIUS	Canadian Internet Use Survey
CRTC	Canadian Radio-television and Telecommunications Commission
CSA	Canadian Standards Association
HSO	Health Standards Organization
IPC	Infection Prevention and Control
ICTs	Information and Communication Technologies
LPN	Licensed Practical Nurse
LTC	Long Term Care
NH	Northern Health
NHA	Northern Health Authority
PHAC	Public Health Agency of Canada
PHSA	Provincial Health Services Authority
RCA	Registered Care Aide
RD	Registered Dietitian
RSW	Registered Social Worker
RN	Registered Nurse
SARS-CoV-2	Severe Acute Respiratory Syndrome Coronavirus 2

tele-ICAR	Telephone- and video-based Infection Control Assessment and Response
WHO	World Health Organization

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Chapter 1: Introduction

Background

COVID-19 is an infectious acute respiratory disease caused by the novel coronavirus virus severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). On December 31, 2019, the World Health Organization (WHO) was informed of cases of pneumonia of unknown microbial aetiology (Beeching et al., 2022). The WHO first declared COVID-19 a public health emergency of international concern on January 30, 2020, and then formally declared it a pandemic on March 11, 2020 (Beeching et al., 2022). COVID-19 presents as a respiratory infection with the severity of symptoms ranging from a mild common cold-like illness to a severe viral pneumonia leading to acute respiratory distress syndrome that may be fatal (Beeching et al., 2022). In response, the provincial governments in Canada declared states of emergencies, enacted social distancing measures including Stay-At-Home orders, limited indoor and outdoor gatherings, ordered closures of public facilities including dine-in establishments, and mandated the use of masks (Public Health Agency of Canada (PHAC), 2021). The restrictions on in-person gatherings as well as requirements of self-isolation and quarantine led many Canadians to turn to technology (PHAC, 2021).

Technology Use in Canada during the COVID-19 Pandemic

Internet Use in Canadians

Canadians have shown have a high level of internet use even before COVID-19, though the COVID-19 pandemic led to a significant increase in the amount of time Canadians spent online as well as changes in the kinds of activities that Canadians conducted online. Statistics Canada conducted the Canadian Internet Use Survey (CIUS) in 2020, where they sampled about 44,800 Canadians across ten Canadian provinces (Government of

Canada, Statistics Canada, 2021). The CIUS survey found that in 2020, 84% of Canadians reported relying on a smartphone for personal use to communicate, to do research, or for entertainment (Government of Canada, Statistics Canada, 2021). The same survey also found that the proportion of Canadians who spent 20 hours or more on the internet for personal use rose from 19% in 2018 to 27% in 2022 (Government of Canada, Statistics Canada, 2021). In 2018, 73% of Canadians reported shopping online and spent about CDN$57.4 billion – in 2020, there was an increase to 82% of Canadians, and the amount spent went up to CDN$84.4 million (Government of Canada, Statistics Canada, 2021). The proportion of Canadians who made online phone and video calls rose from 47% in 2018 to 64% in 2020 (Government of Canada, Statistics Canada, 2021). This survey also found that during the COVID-19 pandemic, Canadians reported shopping online more often for groceries and other physical goods; in fact, the percentages of Canadians buying groceries and other physical goods online for the first time during the COVID-19 pandemic were 13% and 9% respectively (Government of Canada, Statistics Canada, 2021). The CIUS survey also found that many Canadians used online tools to monitor health – 69% searched for health information online, 25% used online tools to track health or fitness, and 14% used internet-connected wearable smart devices such as smart watches or glucose monitoring devices (Government of Canada, Statistics Canada, 2021). Interestingly, the increase in internet use was observed in not just the young – the same survey also found that 54% of older Canadians, between 65 to 74 years of age, reported participating in more online activities during the COVID-19 pandemic.

Digital Divide in Canada

The CIUS Survey found that internet use varied greatly among subgroups within the Canadian population. For example, compared to the Canadian average of 92% in 2020, subpopulations that had lower levels of internet use included those living outside of a Census Metropolitan Area of Census Agglomeration (87%), persons who were unemployed (85%), persons with a disability (84%), and persons aged 75 years old and older (62%) (Government of Canada, Statistics Canada, 2021). The findings in the CIUS survey that there was an urban-rural divide in terms of internet use was echoed in a report on the urban-rural divide in terms of internet connectivity by the Canadian Radio-television and Telecommunications Commission, which found that while 87.4% households have access to internet connections at broadband speeds (at least 50 Mbps download and 10Mbps upload and access to unlimited data), only 45.6% Canadians living in rural and remote areas do (Government of Canada & Canadian Radio-television and Telecommunications Commission (CRTC), 2016). In an April 2021 press release, the Canadian Internet Registration Authority (CIRA) reported a significant difference in the median download speeds in rural areas compared with cities at the start of COVID-19, and this divide has continued to widen during the pandemic (CIRA, 2021). While median download speeds in rural areas have improved from 5.42 Mbps in March 2020 to 9.74 Mbps in March 2021, the median download speeds in urban areas improved significantly from 26.16 Mbps to 51.09 Mbps over the same period (CIRA, 2021).

Aging and Long-term Care in Canada

Canada's Aging Population

Canada's population is aging. In 2020 the proportion of Canadians aged 65 years or older was 12.6%, and the number has increased to 18.5% representing a total of 6.84 million

Canadians 65 years or older in Canada in 2021 (Government of Canada, Statistics Canada, 2020). By 2037 approximately 10.4 million Canadians will be 65 years or older, with the proportion of adults 75 years older expected to double from 2017 to 2037 (Canadian Institute for Health Information (CIHI), 2017). Statistics from the Landmark Report by the Alzheimer Society of Canada show that the annual incidence of dementia will increase from 12,400 new cases in 2020 to 187,000 in 2030 (Alzheimer Society of Canada, 2022). In the same report, the authors note that the prevalence of dementia in Canadians will increase from 1.6% in 2020 to 3.6% by 2050 (Alzheimer Society of Canada, 2022). It is expected that as Canada's population continues to age, more Canadians will require supportive care services in the community or in specialized facilities.

Long-term Care in Canada

The Canadian Institute for Health Information defines Long-term Care (LTC) homes as the following:

> Long-term care (LTC) homes, also referred to as nursing homes, continuing care facilities and residential care homes, provide a wide range of health and personal care services for Canadians with medical or physical needs who require access to 24-hour nursing care, personal care and other therapeutic and support services (CIHI, 2017).

In Canada, the provision of universal health care services for Canadians is covered by the Canada Health Act (Government of Canada, Legislation Services, 2017) which requires all provinces to "ensure that eligible individuals do not have to pay directly for 'medically necessary' physician and hospital services" (Liu et al., 2020). The Act does not cover LTC services, and therefore there are no federal policies, funding and standards concerning LTC – these are decided at the provincial levels (Liu et al., 2020). In British Columbia (B.C.), LTC

is covered by the Residential Care Regulation within the Community Care and Assisted Living Act (B.C. Office of Legislative Counsel, 2022). In January 2023, the Health Standards Organization (HSO) and the Canadian Standards Association (CSA) published new national standards for LTC in Canada – these standards are currently voluntary (Roman, 2023), and "address the delivery of safe, reliable and high-quality LTC services" as well as "design, operation and infection prevention and control practices in LTC homes"(*HSO National Long-Term Care Services Standard*, n.d.).

The data from CIHI indicates that in Canada there are 29 LTC beds per 1,000 older adults aged 65 and above (CIHI, 2017). The proportion of older adults in BC are higher than the Canadian average – the proportion of Canadians in B.C. aged 65 years or older was 13.1% in 2000, and the number has increased to 19.7% in 2021 (Government of Canada, Statistics Canada, 2020). However, the number of LTC beds per 1,000 older adults aged 65 or older in B.C. is lower than the national average: in B.C. - there are 28 LTC beds per 1,000 older adults age 65 and above (CIHI, 2021). While these numbers compare favourably with other provinces and countries around the world (Wilson et al., 2017), there are several reports that have sounded the alarm regarding the long stressed and under-resourced state of Canada's LTC sector (Gibbard, 2017; MacCourt et al., 2020; MacDonald et al., 2019). These reports highlight serious problems within Canada's LTC sector that existed before the COVID-19 pandemic and were made much worse by the pandemic, such as increased needs of LTC residents, old buildings not built to meet LTC residents' needs, ongoing LTC staffing challenges and service gaps (Gibbard, 2017; MacCourt et al., 2020; MacDonald et al., 2019). With the future need for LTC beds expected to double within the next 10-15 years, these

reports also project severe shortfall in meeting the future needs (Organisation for Economic Co-operation and Development, 2021).

Technology in Long Term Care Settings in Canada

Many LTC buildings in Canada have outdated building designs with antiquated technological infrastructure – many LTC homes lack even basic internet access (Chu et al., 2021). In a 2021 McMaster Health Forum evidence brief reporting on the potential of technology in LTC in Canada, Gauvin et al., (2021) noted that technology was not used consistently to support core LTC services, such as routine activities, programs and services for residents, as well as communication between residents and formal caregivers, family and friends. Further, technology adoption in LTC was slower than other health sectors such as acute care. The panelists in the study by Gauvin et al. (2021) noted technologies may help improve the quality of life of residents as well as support LTC staff to improve quality of care, but there were concerns that technology "replaced people" and took staff away from direct care. The panelists also noted that older adults were often able to use technology with some support though there was a belief that older adults did not want or were unable to use technology (Gauvin et al., 2021). Other challenges noted included the disparity of access due to the cost of digital devices, the inability to connect to the internet due to the lack of internet infrastructure within the LTC building itself or a larger lack of critical internet infrastructure in some parts of Canada (Ickert et al., 2020).

Long Term Care in British Columbia

In B.C., the provision of health services falls under the portfolio of the Ministry of Health, which works together with the Provincial Health Services Authority (PHSA), five regional health authorities, and the First Nations Health Authority. The five regional health

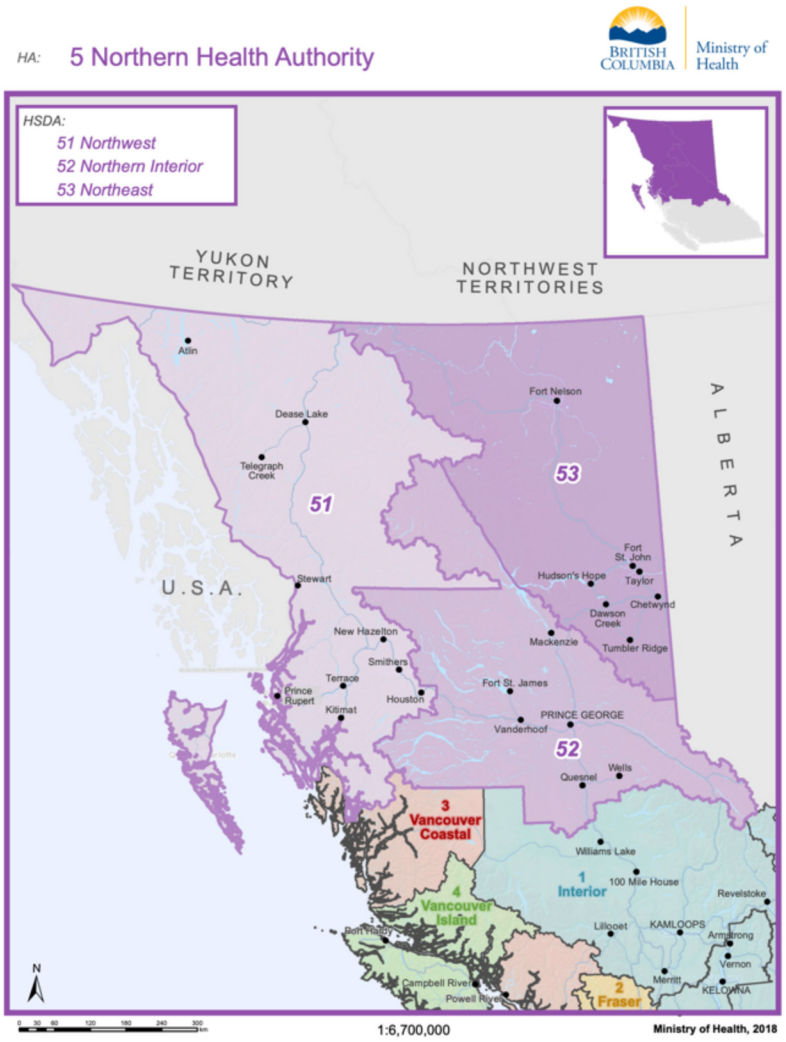
authorities are Fraser Health Authority, Interior Health Authority, Northern Health Authority (NHA), Vancouver Island Health Authority, and Vancouver Coastal Health Authority – these entities govern, plan and deliver healthcare services within their geographic areas. The services provided to those living in LTC facilities in B.C. include: standard accommodations, development and maintenance of a care plan that identifies clinical support services (such as rehabilitation and social work services), social and recreational activities, meals and nutrition supplements that meet therapeutic diet needs or tube feeding, routine laundry services, general hygiene supplies, routine medical supplies, incontinence management, personal basic wheelchairs as well basic cleaning and maintenance, and other specialized care (such as dementia or palliative care) (B.C. Ministry of Health, n.d.). As such, there are a variety of health care staff that work in LTC in B.C., including direct care staff (registered nurses, licensed practical nurses, and care aides) and allied health care staff (occupational therapists, physiotherapists, social workers, dietitians, recreational therapists, activity workers) (Plecas, 2017). In addition to health care staff, there are a variety of non-health care staff that provide support services to LTC residents, such as foodservices, laundry and housekeeping services and building maintenance services (Plecas, 2017)

Long Term Care in Northern British Columbia

Northern Health Authority provides health care services to about 300,000 people living in a geographical area that spans the northern two-thirds of B.C. province and spilt to three health service delivery areas – see Figure 1 (B.C. Ministry of Health, 2018). The population densities per square kilometre for the North West, Northern Interior and North East are 0.3, 0.7 and 0.4, respectively (Statistics Canada, 2017b, 2017a, 2017c). There are 25 LTC facilities within the NHA catchment area (Northern Health Authority, n.d.).

Figure 1

Northern Health Authority and Health Services Delivery Areas



Note. The purple regions indicate the catchment area of Northern Health Authority. Taken from Health Boundaries, by the B.C. government (https://www2.gov.bc.ca/assets/gov/data/geographic/land-use/administrative-boundaries/health-boundaries/5_northern_health_authority.pdf). Copyright by the B.C. government under the Open Government Licence]

The need to provide health care services over large geographical areas that have low population densities creates unique problems beyond access to health care services for the general public; it is challenging to find enough well-trained staff in the region to hire as well as to provide continuous education to maintain service standards. These challenges have been exacerbated during the COVID-19 pandemic. The 2020-2021 waiting time for a bed in a

LTC home within NHA was 165 days – among the B.C. health authorities only Vancouver Island Health had longer wait times at 171 days. The wait times reported in the other B.C. health authorities for LTC beds were much shorter: Interior Health (59 days), Fraser Health (62 days), Vancouver Coastal Health (21 days) (B.C. Office of the Seniors Advocate British Columbia, 2021).

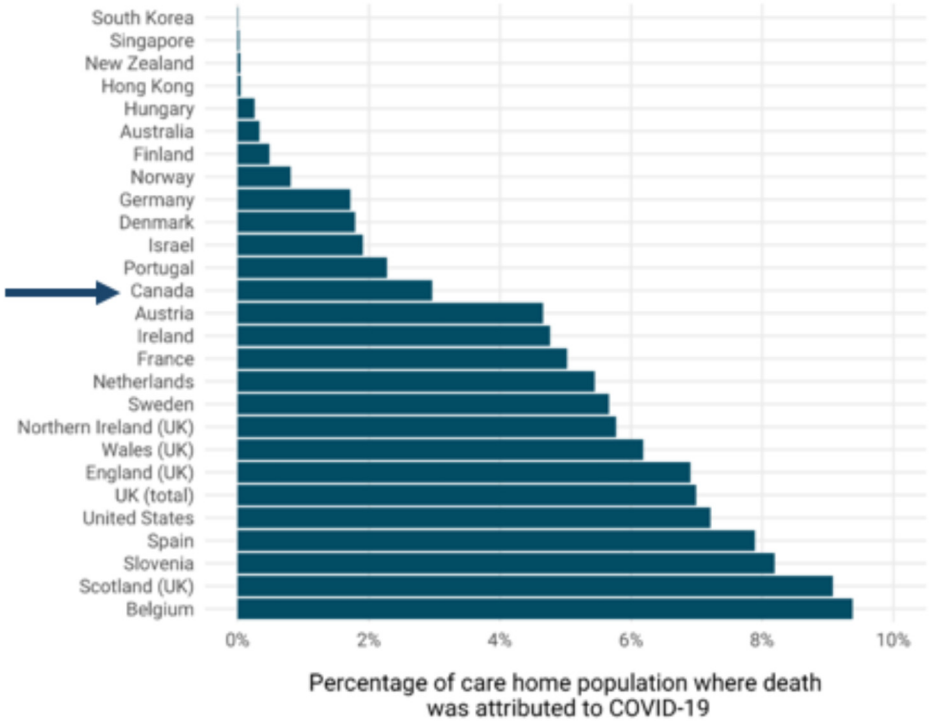
COVID-19 and Long-term Care

Long-term care residents have been disproportionally negatively affected by the COVID-19 pandemic. Not only do many LTC residents have underlying medical conditions that put them at higher risk of developing more severe forms of COVID-19, they also live in congregate living environments that put them in unavoidable close contact with other LTC residents as well as LTC staff (Government of Canada, 2020). In response to the COVID-19 pandemic, the health ministries of the different provinces created and implemented new policies regarding infection prevention and control, use of personal protective equipment, staffing and other on-site work policies, visitation, outbreak management (Liu et al., 2020). For many months, LTC homes in Canada had strict visitor restriction policies such that all visitors were denied entry except for residents nearing end-of-life or if visitors were deemed essential – these visitors were allowed entry under exceptional situations. (Chu et al., 2021; Ickert et al., 2020). The social isolation of LTC residents led to severe deterioration of the health status of many residents in LTC (Chu et al., 2021). Technology became critical in the facilitation of social connections in LTC, though many homes experienced challenges related to the rapid deployment (Ickert et al., 2020). These issues included older tablets that were unable to download or update videoconferencing apps to the newest versions that allowed video calls as well as poor internet infrastructure of the LTC buildings leading to weak Wi-Fi

that was not strong enough to allow video calls (Ickert et al., 2020). As well, many LTC residents had physical or cognitive deficits which affected their abilities to use these technologies independently; for example, most residents needed the help of LTC staff to initiate phone calls and/or hold the tablet at face level (Chu et al., 2021; Ickert et al., 2020). Figure 2 shows the 2020 mortality rates attributed to COVID-19 per percentage of LTC residents of Canada (2.61%) compared with other countries, like Australia (0.33%), England (7.22%), Denmark (1.79%), France (5.02%), Germany (1.72%), United States (7.21%) (Comas-Herrera et al., 2020).

Figure 2

Share of LTC residents whose deaths were linked to COVID-19, compared to the LTC population



Note. Figure taken from "Mortality associated with COVID-19 in Care Homes: International Evidence" by A. Comas-Herrera, J. Zalakaín, E. Lemmon, D. Henderson, C. Litwin, A.T. Hsu, A.E. Schmidt, G. Arling and J-L. Fernández, 2020. Article in LTCcovid.org, International Long-Term Care Policy Network, CPEC-LSE, 14 October.

COVID-19 in Long-term Care in British Columbia

The first death related to COVID-19 in Canada occurred on March 08, 2020, and the victim was a LTC resident living in Lynn Valley Care Centre, in North Vancouver, B.C. – Lynn Valley Care Centre went on to lose 20 residents in that COVID-19 outbreak (Uguen-Csenge, 2021). In the following weeks and months, B.C.'s Provincial Health Officer issued orders restricting the movement of LTC staff across different facilities (B.C. Office of the Provincial Health Officer, 2020), as well as additional LTC COVID-19 preventative measures (B.C. Office of the Provincial Health Officer, 2021a). These orders imposed restrictions on people working and visiting LTC homes in B.C.; for example there was an order requiring all LTC staff to be vaccinated by October 12, 2021, and visitors by November 20, 2021 (B.C. Office of the Provincial Health Officer, 2021a). As well, the B.C. Centre for Disease Control issued guidance for LTC facilities regarding visitation, infection prevention and control measures, and outbreak management (B.C. Centre for Disease Control, n.d.). These guidelines and restrictions contributed to the reduction in exposure to COVID-19 for LTC residents who were at high risk for severe illness and death. However, these policy decisions subsequently also resulted in LTC residents losing social support from their family and friends and experiencing increased social isolation and loneliness, leading to increased depression and stress, and decreased cognition (B.C. Office of the Provincial Health Officer, 2021b). These changes were particularly detrimental to residents with dementia, who comprised about 64% of LTC residents in B.C. (B.C. Office of the Provincial Health Officer, 2021b). In response, families of residents as well as the staff of LTC homes sought safe and creative alternatives to traditional visits, including the use of internet communication technologies and other user-friendly technologies to support for virtual visits

for LTC residents to allow LTC residents to have virtual connection to their families and friends outside the LTC homes (B.C. Office of the Provincial Health Officer, 2021b).

While NHA reported their first COVID-19 case in March 2020, LTC homes in northern B.C. did not experience COVID-19 outbreaks during the first wave of COVID-19. The first LTC COVID-19 outbreak within NHA's catchment area was declared for Rotary Manor at Dawson Creek on November 02, 2020 (Northern Health, n.d.). This was followed by Jubilee Lodge at Prince George on December 12, 2020, Acropolis Manor at Prince Rupert on January 19, 2021; and all three facilities would be affected by additional outbreaks a few months later (Northern Health, n.d.).

Chapter 2: Literature Review

Technology use in LTC changed during the COVID-19 pandemic, as the infection control practices minimizing the spread of COVID-19 in health care workers included new restrictions on how they were able to work, collaborate and move between health care sites. Therefore, there was a need to better understand how technology was used in LTC during the COVID-19 pandemic, as well as the perspectives of people who used technology within the LTC setting. The purpose of this literature review was to examine the breadth of evidence in the use of technology in the LTC setting during the COVID-19 pandemic, which would inform the design for this research study that was focused on technology use in LTC homes in northern B.C.

Search Methodology

Guided by Arksey and O'Malley's (2005) scoping review framework, a systematic literature search was conducted to identify peer-reviewed articles using key words and subject headings related to Long Term Care, COVID-19, and Technology.

Arksey and O'Malley identified four reasons to undertake a scoping study, of which the latter two - "summarize and disseminate research findings", and "identify research gaps in the existing literature" (Arksey & O'Malley, 2005, p21) - explained this researcher's choice in Arksey and O'Malley's approach. The researcher wanted to examine key concepts about the use of technology in the LTC setting during COVID-19 as well to identify research gaps in the existing literature. Therefore, this was the ideal search methodology for the literature review for this research study. Arksey and O'Malley's (2005) framework consists of five stages (Arksey & O'Malley, 2005):

Stage 1 identifying the research question

Stage 2 identifying relevant studies

Stage 3 study selection

Stage 4 charting the data

Stage 5 collating, summarizing and reporting the results

Stage 1: Identifying the Research Question

A Population, Intervention and Effect table (Table 1) was created to help generate the research question. The terms in the PIE table were conceptualized to generate similar words. Table 2 displays a list of search terms.

Table 1

Population, Intervention and Effect Keywords

Population/problem/patient	Long Term Care during the COVID-19 pandemic
Intervention/issue	Technology Use
Effect/evaluation	Activities

Table 2

Documentation - Search Terms

Themes	Subsidiary search terms	
Long Term Care	+ nursing home + assisted living facility*	+ residential facilit* + retirement home
Technology	+ technolog* + electronic* + internet + tablet* + comput*	+ comput* + telecommunication + video conferenc* + telemedicine
COVID-19	+ COVID-19 + pandemic	

Stages 2 and 3: Identifying Relevant Studies and Study Selection

For this literature review, five databases were searched separately on 16th October 2022 – Pubmed (NLM), APA PyschInfo (EBSCO), CINAHL (EBSCO), SocIndex (EBSCO), and Web of Science (Clarivate); see Appendix A for the search strategies used in the databases. Research articles that described implementation and/or use of any kind of technology, as well as data analysis on technology use in the LTC setting during the COVID-19 pandemic were included for analysis. Articles that did not describe investigations, interventions or reported data analyses (for example articles that described a problem with a narrative review and a call-to-action) or described research studies that looked at the technology in settings outside LTC or before the COVID-19 pandemic, were excluded from the analysis. Due to the large number of articles found, two additional exclusion criteria were added - investigations that were done outside North America and articles that were not original research articles (for example conference proceedings, posters abstracts, and dissertations).

Stage 4: Charting the Data

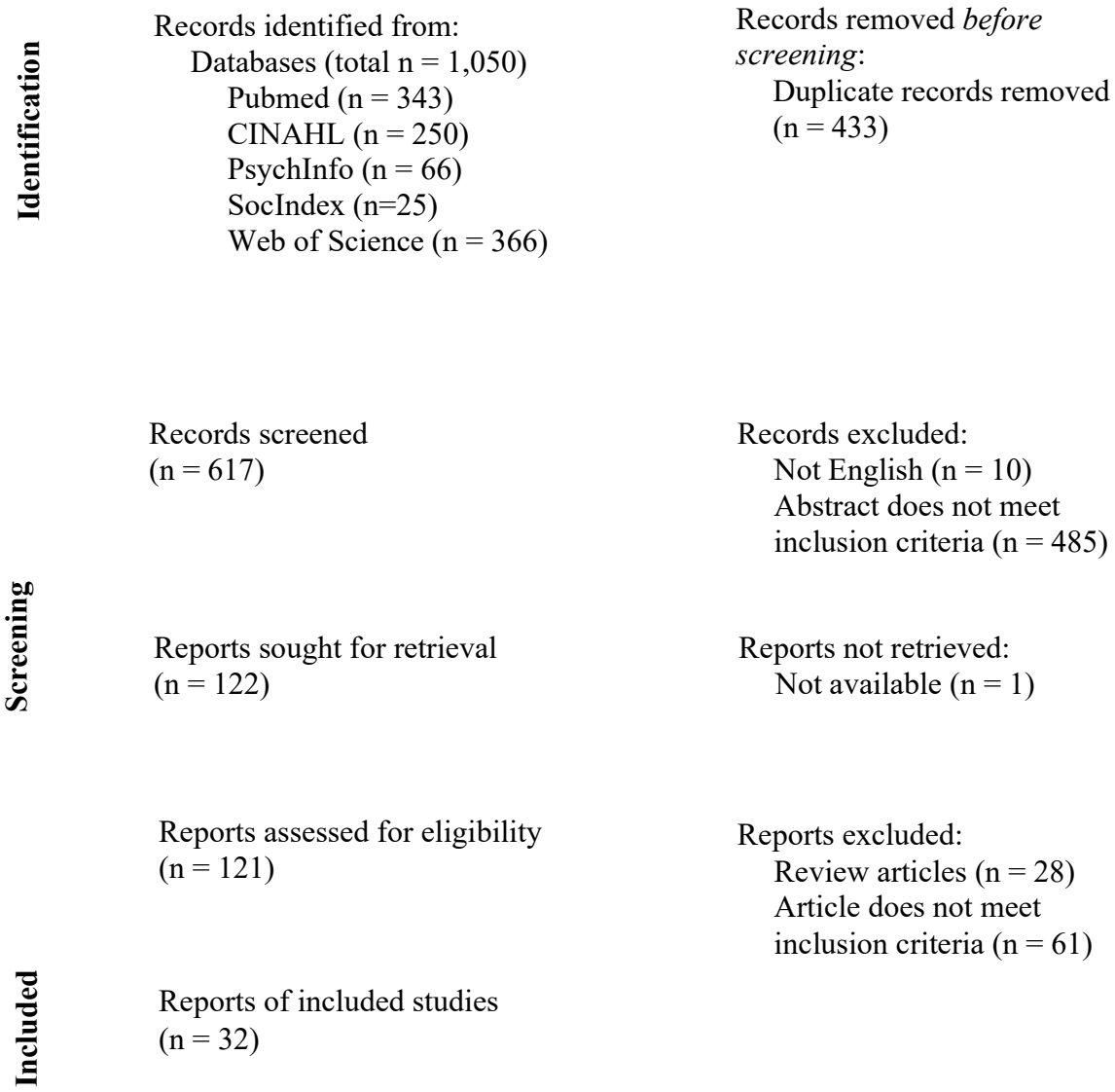
A literature matrix was created with Microsoft Excel for Mac Version 16.71 (Microsoft Corporation, 2019). The data from the articles were entered into a Microsoft Excel spreadsheet (see Appendices B, C and D) and then analyzed for themes.

Stage 5: Collecting, Summarizing and Reporting the Results

There were 121 articles retrieved, of which 32 articles met the inclusion criteria and were included for analysis. Figure 3 shows the PRISMA diagram of the literature review.

Figure 3

PRISMA Diagram of Literature Review



Note. Figure adapted from "The PRISMA 2020 statement: an updated guideline for reporting systematic reviews" by M.J. Page, J.E. McKenzie, P/M/ Bossuyt, I. Boutron, T.C. Hoffmann, C.D. Mulrow, et al., 2021, *BMJ, 372(71)*. doi: 10.1136/bmj.n71.

Findings from the Literature Review

The articles retrieved were published between 2020 and October 2022. Of these 32 articles (Appendices B to D), nine were published in 2021 and 23 were published in 2022. Ten studies were conducted in Canada; none were epidemiological studies - all ten were descriptive studies conducted in Canadian LTC homes situated in the following provinces: British Columbia (n=3), Ontario (n=6), Alberta (n=1) and Quebec (n=1) – one study recruited participants from two provinces. There were 22 studies from the United States, of which seven were involved in the participation in surveys or virtual participation (for example virtual education sessions) where subjects in the studies came from multiple states, and one was a consensus panel consisting of experts from a few states. The others were conducted in LTC homes situated in the following states: California (n=1), Colorado (n=1), Florida (n=1), Maryland (n=1), Massachusetts (n=1), Minnesota (n=1, New York (n=2), North Carolina (n=1), Pennsylvania (n=1), Rhode Island (n=1), South Carolina (n=1), Texas (n=1) and Wisconsin (n=1). The articles included studies of various methodologies including mixed methods (n=8), qualitative descriptive (n=13), quantitative descriptive (n=2), retrospective cohort (n=5), cross-sectional (n=1), consensus panel (n=1), and computer-based modelling (n=2). The populations studied included LTC staff, medical professionals, LTC residents and their families.

Characteristics of Technology Use in Long-term Care

The studies in the literature reported that there was greater telehealth rollout in LTC homes in the United States during the COVID-19 pandemic (Alexander et al., 2021; Schuster & Cotten, 2022). However, this was not homogenous throughout the United States (Alexander et al., 2021). For example, 64% of nursing homes reported increases in telehealth

use while 32% reported declines in technology use (Powell et al., 2022). There were no studies found that reported Canadian data on telehealth rollout in LTC.

Nursing home characteristics have been found to have an impact on telehealth use (Alexander et al., 2021) - nursing homes in rural locations used less telehealth, and were less likely to have the capability to transmit and receive laboratory results electronically; and smaller nursing homes were less likely to use electronic reporting for lab results compared to medium and larger nursing homes (Alexander et al., 2021). However, the details regarding the characteristics and locations of the LTC homes such as urban or rural setting, size of LTC homes, as well as funding models were not consistently reported in the literature nor described in detail. For example, Kuepfer (2022) included information as to whether the LTC homes were in rural or urban settings, Connelly et al. (2022) included information as to the size of the LTC homes in the form of the number of beds, and Chu et al. (2022) included information as to whether the LTC homes were publicly or privately funded.

In the literature, a variety of technologies were described including robots (n=3), web-based websites and games (n=1), and computer-based models that predict COVID-19 transmission in LTC (n=2), but the bulk of the studies in the literature described the use of ICTs in LTC to help connect people within LTC to those outside LTC – these technologies include internet connection via Wi-Fi and access to content online, and devices with audio (the telephone), audio-visual as well as video conferencing capabilities (smartphones and tablets). Within the LTC setting during COVID-19, technology was deployed in support of programs and policies that addressed five major areas of need: Quality of life of LTC residents in the context of social isolation (n=14); Telehealth and virtual services and multidisciplinary collaborations (n=10); Continuing education and training (n=7); Infection

prevention and control services and activities (n=4); Computer-based modeling for the LTC setting (n=2). The same programs or technologies were often deployed in multiple areas of need and served different groups of people within LTC. These five areas of need, as well as the corresponding technologies, will be elaborated further in the following sections.

Quality of Life of Residents in the Context of Social Isolation.

In response to COVID-19, strict social isolation protocols were implemented in LTC, which resulted in LTC residents experiencing drastic increases in social isolation. On analyzing National Health and Aging Trends Study (NHATS) data, Freedman et al. (2021) found that there was significant decline in in-person or phone contact for older adults in residential care settings in the United States, and these were more substantial than for those living in the community.

Recognizing the risks of social isolation and the separation of LTC residents from their families when strict social isolation protocols in LTC were implemented, many LTC homes turned to technology as a solution. Freidus et al. (2021) noted in their North Carolina study that "the use of technology to address social isolation was an issue for most LTC communities". ICTs allowed socially isolated LTC residents to connect virtually with their loved ones outside LTC and participate in virtual recreation activities. Additionally, it was important for families to have multiple options when communicating with LTC facilities. Straker and Choi (2021) found that families with multiple communication channels available to reach their loved ones in LTC reported greater peace of mind, so much so that "after adding communication variables the variable of COVID-19 cases was not a significant predictor for peace of mind" (Straker & Choi, 2021). Analysis of the literature showed that the number of research articles where devices used in the context of social isolation of LTC

residents included smart devices (n=9); telephones (n=2); and robots (n=3). These devices were used by residents for virtual visits, ICT-mediated social interactions and recreation activities.

Smart devices. Smart devices are devices that can connect to the internet, and typically have audio, visual, and/or audio-visual capabilities. Many smart devices are able to support video-telephony and chat services through software such as FaceTime, Zoom, and Teams. Through these devices, LTC residents were able to connect with people outside LTC (Chu et al., 2022; Hardy et al., 2022; Prophater et al., 2021), and access sources of entertainment and stimulation on the internet such as music, movies, and news (Hardy et al., 2022; Prophater et al., 2021).

Virtual visits. Five studies mentioned the use of video-conferencing technologies to support LTC residents and their families to connect virtually (Chu et al., 2022; Freidus et al., 2021; Hardy et al., 2022; Kuepfer, 2022; Prophater et al., 2021). The studies did not all specify which devices were used, that is, whether participants used smartphones, tablets, a combination of both, or other devices, though some studies did. For example, Hardy et al. (2022) investigated video-conferencing on tablets; and Prophater et al. (2021) described the use of tablets installed with proprietary software with added security features that served multiple functions, one of which was a direct video call app that allowed LTC residents to connect with families safely. Researchers found that LTC residents, families and caregivers appreciated and expressed positive statements about the availability of ICTs for communication when LTC homes were under strict visitation restrictions (Hardy et al., 2022; Prophater et al., 2021). Video-conferencing technologies allowed families and residents to see each other which “made all the difference”, and while families noted that video-

conferencing technologies could not replace face-to-face meetings, they remained "the most effective way to maintain quality contact" (Hardy et al., 2022). Even for residents with severe cognitive impairments, LTC staff reported that these residents reacted positively by smiling and clapping when these residents saw or heard their families on the screen (Hardy et al., 2022). Tablets were perceived to be easier and faster for families; many families already had their own digital devices that they used for video-conferencing with residents (Hardy et al., 2022). For some families that found frequent in-person visits to be physically demanding or those that lived far from the LTC homes and could not visit their loved ones in LTC often, they appreciated the availability of virtual visits on tablets as an option (Hardy et al., 2022).

Other information and communication technologies-mediated social interactions and recreation activities. Long-term care residents used information and communication technologies (ICTs) to connect with people other than families, participated in individual as well as group activities virtually, and accessed online content. Sheperis et al. (2022) described a program that allowed medical and healthcare professional students to connect with and provide social support to residents in LTC or retirement homes at risk of social isolation via telephones, mobile phones and videoconferencing technologies. Wi-Fi enabled tablets with proprietary software installed that was used as described in the preceding section that allowed LTC residents to video call families, also included a simple interface that allowed residents to access entertainment and spiritual content curated for older adults (Prophater et al., 2021). Kuepfer (2022) reported the use of worship presentations on PowerPoint with links to hymns on YouTube that recreation staff could deliver as a program, organized memorial services on Zoom, played residents' Christmas music requests via the LTC home's internal broadcasting system, and even a virtual piano recital. Virtual group

activities were able to provide LTC residents with common experiences that they could talk about when they met in person (Kuepfer, 2022). For many LTC residents, ICTs also played a role in spiritual care activities. The study by Kuepfer (2022) reported that LTC chaplains in Ontario supported residents in their use of ICTs to participate in real-time virtual church services, virtual bible studies, virtual reflection times, and virtual synchronous and asynchronous worship services. Other technologies described in the literature that allowed residents to have social interaction include "Seniors WithOutWalls" which allowed residents to call in or receive calls and connect as a group via their telephones (Kuepfer, 2022) and in-house systems that some LTCs that were well-equipped and had resources set up that allowed these facilities to stream programming to the residents in their rooms (Freidus et al., 2021).

Robots. Robots were also used in LTC during COVID-19 to support social connection (Freidus et al., 2021; Hung, Mann, Perry, et al., 2022; Van Orden et al., 2022). These robots took on a variety of forms, including robotic cats and dogs (Van Orden et al., 2022), a robotic baby seal and mobile telepresence robot that was "mobile and offer video-enabled virtual visits" (Hung, Mann, Perry, et al., 2022). Both studies reported that the LTC staff had positive responses on the use of such devices for LTC residents (Hung, Mann, Perry, et al., 2022; Van Orden et al., 2022). Van Orden et al. (2021) reported that robotic pets not only provided companionship and comfort to the veteran residents with dementia, the pets also promoted social interactions with other staff and residents as the veteran residents chatted about their "pets". Like the study by Van Orden et al. (2022), the participants in the study by Hung et al. (2022) agreed that robots offered a supportive role in social connection in LTC, and noted in particular that telepresence robots reduced the workload of LTC staff in

supporting residents for social connection (Hung, Mann, Perry, et al., 2022). However, funding was a concern for some LTC homes for access to robots - Freidus et al. (2021) described the provision of grant writing assistance to LTC homes that did not have staff with this expertise, to allow them access to funding that enabled them to purchase robotic pets for the LTC residents in the context of social isolation.

Negative emotions with technology-mediated activities for residents. Information and communication technologies helped bridge connections between LTC residents their families outside LTC, but researchers noted that the use of these technologies also led to negative emotional experiences for LTC residents, their families, and LTC staff (Chu et al., 2022; Hardy et al., 2022; Hung, Mann, Perry, et al., 2022). Families of LTC residents struggled emotionally with keeping LTC residents engaged via ICTs when the LTC residents were not able to engage in conversations or participate effectively (Hardy et al., 2022), and with watching residents become agitated at the end of the virtual visits (Chu et al., 2022; Hardy et al., 2022). Other staff reported that for residents with dementia, not only did mobile robots have the potential of triggering responsive behaviours for LTC residents, robots could also be used as a weapon during a behaviour episode (Hung, Mann, Perry, et al., 2022). LTC staff and families of residents that were interviewed expressed discomfort over the loss of privacy (Chu et al., 2022; Hung, Mann, Perry, et al., 2022), and this will be elaborated upon in a later section that discusses privacy concerns in general.

Telehealth, Virtual Services and Multidisciplinary Collaborations

To minimize the risks to LTC residents of COVID-19 exposure while maintaining continued provision of medical care, LTC homes turned to ICTs, including telehealth technologies (Bogin et al., 2022; Powell et al., 2022). Powell et al., (2022) define telehealth

as “the delivery and facilitation of health and health-related services including medical care, provider and patient education, health information services and self-care via telecommunication and digital communication technologies”. Eight articles discussed telehealth rollout in LTC due to the COVID-19 pandemic, of which seven investigated the perspectives of LTC stakeholders on telehealth, virtual services and multidisciplinary collaborations, including medical and allied care professionals providing services to LTC residents from outside LTC (Beaudreau et al., 2022; Davitt & Brown, 2022; Shaughnessy et al., 2022), as well as LTC staff connecting with other medical and allied health care professionals outside LTC and caring for LTC residents (Cruz et al., 2022; Ford II et al., 2022; Powell et al., 2022; Reddy et al., 2021).

Telehealth technologies and areas of use. The technologies and devices used for telehealth purposes in the literature included videoconferencing technologies (Beaudreau et al., 2022; Bogin et al., 2022; Ford II et al., 2022; Powell et al., 2022; Shaughnessy et al., 2022), voice and touchscreen controlled smart speakers (Davitt & Brown, 2022), and a tablet-compatible web-based mobile app (Cruz et al., 2022). Videoconferencing technologies were used to allow medical professionals to see patients living in LTC virtually (Beaudreau et al., 2022; Bogin et al., 2022; Shaughnessy et al., 2022), and allow inter-professional meetings and collaborations (Ford II et al., 2022; Powell et al., 2022; Shaughnessy et al., 2022). Voice and touchscreen controlled smart speakers were used to allow caseworkers to communicate with their guardianship clients in LTC during the COVID-19 pandemic when caseworkers were not allowed into LTC homes (Davitt & Brown, 2022). A tablet-compatible web-based mobile app, Mobile Smart Care System (mSCS) - that allowed health care aides to access care plans, record observations and chart completed care activities, and nurse

managers to monitor the activities of care aides' care activities - was trialed in a LTC home in Alberta (Cruz et al., 2022). The researchers found that overall acceptance of the mSCS was high - care aides found the mSCS useful, easy to use, fit with their needs, and expressed willingness to continue using the mSCS in the future. Interestingly, the demographics of the care aides as reported in Cruz et al., (2022) showed that the care aides reported high comfort levels with use of digital technologies.

Benefits of telehealth technologies in long-term care. The benefits of telehealth technologies include increased access by LTC residents to medical specialists and other health care professionals in some circumstances and lowered time and cost associated with transportation of LTC residents off-site (Bogin et al., 2022; Ford II et al., 2022; Powell et al., 2022; Shaughnessy et al., 2022). Researchers found that that program adaptions via telehealth technologies that allowed clinicians flexibility in treatment modality that "did not diminish the effectiveness of the intervention" (Beaudreau et al., 2021). Researchers also noted that telehealth technologies could be used to provide care to medically complex older adults with brain diseases and/or mental health issues (Beaudreau et al., 2021; Shaughnessy et al., 2022). To support this, Shaughnessy et al. (2022) described the convening of a multidisciplinary consensus panel that put together a list of recommendations for best practices of "using telemedicine to assess and manage psychosis in neurodegenerative diseases in LTC". As well, Beaudreau et al. (2021) described program adaptions to train clinicians to deliver Problem Solving Training, an evidence-based therapy "for depression and other psychiatric disorders and psychosocial stressors", to their patients by telephone and/or video-conferencing as well as in-person.

Continuing Education and Training

Continuing education and training are integral in the provision and maintenance of quality health care services. This became especially critical during the COVID-19 pandemic, where health care workers needed to be trained on how to safely provide care and limit infection of a novel virus within a context of rapidly changing information and system practice changes. Staff training was an important facilitator of technology adoption in LTC – in Powell et al. (2022) the researchers noted that the only LTC homes that reported sustained increase in telehealth use after two years were those that reported training for staff.

However, face-to face-workshops were not feasible for staff during the COVID-19 pandemic due to staff shortages as well as adherence to socially distancing guidelines (Hung et al., 2022). There were two virtual education formats described in the literature - synchronous sessions where participants met online at the same time and interacted live (Baughman et al., 2021; Beaudreau et al., 2021; Lingum et al., 2020; Penna et al., 2022; Prophater et al., 2021) asynchronous education delivery methods where learners attended the education sessions at their own time and pace (Hung et al., 2022; Prophater et al., 2021).

Synchronous delivery. Of the five studies that described education activities via synchronous delivery, three described the adaptation and adoption of Project ECHO®, a program to improve implementation of evidence-based infection control practices regarding COVID-19 prevention, outbreak management and return-to-work policies in LTC (Baughman et al., 2021; Lingum et al., 2020; Prophater et al., 2021). Project ECHO® was a video-conferencing program consisting of 16 weeks of virtual education sessions where multidisciplinary experts and community-based partners met in "regularly scheduled collaborative learning sessions to participate in case-based discussions and hear experts

present on best-practice care" (Prophater et al., 2021), The research studies described the implementation of Project ECHO® in Ontario (Lingum et al., 2020), Massachusetts (Baughman et al., 2021) and Florida (Prophater et al., 2021). The study by Beaudreau et al. (2021) described program adaptions to a previously in-person workshop that trained clinicians providing care to veterans - the workshop to virtual with trained psychologists "facilitating small-group roleplays" and "leading weekly group learning calls after the virtual training" (Beaudreau et al., 2021). In another study, Penna et al (2022) described and evaluated a United States Centers for Disease and Prevention Control (CDC)-designed virtual course to train public health staff core health care Infection Prevention and Control (IPC) principles and apply the CDC COVID-19 healthcare IPC guidance for nursing homes. Learners were required to attend all live virtual training sessions that were led by CDC Subject Matter Experts (SMEs) whom facilitated group discussions, and were encouraged to perform on-site and remote COVID-19 IPC assessments within a few weeks of completing the course (Penna et al., 2022). All five studies that described virtual synchronous education activities reported that LTC staff valued these sessions which were effective at transmitting valuable information that was relevant to their work, and increased the ability of staff to integrate knowledge into practice (Baughman et al., 2021; Beaudreau et al., 2022; Lingum et al., 2021; Penna et al., 2022; Prophater et al., 2021). The sessions were effective in increasing the knowledge and confidence of LTC staff and were also well-accepted by LTC staff (Baughman et al., 2021; Beaudreau et al., 2022; Lingum et al., 2021; Penna et al., 2022; Prophater et al., 2021).

Asynchronous delivery. The two studies that described asynchronous education sessions were both self-paced online programs targeted towards professional caregivers – one

was described as providing four hours of education material that "covered foundational information on Alzheimer's and dementia" (Prophater et al., 2021, p3) and the other was an online game-based dementia education accessible on a variety of platforms (including mobile phones, tablets and computers) that taught practical person-centered communication techniques to interdisciplinary health care workers (Hung, Mann, & Upreti, 2022). The researchers of both studies found that these asynchronous education activities were also well-received by the participants of the training (Hung, Mann, & Upreti, 2022; Prophater et al., 2021).

Infection Prevention And Control Services And Activities

Like continuing education and training, IPC is an integral part of the provision and maintenance of quality health care services, especially during the COVID-19 pandemic when there was early recognition that LTC homes were settings at high risk of transmission (Lingum et al., 2021), and LTC residents were more vulnerable to infectious diseases and disproportionately more likely to experience severe outcomes in the event of an infection due to their advanced ages, multiple comorbidities, and living in close proximity (Walters et al., 2022; Singer et al., 2022). Four articles described technology use in IPC services and activities – three discussed the use of telephone- and video-based infection control assessment and response (tele-ICAR) strategies to conduct remote IPC assessments (Ostrowsky et al., 2022; Singer et al., 2022; Walters et al., 2022), and one discussed the implementation of an autonomous robot screener (Getson & Nejat, 2022).

Telephone- and Video-based Infection Control Assessment and Response. The studies that discussed telephone- and video-based infection control assessment and response (tele-ICAR) were done in the United States. New York was the first state of which tele-ICAR

was trialed (Ostrowsky et al., 2022), and this was adopted in other US states (Singer et al., 2022; Walters et al., 2022). The remote IPC assessment consisted of three components – a screening tool for public health and nursing facilities for situational awareness; a telephone IPC checklist that "captured facilities' self-reported assessment of the implementation of COVID-19 IPC recommendations"; and virtual visits to LTC homes for COVID-19 IPC assessments using video-conferencing tools in smartphones (COVIDeo) (Ostrowsky et al., 2022). All three studies that investigated the implementation of tele-ICAR noted similar benefits – the screening tool was able to identify major gaps in IPC practices, facilitate discussions of clinical presentations of COVID-19 in LTC residents, and enable "more tailored, concrete and observation-based recommendations", and was suitable for proactive surveillance in LTC homes (Ostrowsky et al., 2022; Singer et al., 2022; Walters et al., 2022).

Autonomous robot screener. Getson and Nejat (2022) described the implementation of an autonomous robot screener at a LTC home in Toronto, Canada. The robot was placed at the front entrance, and was able to detect and record body temperature, cue people to put on masks and detect if the mask was worn correctly, and ask health screening questions and record answers. The researchers found that "staff were engaged and complied with the robot during the entire screening task" (Getson & Nejat, 2022). The robot increased the efficiency of the screening process, which was particularly helpful "during times when a surge of staff and visitors arrive to start their shifts or visit residents" (Getson & Nejat, 2022).

Computer-based Modeling for the Long term Care Setting

Two articles described the creation and/or use of computer-based modelling to predict parameters related to the COVID-19 pandemic (Fosdick et al., 2022; Miller et al., 2021). Fosdick et al. (2022) described the development of an agent-based model – a "powerful tool

for understanding complex dynamic process" and able to "simulate key daily behaviours and events that impact disease transmission in a facility". Using this agent-based model, the researchers created an online dashboard that a LTC administrator could access, enter facility-specific parameters into, obtain forecasts on infection rates and worker days missed that was specific to that LTC home, thus able to "evaluate the relative impact of various strategies" and make policy decisions more suited for their particular context (Fosdick et al., 2022). Fosdick's work was not implemented in practice. In contrast, Miller et al. (2021) described a process by which an isolation space was designed, implemented and validated in a skilled nursing facility through the modification of the facility's existing heating, ventilation and air conditioning systems. These modifications were successful at maintaining a pressure differential between the isolation space and the surrounding hallways, and the authors reported that no transmissions of SARS-CoV-2 occurred between residents in the isolation space to the staff and other residents (Miller et al., 2021).

Challenges Encountered with Technology Use in Long-term Care

Despite the variety of roles and numerous benefits that technology has had in the LTC setting during the COVID-19 pandemic, there were also substantial challenges that were reported. The subtopics include: Supporting LTC residents with physical and cognitive challenges; Technology challenges in LTC, Low technology literacy within the LTC setting; Scheduling conflicts, staff shortages and high staff workload; Privacy and other ethical concerns.

Supporting residents with physical and cognitive challenges. The use of ICTs was challenging for LTC residents, many of whom had physical or cognitive impairments and using technologies that did not meet the residents' needs – this limited their ability to

participate fully in virtual activities (Chu et al., 2022; Hardy et al., 2022; Hung, Mann, Perry, et al., 2022; Saad et al., 2022). LTC residents with physical limitations required the assistance of LTC staff to help with proper body positioning as well as the position of the devices, ensuring that assistive devices be in place (such as hearing aids for residents), that tablets be held up by the staff themselves or with tablet stands (Chu et al., 2022; Hardy et al., 2022; Hung, Mann, Perry, et al., 2022). The researchers reported interviewees that questioned the usefulness of ICTs for residents with dementia who were often confused, disoriented, and showed irritation by the tablet interface (Chu et al., 2022; Saad et al., 2022) or for LTC residents that had severe visual or hearing impairment or were nonverbal (Saad et al., 2022).

Technology challenges in long-term care. Researchers noted that LTC homes had poor technological infrastructure, unstable Wi-Fi connectivity and inadequate number of devices to support virtual visits, other online recreation activities in LTC, as well as the provision of telehealth services and LTC staff having access to digital training (Bogin et al., 2022; Chu et al., 2021; Ford II et al., 2022; Hung, Mann, Perry, et al., 2022; Hung, Mann, & Upreti, 2022; Saad et al., 2022). That led to frustrations for LTC residents, their families as well as LTC staff and health care professionals providing services to LTC residents via telehealth technologies (Bogin et al., 2022; Chu et al., 2021; Hung, Mann, Perry, et al., 2022; Saad et al., 2022). To facilitate LTC residents' virtual visits with their families, Freidus et al. (2021) noted that LTC staff often used their own personal devices. Even when technology was set up properly, the chosen technologies were often localized to specific rooms such as a personal Wi-Fi connection or telephone line to a resident's room - the relocation of the LTC resident to other rooms in response to outbreak and IPC protocols resulted in the LTC

resident losing access to technology (Freidus et al., 2021). Healthcare professionals within and outside LTC, who were providing services via telehealth technologies, reported challenges related to systems interoperability and poor data integration, which resulted in clinicians having to deal with multiple logins to different systems remotely to access medical information such as lab results, vital signs and progress notes (Ford II et al., 2022; Powell et al., 2022). Technology also led to difficulties related to learning how to do previously technology-free activities with the mediation of technology such as communicating with LTC residents with dementia during virtual visits or conducting physical examinations in telehealth sessions, especially when the technology was not quite suited for the purpose (Ford II et al., 2022; Hardy et al., 2022). For example, Hardy et al. (2022) described challenges faced by families on the effort required to participate in one-sided conversations with their loved ones in LTC via tablets "especially when the resident is unable to understand or uphold the conversation", and Ford et al. (2022) reported that "participants noted that telemedicine modality was less desirable for conduct of sub-specialty encounters where the physical exam played a dominant role in decision making". In the study by Davitt et al. (2022) on the use of voice and touchscreen controlled smart speakers with Wi-Fi connection, caseworkers described specific technology difficulties related to using a single user Amazon account (the caseworker) to manage multiple devices belonging to multiple clients, such as user tracking, and that when a LTC resident used these smart speakers to call other people the call appeared to come from the caseworker.

For some technologies, technical challenges remained such that the device was not yet ready for full scale deployment; the autonomous screening robot stationed at the front entrance of a LTC home, as described by Getson and Nejat (2022), is an example of this.

Getson and Nejat (2022) noted that several technical challenges (speech recognition, navigation and autonomy) remained, in particular with speech recognition in noisy environments where the robot would be expected to detect speech even when many people were talking at the same time. Getson and Nejat (2022) also noted the importance of robots being able to handle different kinds of inputs (speech, touchscreen and gestures) to improve the experience of human-robot interactions.

Low technology literacy in long-term care. Low technology literacy in LTC residents who were not familiar with the technology devices often required staff assistance, and also in LTC staff which contributed to situations such as setting up of ICT devices in noisy locations with video cameras improperly positioned leading to poor virtual visits experiences for the families, poor telehealth experiences for the residents and for the physicians doing the assessment and staff expressions of discomfort and concerns of safety when working with robots (Chu et al., 2022; Hung, Mann, Perry, et al., 2022; Powell et al., 2022). Low technology literacy of LTC staff was noted as a barrier in using technology and gamification in clinical education (Hung, Mann, & Upreti, 2022).

Scheduling conflicts, staff shortages and high staff workload. Researchers noted that the scheduling of virtual visits was another source of challenge for LTC staff and families; LTC staff scheduled virtual visits during daytime working hours which did not work for families that also worked full time (Chu et al., 2022; Saad et al., 2022). As well, both LTC staff and families discussed the difficulties that LTC staff faced in trying to manage residents' usual nursing and caregiving needs, assist with virtual visits, teach the use and care of tech devices on top of additional IPC duties at a time of severe staff shortages in LTC (Chu et al., 2022; Hardy et al., 2022; Hung, Mann, Perry, et al., 2022). The problems of

nursing staff being tasked with additional responsibilities related to technology use and the lack of training, in addition to scheduling of telehealth visits, were echoed in survey studies that investigated telehealth implementation in LTC homes (Ford II et al., 2022; Powell et al., 2022). Powell et al. (2022) noted that "no studies reported in the hiring of new staff to accommodate for the increased use of telehealth". Even if the devices only required installation for residents' use and did not require active involvement by LTC staff on day-to-day use, staff shortages within LTC also led to delays (Davitt & Brown, 2022). Staff shortages and high staff workload also had a detrimental impact on training – Hung et al. (2022a) noted that the lack of time was a large contributing barrier in lack of "willingness in healthcare workers to spend time in dementia care education".

Privacy and other ethical concerns. Long-term care staff and families of residents that were interviewed expressed discomfort over the loss of privacy due to the consistent intrusive presence of LTC staff during private family virtual visits, even though LTC staff were there to support LTC residents with technology use (Chu et al., 2022; Hardy et al., 2022). LTC staff and families of residents also worried about the potentiality of ICTs to survey, monitor, take pictures and record audio and video (Chu et al., 2022; Hung, Mann, Perry, et al., 2022). Especially for mobile robots that were self-navigating, there was concern that a malfunction could result in the robot moving to private places such as bathrooms (Hung, Mann, Perry, et al., 2022). Privacy concerns also arose in studies of researchers investigating other technologies in LTC; for example Bogin et al. (2022) noted that there were large state-wide variations but no unified federally mandated guidelines on privacy for telehealth use in the United States, and Davitt et al. (2022) noted that caseworkers as well as the LTC staff were concerned about privacy risks of unannounced virtual visits using voice

and touchscreen controlled smart speakers placed in LTC residents' rooms on the residents as well as their roommates. Other ethical concerns raised about technology use in LTC included cost, equity of access to equipment, purpose (for LTC residents' quality of life or for convenience of LTC staff or the families of LTC residents) of robots (Hung, Mann, Perry, et al., 2022), as well as ownership, usage and access of appropriate content on voice and touchscreen controlled smart speakers (Davitt & Brown, 2022).

Conclusion

In conclusion, the literature showed that there was increased use of technology in LTC homes in North America during the COVID-19 pandemic. Technologies were used for various purposes in LTC including the provision of virtual activities to enhance LTC residents' quality of life, telehealth and virtual services, continuing education and training activities, IPC activities, and others. However, few authors reported details regarding the characteristics and geographical locations of the LTC homes, and no studies focused on technology use in LTC homes in rural and remote settings in North America. Therefore, this research project aimed to address this research evidence gap by investigating the perspectives of LTC paid employees in northern BC regarding technology use in LTC during the COVID-19 pandemic.

Chapter 3: Methodology

Purpose of the Study and Research Question

The purpose of this research is to describe the role of technology and its impact on the experiences of LTC staff working in northern B.C. during COVID-19. The research question that this research aims to address is: How was technology used by LTC staff during the COVID-19 pandemic in northern B.C.?

Research Design

The research design for this thesis project was a secondary analysis of a qualitative data set from the data corpus of qualitative component of the *Assessing the Health and Human Resource Impact of COVID-19 in the LTC Setting in Northern B.C.* study (Ethics Approval Number H21-01883). The primary study was undertaken for the initial purpose of describing the lived experiences of NHA staff of different disciplines working in LTC during the COVID-19 pandemic, including the effects that the COVID-19 pandemic had had on mental health, quality of life and well-being of LTC staff, existing policies and procedures in LTC, new policies and procedures implemented in response to the COVID-19 pandemic, and the impact of the COVID-19 pandemic on staffing levels and staff retention in the LTC setting.

There were quantitative and qualitative components in the study design of the primary study. For the qualitative component of the primary study, LTC staff from all disciplines, including management and front-line direct care providers, that worked in the NHA region in northern B.C. were invited to participate in one-hour semi-structured interviews to share their experiences. Interviews were held over zoom or over the telephone, whichever was most convenient for the participants, so as to adhere to the COVID-19

pandemic social distancing requirements. The interviews were recorded and transcribed verbatim. The original list of questions for the interviews in the primary study did not include one that related to technology. However, it became clear after the first few interviews that, in the context of social distancing, technology was an important source of support as well as challenge for LTC staff working during the COVID-19 pandemic – participants brought up the use of technology in their responses of their own accord even though they were not asked directly about technology use. Therefore, questions regarding technology were added formally to the semi-structured interview questionnaire for later participants (Appendix E). Of the 53 interviews, 2 used the older questionnaire and 51 used the newer questionnaire.

The data set consisted of transcripts of the hour-long semi-structured interviews of NHA LTC staff from the primary study. The secondary analysis was conducted with uncoded transcripts as per the recommendation of Ruggiano and Perry (2019). There were 53 original interviews conducted with staff, of which the participants who discussed technology anywhere during their interviews were included in this study.

Data Collection

The data for this research project had originally been collected and transcribed as part of the *Assessing the Health and Human Resource Impact of COVID-19 in the LTC Setting in Northern B.C.* study. These transcripts were uploaded to NVivo 12 Pro (QSR International, 2018) The first-round of coding on NVivo 12 Pro (QSR International, 2018) focused on assessing, identifying and labelling interview transcripts where participants commented on the use of any kind of technology, electronic technology or digital devices. These transcripts were then identified and collected into a data set of which the transcripts were checked back against the original audio recordings to ensure accuracy. The data set was then analyzed

qualitatively and organized by themes using Braun and Clarke's six-step thematic analysis approach (Braun & Clarke, 2006).

Braun and Clarke's six-step thematic analysis describes "a method for identifying, analyzing and reporting patterns (themes) within data" (Braun & Clarke, 2006). It is a flexible qualitative analytical method that is "independent of theory and epistemology, and can be applied across (emphasis by author) a range of theoretical and epistemological approaches" (Braun & Clarke, 2006). For this study, Braun and Clarke's six-step thematic analysis process was conducted in an iterative process that began by first getting familiarized with the whole transcripts of participants that described the technology use in LTC homes and creating a list of interesting ideas and thoughts that are generated from the data (Braun & Clarke, 2006). Step 2 involved generating initial codes from the data, and working systematically through the whole data set on NVIVO 12 (Braun & Clarke, 2006, p.78). After all the technology-related data was coded and collated, the codes were analyzed and sorted into different themes and subthemes - Step 3 - and an initial thematic map was created (Braun & Clarke, 2006). Step 4 involved reviewing and refining the themes and developing the thematic map such that the themes formed cohesive patterns (Braun & Clarke, 2006). Step 5 involved clarifying the specifics of the themes and coming up with clear names and definitions for them (Braun & Clarke, 2006). Finally, when the themes were fully developed, the writer attempted to write a "concise, coherent, logical non-repetitive and interesting account of the story" (Braun & Clarke, 2006, p. 93). For this study, thematic analysis was used to describe the "experiences, meanings and the reality of participants" (Braun & Clarke, 2006, p. 81). This method assumed a simple relationship "between meaning and experience and language" as such the motivations, experience and meaning was to be interpreted directly

(Braun & Clarke, 2006, p. 85). Using the text directly in these transcripts, the themes were identified at a semantic level only such that the data was organized at an explicit level, summarized, and interpreted insofar as that the significance of these themes was theorized to their broader implications (Braun & Clarke, 2006).

Quality and Trustworthiness

Quality criteria used in quantitative studies to establish rigor, for example validity, generalizability, and reliability, are not appropriate measures of quality for qualitative studies. While there have been several different criteria proposed for assessing rigour in qualitative studies, the criteria for "trustworthiness" by (Guba & Lincoln, 1994) is well-known and used by many qualitative researchers, and consists of the following dimensions: credibility, dependability, confirmability, transferability, authenticity. Table 3 shows the definitions of these terms and the strategies that were used in this study.

Table 3

Criteria of Lincoln & Guba (1985) Trustworthiness Framework and Corresponding Strategies Used in this Study

Criterion	Definition	Strategies Used to Promote Trustworthiness for this Study
Credibility	The "confidence in the truth of the data and interpretations of them" by "carrying out the study in a way that enhances the believability of the findings" and "taking steps to demonstrate credibility in research reports"	All steps taken for this study was documented and reported in the final research report. Transcripts were reread twice with audio recordings to ensure accuracy of the transcripts.
Dependability	The "stability (reliability) of data over time and conditions".	
Confirmability	Refers "to objectivity, that is, the potential for congruence between	Immersion into data and use of researchers' notes of the interviews

	two or more independent people about the data's accuracy, relevance or meaning" and "findings must reflect the participants' voices and the conditions of the inquiry, and not the researcher's biases or perspectives"	themselves to ensure attention is paid to the context such that the codes truly emerged from the data. Regular check ins with thesis supervisor who was the primary investigator of the original study for documentation and exploration of relevant presuppositions and reflections on the emerging data
Transferability	Refers "to the potential for extrapolation, that is, the extent to which findings can be transferred or have applicability in other settings or groups", and "the investigator's responsibility is to provide sufficient descriptive data so that consumers can evaluate the applicability of the data to other contexts"	Descriptive data of the participants was reported, including sex, gender, job positions were included in the final report.
Authenticity	Refers "to the extent to which researchers fairly and faithfully show a range of realities. Authenticity emerges in a report when it conveys the feeling tone of participants' lives as they are lived."	Quotes from participants were used during the reports to illustrate the themes identified. The themes identified were triangulated with findings in the literature regarding technology in LTC.

Note. Definitions of the criteria by Lincoln and Guba (1985), taken from "Nursing Research: Generating and Assessing Evidence for Nursing Practice" by Polit & Beck (2017, pp. 787–788)

Steps to Promote Trustworthiness

NHA LTC staff are still living and working within the COVID-19 pandemic context. The primary study recruited participants between October 2021 and February 2022. While it was expected that the perspectives of participants may have shifted during different time frames of the pandemic, the close time frame between the conducting of the primary study and the secondary study should limit the effects of change in time and context of the COVID-19 pandemic and the relevance of the data in the primary study for use in secondary data analysis. As well, while this secondary analysis aimed to answer a new question, that

role of technology in LTC during the COVID-19 pandemic, the context of this question remained well within the scope of the primary study which was that of perspectives of LTC staff working during the COVID-19 pandemic, and so the use of this data for secondary analysis was appropriate.

Major strategies used to enhance authenticity of a qualitative research include ensuring that the sampling plan was flexible yet purposeful, that participants were free to speak so that data obtained was participant-driven, and that the researcher should probe for clarification and depth so that the data obtained is rich. As a researcher working with secondary data, while I was unable to use these strategies directly to ensure authenticity for this research project, the design of the primary study, which had at least two highly trained interviewers that attended every interview, ensured authenticity of this research project. In addition, I was present for many of the interviews, which also helps with enhancing authenticity. Credibility of the analysis was established through two re-readings of the transcriptions with the audio recordings to ensure accuracy of the transcripts. Working with uncoded transcripts, I immersed myself into the data and use the researchers' notes of the interviews themselves to ensure attention was paid to the context such that the codes truly emerged from the data.

Strategies to enhance criticality and integrity (confirmability) include reflection of researcher bias, member checking and peer review (Milne & Oberle, 2005). As a current NHA staff who worked in a LTC setting in northern B.C. before and during COVID-19, I have shared commonalities in experiences with the study population, and this is a source of researcher bias. As well, I was not able to return to primary study participants for member checking. Therefore, it was important that I reflected actively on my biases throughout the

research study and how they may influence the analysis. I kept reflexive memos during my participation in the primary study, and I continued journaling throughout this research study. As well, there were regular analysis meetings with the primary investigator of this study alongside my committee so as to allow for documentation and exploration of relevant presuppositions and reflections on the emerging data.

Reflexivity Statement

I am a registered dietitian (RD) by professional training. The training of RDs is science- and clinical-heavy, but there is recognition within dietetic practice that food is complicated, interdisciplinary, and that food is such an intimate topic that touches a wide range of the human condition, from practices of individuals, families, cultural groups, to food production, transformation, preparation and consumption, access and lack thereof. While I describe myself as a deeply curious individual with catholic tastes in all kinds of non-fiction writing, my first love was the study of structure, function, and process within the realm of natural and applied sciences. Comparatively, my interest in social sciences, people and phenomena came much later in life. I make it a priority to read widely to gain exposure to forms of knowledge from different epistemologies, though as a thinker and researcher, I remain partial to pragmatism with post-positivism sympathies as a research paradigm.

My RD work experiences have centred in health care institutions settings, hospitals and LTC, as a clinical RD and in foodservices management, and the issue of malnutrition in health care institutions is one that is near and dear to my heart. In a clinical setting, my work involved seeing clients in person, assessing their nutritional needs and creating nutrition care plans for them, as well as collaborating and communicating with other health care professionals. In foodservices, my work involved overseeing operational challenges related

to the management of staff, supply, inventory, and budget in the provision of foodservices. In October 2018, I moved from Toronto, Ontario to Prince George, B.C. and started working in NHA in the role of Facilities Foodservices Coordinator where I managed the food service operations of three NHA owned-and-operated LTC homes.

It is difficult to make a simple overarching statement comparing technology use within health care settings in Toronto versus Prince George. On one hand, when I did my dietetic internship in Toronto between 2014 and 2015, all the healthcare institutions I worked in (acute and LTC) were already using electronic charting primarily with only some information that was recorded on paper; in contrast, as of writing in May 2023, most NHA clinicians working in LTC are still required to document on pen and paper, though some information such as scans and lab work information are available on the computer. On the other hand, the foodservice operations of Toronto hospitals that I know of have simple technology set ups at the backend for the provision of meal service – one menu for one site, with the diet office in the basement of the same building and diet clerks printing tray tickets manually using a foodservice information system like CBORD (*About CBORD | CBORD*, 2020) or Computrition (*Foodservice Automation - Computrition, Inc.*, n.d.). In comparison, NHA is one of only three Canadian healthcare organizations that I know of that has a regional menu that is managed by a regional diet office. There is a high level of technological sophistication and automation of the CBORD system in NHA's Regional Diet Office in Prince George – not only does that CBORD system allow the Regional Diet Office team to manage the menu as well as all the information of allergies, food preferences, diet orders and changes for all patients and residents across all NHA sites directly from Prince George, foodservices operators across all NHA sites are also on the same CBORD system for

purchasing, receiving and inventory management. If an item has to be substituted to a different brand, the team in NHA's Regional Diet Office takes care of the required updating of nutritionals and allergy information. In most foodservice operations I have observed, item shortages and ingredient changes are operational challenges for the kitchen. For example if the usual mayonnaise that is gluten free is out of stock and the replacement product has wheat and therefore not gluten free, the foodservice operator on site manually updates all recipes that use this product to be non-compliant to the gluten-free diet, and the foodservice supervisor onsite sorts through the tray tickets to find patients with gluten allergies, manually updates those tray tickets, and also remembers to inform the cooks to prepare items that are compliant for gluten-free patients. In NHA, the Regional Diet Office team in Prince George makes the change on CBORD, and CBORD sends updated gluten-free tray tickets with substituted items automatically to all the printers across NHA. As well, the Regional Diet Office team sends new tally sheets to all the kitchens so that all the cooks have updated information about which foods to prepare. As for technology use amongst LTC residents in Toronto compared to Prince George, I think they are similar – prior to the COVID-19 pandemic I do not recall LTC residents having routine access to technology beyond that of a television or radio, nor do I recall the use of much technology by recreation staff or volunteers during activities.

Before the COVID-19 pandemic, I mostly enjoyed my work in LTC foodservices. I was in this role for about 18 months when the COVID-19 pandemic began in March 2020. As Facilities Foodservices Coordinator, my job position was unique in the organization – it was close enough to frontline that I was able to observe directly the impact of COVID-19 on the staff and also the residents (with the rare interaction with residents' families), but I also

had access to some meetings at the managerial level which gave me a little bit of insight as to some of the difficulties and dilemmas faced by upper management as well as the creation and implementation of subsequent processes and procedures. Within the LTC home I worked in, the no-visitors policy had a noticeable impact on foodservices – increased food waste. We produced the same amount of food but without visitors, the residents ate less. Before the COVID-19 pandemic foodservices sometimes provided food for large group activities organized by the Therapeutic Recreation department; during the COVID-19 pandemic most of that stopped. As a dietitian, the implications of these developments on the nutrition status of the LTC residents worried me. Before the COVID-19 pandemic, I observed Recreation staff along the hallways pushing carts that contained analogue equipment such as papers, musical instruments, art, and craft materials, cook ware, etc. After the pandemic started, Recreation staff were walking about with tablets a lot – these were used for virtual visits for residents. I also noticed that an increased use of online programming for group activities, for example, the projecting of musicians on YouTube on screens because live musicians were no longer allowed. A precautionary outbreak was called at in a wing of the LTC home I worked in that was called off two weeks later when no further evidence of transmission within the LTC home emerged.

From a technology perspective, foodservice operations in NHA were already well integrated with the Regional Diet Office even before the COVID-19 pandemic. This was a huge help as the COVID-19 pandemic caused major disruptions in supply chains which led to significant increases in the number and duration of item shortages. Fortunately, the procedures within Foodservices regarding dealing with food shortages and substitutions were already well-established and easy for foodservice operators to execute. This was critically

important because the constant changing of food sources and food substitutions are major risks to patient care in terms of the managing of diet restrictions and allergies. The way we had meetings within Foodservices did change slightly - before the COVID-19 pandemic there was a blend of in-person and online meetings, during the COVID-19 pandemic all meetings were held online.

The COVID-19 pandemic did not result in the change of the scope of my foodservices operations work in LTC, though the work became much harder. There were numerous changes in NHA policies and procedures, all of which had to be communicated to foodservices staff at a timely manner. Food item shortages were common resulting in constant menu changes, which upsetted not just staff but also residents. Staffing wise, the number of sick calls was more volatile and there was some increase in staffing shortages within foodservices. However, severe staff shortages in other departments were common, unpredictable and had huge spill-over effects on mealtime and meal service. As Facilities Foodservices Coordinator, it was my job to help and support LTC foodservices staff that were in my care, but while I did the best I could, I never quite felt that what I did was enough or adequate to support foodservice staff at the level that they needed. I stayed in this role until October 2021, when I left this full-time foodservice position for a casual clinical RD position in an acute care setting so as to focus on my Master's studies. At the time when I decided to leave this job for school, I did not think that the decision was influenced by my work experience in LTC during the COVID-19 pandemic and the impact of this experience on my health and well-being. However, I have noticed with interest that since leaving LTC, I have found myself reluctant to pick up casual clinical RD shifts in LTC.

Ethical Considerations

Ethics for this research project was obtained as part of the original ethics application for the primary study. Harmonized ethics approval was obtained from the University of Northern British Columbia Research Ethics Board and Northern Health Authority Ethics Board and informed consent gathered from all participants prior to the study (Ethics Approval Number H21-01883). All electronic data including audio recordings, and transcriptions was saved and stored in a dedicated and secured password-protected folder in a server managed by UNBC's Information Technology Services. The master participants list containing identifiable information was stored and secured in a different folder from other study data. All physical information, including hard copies of documents and interview notes, were stored in a locked cabinet in locked office on the University of Northern British Columbia campus.

Chapter 4: Results

Characteristics of the Long-term Care Homes and Demographics of the Study Participants

LTC staff from 15 LTC homes in northern B.C. were interviewed in the primary study – six LTC homes had less than 50 beds, five LTC homes had between 50 and 99 beds, and four LTC homes had more than 100 beds. Most locations in northern B.C. with LTC homes had one single LTC home in the community. Therefore, the staff in these communities were working in only one LTC and not affected by the Single Site Order (Office of the Provincial Health Officer, 2020). Prince George was one city in northern B.C. that had more than one LTC home and so LTC staff that worked in multiple LTC homes were affected by the Single Site Order restriction.

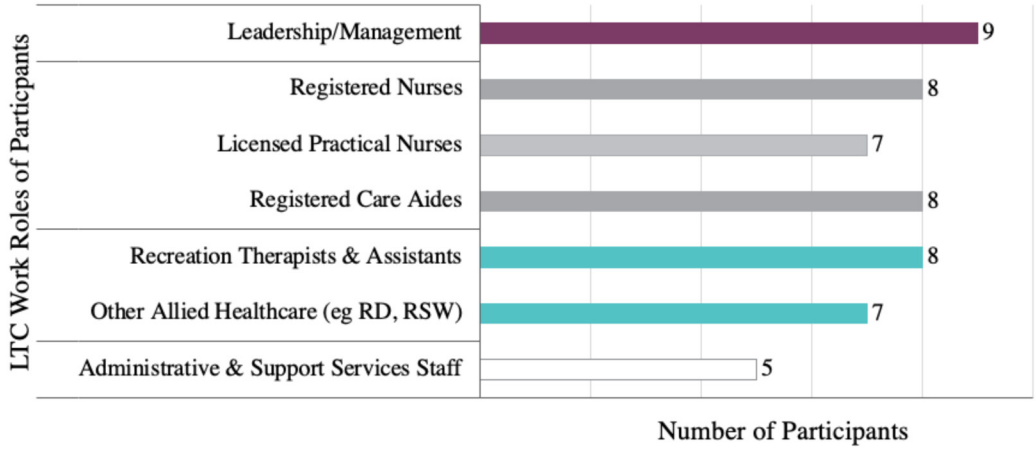
Of the 53 interviews conducted with the LTC staff, 52 participants discussed technology use. All participants identified as having the same sex and gender - the majority of the participants in the study were female (n=43), and nine were male. The ages of participants ranged between 24 and 69 years, with an average age of 45.5 years (one participant declined to provide age). The number of years that participants worked in LTC ranged between 1 and 40 years, with an average of 10.1 years.

The LTC staff across various disciplines in different roles who participated in this study, included Leadership/Management (n=9), Registered Nurses (n=8), Licensed Practical Nurses (n=7), Registered Care Aides (n=8), Allied Healthcare not including Recreation (n=7), Allied Healthcare – Recreation only (n=8), and Administrative and Support Services (n=5). Some participants were in roles that were more deskbound whereas others were in roles that worked away from desks; some people were in roles that interacted a lot with LTC

residents and families, others less so. Figure 4 shows the work roles of the participants in the study. To further anonymize the job roles of the study participants during the presentation of results, heretofore, job roles were condensed into four categories. These include: Leadership/Management (individuals in management roles, day-to-day tasks included meetings with Upper Management that discussed policies and processes); Nursing Staff (individuals who provided front-line nursing care such as registered nurses, licensed practical nurses, registered health care aides); Allied Healthcare Staff (individuals in allied healthcare roles such as RDs, social workers, recreation therapists, and so on); Administrative and Support Services Staff (individuals providing administrative and other support services roles such as clerks, food service, and so on). Participants were classified by their primary role rather than their professional designation – for example, participants that held the Registered Nurse professional designation that were in a management role rather than a resident caregiving role were not classified as "Nursing Staff" but "Leadership/Management".

Figure 4

Work Roles of Participants (n=52) in the Study that Discussed Technology Use in Long-term Care in Northern British Columbia in 2021



Note: The figure shows the work roles of participants within LTC in the study. These roles are further divided into four categories: Leadership/Management, Nursing Staff, Allied Healthcare Staff, Administrative and Support Services Staff.

Overview of Themes

The experiences of the study participants on technology use within LTC showed high heterogeneity. Some participants worked in departments where technology was already part of routine operations – some examples described included managers attending regional meetings virtually, aspects of clinical nutrition and foodservices managed using the computer system CBORD, or nurses accessing clinical resources and online training on the computer. These aspects of the job did not change due to visitation restrictions in LTC or the Provincial Health Officer's Single Site Order. Other participants reported having to learn a new way to do their work, manage changes in their role, and/or support residents and their families with technology use. There was also variation on perceived technology literacy within the LTC setting - some participants reported they were comfortable with technology, others reported struggles adapting to technology themselves or observations of struggles in other LTC staff.

Despite the heterogeneity in experiences of LTC staff regarding technology use in LTC, four themes emerged including: Ameliorating geographical constraints with virtual alternatives; Technology use for coordinating activities and communicating information; Technology use for communicating presence and connection; Managing major technology-mediated changes and challenges.

Theme 1: Ameliorating Geographical Constraints with Virtual Alternatives

COVID-19 resulted in visitation restrictions that placed limitations on who could come into LTC homes, the physical distance between two people as well as the size of the gatherings for those within the LTC homes. Whether they were LTC staff and volunteers that provided in-person services that were no longer allowed to enter LTC homes or LTC residents that participated in large in-person group activities that were no longer allowed to

be run, participants shared how they used technology to support these activities to continue despite space and distance restrictions. Participants described the ways by which technology bridged barriers in space within LTC when the in-person activity was no longer possible due to the COVID-19 pandemic related restrictions. Technology enabled communication between those within LTC with those outside LTC. Within this theme, three subthemes emerged: Work site flexibility and virtual team meetings; Changes in medical and clinical care practices, including care conferences; Virtual visits and virtual activities for LTC residents.

Work Site Flexibility and Virtual Team Meetings

This subtheme describes the ability of participants to meet with other people and/or provide services from another location despite not being physically present in the same room. Participants that typically came into LTC homes to provide services or attend meetings that were no longer allowed into LTC homes, or those that were allowed in but wanted to minimize the frequencies of them entering LTC homes, reported switching from in-person to virtual activities. The switch to the provision of services virtually allowed them to service a site from other locations, including from home.

> I would communicate with the facility, with key people in the facility about what was going on if there was a reason for me to be there. I would go and I would take care of it, and other than that I would work out of my office at [off-site] using computer connections and phone connections, right, to get things done.
>
> (Allied Healthcare Staff)

Participants reported the ability to work from another site positively as adding flexibility while the ability to work from home was perceived negatively - many acknowledged the necessity but did not like being able to take work and stress home and work around the clock.

> We all worked really hard to get this stuff done… we all have our iPhones, we're all talking 24/7. If I'm awake and I've got an issue, [Person] is awake and he's answering the issue. I never was alone in any of this… like there was always somebody we could talk to. It was just so extensive, so much work and everybody's just really tired. (Leadership/Management)

Amongst the participants, some reported attending meetings virtually regularly before the COVID-19 pandemic while others reported most team meetings were face-to-face or a group phone call over the speaker phone. During the COVID-19 pandemic, team meetings were switched to virtual via video-conferencing. As one allied healthcare staff participant noted "I would just say staff meetings going online have been the big thing."

Changes in Medical and Clinical Care Practices, Including Care Conferences

This subtheme describes the changes in the way the LTC inter-professional team - consisting of medical, nursing and allied healthcare professionals - provided medical and clinical care to LTC residents when only some members of the team were in the LTC homes and others had to remain outside. Participants who were nursing staff reported changes in how LTC residents assessed medical care from physicians and other health care professionals that previously came into the LTC homes and laid eyes on the residents. With the COVID-19 pandemic, physicians provided consultations and assessments of LTC residents virtually, and nurses communicated with doctors and other health care professionals by phone calls, video calls, even by texting. This resulted in changes in the way nursing staff did their work. As

one nursing staff participant noted, “In my role we’ve been doing the med reviews with the pharmacist by Zoom, we’ve been doing telephone rounds with the doctor... We’re sending more pictures to wound care nurses and doctors cause they’re not in physically as much.”

Care conferences were annual in-person meetings for each LTC resident that were attended by all healthcare disciplines in the inter-professional team and with an invitation extended to family – these meetings were changed to tele- or video-conferencing so that all healthcare disciplines, as well as the residents’ families, could attend. With the use of tele- or video-conferencing technologies, families that were not in town could also participate in care decisions of LTC residents.

> …my understanding is we didn’t really offer a teleconference number for families to be able to come in for things like care conferences and now we do so family members who are involved but live out of town are now able to attend care conferences which is a small but I think pretty cool. (Allied Healthcare Staff)

Virtual Visits and Virtual Activities for Residents

This subtheme describes the changes in the way LTC residents connected to families and friends and participated in social activities due to the visitation restrictions and physical distancing requirements in LTC. In-person visits by families and friends became virtual, and in-person group activities were changed to virtual alternatives. Participants noted that residents struggled with the loss of contact with families in the context of strict visitation restrictions. In response, LTC homes brought in tablets with video-conferencing capabilities so that residents may have scheduled virtual visits and remain connected with their families and friends that previously came into LTC.

> One thing they did was they brought in tons of iPads and stuff so at least they could communicate and they brought in extra staff just to help the residents with the iPads so they could talk to family. They really focused on how important family was and they really worked hard to ensure that there was some form of communication going on with family for the residents. (Nursing Staff)

Participants reported that for LTC residents, scheduled virtual visits were not an adequate replacement for in-person visits but it was better than nothing. As a participant in a Management/Leadership role noted, "…the technology itself it played a huge part in maintaining their sense of well-being to a point. Without it I don't think they would've been through this completely unscathed." Participants also reported having to support residents with virtual visits, "The residents didn't have the ability to use it. The staff who dialed the number, you know, for the resident and the relative would come on and that's how they would talk" (Nursing Staff). As well, LTC staff invited families to send digital content in to be shared with residents, as well as created digital content themselves to be shared with families. One participant noted that the connection between the staff working in their LTC home and the families had improved because the increased communication resulted in families having an improved understanding to all the things that LTC staff did at work.

Visits from members of the community and volunteer entertainers into LTC were also not allowed, and thus these activities were changed from in-person to virtual. Recreation staff noted that access to online content, such as YouTube, as well as streaming services on the internet had been very helpful. For example, a YouTube video was shown on television instead of a live musician performing for residents, and LTC homes streamed local church services when they started offering virtual churches on zoom.

> The iPad we are using, we use a lot. I think it made us discover what was really out there on YouTube and virtual music programs and stuff like that so we have used it a ton. And local church services we used quite a bit as well. That way the technology has been a positive thing. (Allied Healthcare Staff)

An allied healthcare staff participant noted expansion in technology use in the community for other services such as grocery ordering and delivery, retail, and government services, "[I was] supporting residents with accessing more online shopping… because of the pandemic I think there was an expansion in store capacities to do online delivery, like Save-On or whatever." However, other participants noted that technology helped but did not entirely overcome the challenges from distancing restrictions on LTC residents. As noted by an allied healthcare staff, "…a lot of the places in [Name of Town], like the church, they would record their service, so we tried to get things that were familiar to the residents but sometimes it just didn't work".

Theme 2: Technology Use for Coordinating Activities and Communicating Information

This theme highlights the use of communication technology to coordinate work as well as other activities and communicate information in LTC. There were different kinds of technologies for synchronous and asynchronous communications, for communication between different groups of people within LTC, such Organization-to-Staff or Staff-to-Staff, and for purposes ranging from information sharing, coordination of activities and for education and training. Within this theme, three subthemes emerged: Synchronous communication technologies for virtual meetings; Asynchronous communications for information sharing and regular updates; Unequal access to information.

Synchronous Communication Technologies for Virtual Meetings

This subtheme describes the use of synchronous communication technologies such as telephones and video-conferencing technologies that allow users to interact, ask questions and receive answers in real time. Telephones transmitted audio only, while video-conferencing technologies on smartphones and laptops allow users to see and hear each other. For example, managers reported that they had regular virtual meetings with other managers in the region. These meetings were helpful in disseminating information about COVID-19 updates. Managers reported that they felt supported and less alone in the North.

> …it was all the long-term care facilities and you didn't feel like oh my God, I'm the only one going through this because everyone still had, everyone had all the same questions so it kind of like, okay I can feel alone out in the rural northern B.C., right. (Leadership/Management)

Some managers reported spending the majority of their time reading emails and attending meetings on MS Teams or Zoom, which was not the case before the COVID-19 pandemic.

Nursing and recreation staff also reported a shift from in-person meetings to virtual meetings for synchronous communications for team meetings between staff. As well, there was a shift from teleconferencing on the telephone to video-conferencing using video-conferencing software on computers, smart phones or tablets – this shift was welcomed as participants were able to see the faces of other people during the meetings and they liked that.

> Me personally, just more like more teleconference things and all of a sudden video conferencing had to become a thing. We didn't really use that before. Now we do

> quite a bit so that's pretty cool.... like times that you might not usually meet with them, like it just made it easier for sure. (Administrative and Support Services Staff)

As described in an earlier section, synchronous communication technologies were used between physicians that were outside LTC and nurses that were providing care to LTC residents inside the homes, and also for the care conferences for LTC residents that were attended by the inter-professional team as well as the residents' families.

Asynchronous Communications for Information Sharing and Regular Updates

This subtheme describes the use of asynchronous communication technologies such as emails, websites, written memos, pre-recorded videos that were available on the internet to be accessed at a different time. Information during the COVID-19 pandemic from the Health Authority was disseminated from synchronous communications such as virtual meetings, and also in asynchronously in the form of emails, memos and also postings on the NHA intranet site OurNH that was accessible to staff only. Many participants noted that while policies changed constantly, they received regular updates by email, found the access to information to be easy, and felt informed.

> …we received emails, like a daily COVID briefings, I can't exactly remember what they're called, I still get them, and then obviously if there are outbreaks or things like that we would receive those as well, like I didn't have to go into to find that, it was just sent to me automatically which was nice. (Nursing Staff)

However, participants also noted that OurNH was not easy to navigate, and it was difficult to look up specific information published on OurNH – the documents may be stored in a different section that participants expected. Participants often received the same email from multiple sources, which led to staff having to manage a high volume of information via

email as well as difficulty in finding the most current policies and processes. This volume of emails led to communication inefficiencies that participants pointed out could be made more efficient with less technology, such as in-person huddles. A participant that was in a leadership role described printing important emails on paper and putting them into a binder so that all staff had easy access to the most up-to-date COVID-19 pandemic processes and policies.

For education and training sessions, participants described the use of synchronous and asynchronous methodologies for information dissemination. Examples of asynchronous methodologies included training modules on The LearningHub, an online education platform used by "six BC health organizations" (*Home - LearningHub*, n.d.), as well as the use of training videos that showed safe donning and doffing of personal protection equipment for LTC staff. An example of a synchronous methodology included the use of video-conferencing technologies for virtual training sessions in real time.

Unequal Access to Information

The general ease of access to information described by some participants in management/leadership roles, as well as for nurses and other allied healthcare professionals was not observed equally across all LTC staff – an example was registered care aides (RCA). Registered care aide participants shared the challenges faced by LTC residents with technology use yet only one RCA talked about the technology challenges that other RCAs experienced. A RCA participant noted, "…they came up in the form of electronic communication… but let's face it, a lot of care aides aren't in their email and it's only because it's what I do that has me in technology." The observation that RCAs did not have easy access to information was echoed by participants that worked closely with them – these

participants noted specifically about the challenges experienced by RCAs with using the computers and accessing COVID-19 related information from their emails. Participants noted that RCAs did not receive additional supports from NHA despite lower technology literacy levels and having to deal with time crunches and lack of access to computers. As a nursing staff that worked closely with registered care aides described in detail-

> Okay, [RCAs], there's four to five [RCAs] and there is one computer for them to use. That one computer is used for anyone taking any Zoom conferences, anyone orientating and these people are on the computer all day, like their whole shift, which happens I would say four days out of seven. So [RCAs] in reality are expected to research or do whatever and read any emails and stuff on their breaks in the coffee room. The coffee room fits five people. There's one computer. You have 15 minutes for your coffee break, well you have a half hour lunch break but you need to eat during your lunch break and perhaps have a rest. But then you're expected to do in-services, and emails and look up any information you might want to. … things like clicking on a link in an email and understanding this and that does not come automatically to [RCAs]. It's just a fact or to me but I had to learn that stuff, right. And I was lucky that I was employed during the time when all this computer stuff was new and staff were trained for that. Like you weren't expected to just know all this right away like [RCAs] are now…. Our [RCAs] are the backbone of extended care, they are the people and these are the people that need that information and they do not have ease of access by any stretch of the imagination. It could not be more difficult for them to obtain this information. And they're expected to do it on their break, when they need a break, emotionally and physically (Nursing Staff)

Theme 3: Technology Use for Communicating Presence and Connectedness

While technology was an invaluable tool for communication, participants reported more challenges and dissatisfaction with technology-mediated interactions for the communication of presence and connectedness than for information gathering. Within this theme, three subthemes emerged: Perceptions of lack in virtual technology-mediated interactions; Less interest for virtual alternate compared to in-person; Staff ambivalence towards virtual visits for LTC residents.

Perceptions of Lack in Virtual Technology-Mediated Interactions

While participants said they liked virtual meetings which they found effective and efficient, others expressed dissatisfaction – they reported that in-person meetings were better to connect with people and described not having the same kind of in-person connection without eye contact and ability to see body language. Some participants in the study said they felt that managers were absent, and some managers in the study said they felt they were not able to support staff adequately from a distance. A participant in a Leadership/Management role noted, "…it did affect my availability for the team in that I was no longer face to face, elbow to elbow, I was more like, you know, by email and by phone and by Zoom."

This perceived lack could be ameliorated to some extent – one participant that attended virtual meetings regularly described steps they took to build relationships and promote team dynamics virtually:

> …we need a team, I'm a real team person, really, so one of the things that I've always done and I just seem to be the, I call myself the cruise director of the group and so we do a lot of things that are extra that are kind of just team-building so we just did a virtual Christmas party. (Nursing Staff)

LTC staff that were providing clinical care and counselling services with LTC also expressed misgivings about the effectiveness of virtual interactions in establishing rapport, building relationships, as well as providing person-centred care. They felt that there was something lacking when the sessions were virtual. An allied healthcare staff noted, "…it was mostly remote work which is really hard to do this kind of job remotely. You know, it wasn't face to face, virtual… and doing counselling it's hard, right. Hard to reach people."

Participants expressed concern about the quality of medical and clinical care that the residents received from healthcare professionals outside LTC, noting that these healthcare professionals were dependent solely on the information sent to them by LTC staff, such as text messages, pictures, and via phone or video calls. Participants noted that much information was lost by not seeing residents and staff within the LTC environment that they lived and worked in.

> …it was a time where we actually built relationship with the pharmacist that we work with and that they actually physically came to the care home… [now that meetings were on zoom only] it's depersonalized… the job is still getting done but it's not as person-centred. They're not seeing how the nurses, the pharmacist isn't seeing how the nurses' area is set up, how the cart is set up, how things are done. The doctors are not seeing the resident, it's just different so some of the function is still being met and it's probably more efficient but the personal part is being lost and that is not great when your whole business is people, right. (Nursing Staff)

Less Interest for Virtual Alternates Compared to In-person

There was variation in interest and participation rates of virtual activities compared to the in-person versions. Participants that attended virtual meetings with other staff, for

example, did not raise the issue of attendance of virtual meetings. In contrast, participants that talked about virtual activities for LTC residents as well as in-person training sessions for LTC staff noted differences in attendance rates. For example, study participants noted that LTC residents showed lower interest and participation rates for virtual versions of activities, including entertainment or spiritual programming, whereas the in-person versions were much more popular and well-attended. An allied healthcare staff noted, "…So we kind of do a spiritual program once a week but even like it has decreased the number of people coming out each week." It would appear that for these LTC residents, the virtual alternates were not effective in meeting their need for social interaction as compared to the in-person version.

Another example was that of training of hands-on procedures such as the safe donning and doffing of personal protection equipment. A participant involved in the provision of education and training of LTC staff regarding IPC policies and processes for COVID-19 noted the low staff turnout for education on virtual platforms compared with in-person education. As well, they questioned the effectiveness of the use of videos in providing education for a hands-on procedure that was the safe donning and doffing of personal protection equipment.

Staff Ambivalence towards Virtual Visits for Residents

The importance of technology use for virtual visits that enabled LTC residents to remain connected with their families and friends in the context of social isolation was described in an earlier section. Despite this, LTC staff expressed ambivalence towards virtual visits in general. Participants noted that some LTC residents were physically and/or cognitively well enough that they had telephones or tablets that they were already using to connect with family outside LTC. With significant amounts of time and supports from LTC

staff, more LTC residents as well as their aging spouses were able to adjust to virtual visits and either learnt to manage tablets or used the telephone for these visits.

> I think that like I look at one of the fellows who had a lot of hard time initially, he's a rock star now and he's [in his 70s] ... and he just knows how to do it now, right. But I mean that's, we're pushing two years right, so it's a lot of time and chances to learn it. (Nursing Staff)

However, participants also noted that many LTC residents struggled with the virtual visits due to their physical and cognitive limitations, and never adapted to virtual visits.

> … I would have to say in my own personal experience I didn't really see very many, it would be less than 10% that adapted so much. Most of them it's still kind of shocking to them that their loved one is on that screen. (Allied Healthcare Staff)

Participants reported that LTC residents were unfamiliar with and unsure about the technology, and had difficulties seeing, hearing and/or holding the tablets. Residents that had more serious or severe cognitive impairments could not understand what they were looking at nor able to engage with their families via the tablets.

> But for seniors who are not cognitively well, we've had folks who tried virtual visits and it went really badly because they get really confused, they think it's a window and the person is there but they're not really there. Like why won't you come through. (Allied Healthcare Staff)

Participants noted that while some families adapted to connecting with their loved ones in LTC via tablets and chose activities that were appropriate for the medium, others struggled. Many directed comments and questions to the LTC staff in the room instead of talking to the LTC resident.

> I mean some of them you set up with the iPad and they'll, some families get it and are great and will sit and sing and show old pictures and converse, but I don't think everyone has that knowledge of what, at what stage they're at and how to deal with it. ...You get questions like how old are you, Mom? Do you know how old you are or who am I and how many kids do you have and I'm like don't ask those questions, right. But it frustrates the resident, anyway. (Allied Healthcare Staff)

Participants reported between caught between the desires of families that wanted the virtual visits and the residents that did not. An allied healthcare staff noted, "…there were sometimes when the client was sleeping, there were sometimes when the clients wouldn't want to talk but the loved one would so there were conflicts some of the time".

Participants shared doubts about the abilities of LTC residents with cognitive issues to understand and feel the presence of their families through technology, and thus also the effectiveness of virtual visits in allowing LTC residents to communicate and connect with their families.

> So we're doing a lot of family visits with Zoom but I will say it's a poor substitute especially for people with dementia, they don't have any ability to grasp that the person on the screen has a relationship ...for people with advanced dementia, it really doesn't connect for them and you just can't say it's an adequate substitute. (Nursing Staff)

Some participants also questioned the value of virtual visits for the LTC residents, though they acknowledged that the visits were likely to be of value to the families.

> …our main goal is to enhance the quality of life for the residents and when they become so deep into their dementia, they don't even know, they don't know to look at

the computer screen. I feel that those aren't therapeutic, they help the family but not really the resident. (Allied Healthcare Staff)

Participants also talked about the emotional toll of virtual visits on their own mental health.

It's been stressful, it's been challenging. I guess it's been rewarding, I don't know what the rewards are but……sorry…… (crying)…… we've had enough of this but I think… … being able to connect the residents with their family, that's been our goal and I think we've done it well but it has taken its toll at work…

(Allied Healthcare Staff)

Theme 4: Managing Major Technology-related Changes and Challenges

Participants described changes and challenges that they had had to deal with at LTC regarding the use of technologies as well as the resulting emotional toll. Within this major topic, four subthemes emerged: Technology setup and getting used to the new and unfamiliar quickly; Technical issues, inadequate infrastructure and hardware problems; Workload impact from changes in work responsibilities and high workload; Emotional load from technology-mediated activities.

Technology Setup and Getting Used to the New and Unfamiliar Quickly

Participants that were RCAs or in Recreation roles reported that that prior to the COVID-19 pandemic their work did not involve the use of much technology. The restriction of movement of staff and visitors into LTC meant that not only were staff required to come up with alternative ways to provide services and coordinate work using technology themselves, they also had to set up these devices for themselves as well as for other people. Participants reported that there was inadequate institutional support and thus the tech took a lot of time to set up-

> So I know my rec therapist spent hours and hours with certain clients trying to get them set up where there was no real, I would say that was no real support from Northern Health, it's just like here's the iPads, you guys do it.
>
> (Leadership/Management)

While participants in different roles, management, nursing, allied health – described having to make adaptations to work, participants in recreation reported significant changes to their jobs with relation to technology. Some recreation staff described how their job scope changed from therapeutic recreation programming to the organization of virtual visits for residents. Prior to the COVID-19 pandemic the therapeutic recreation department ran regular programming consisting of one-to-one activities and group programs for LTC residents. When the visitation restrictions came to effect, recreation staff took on additional work connecting LTC residents with their families, including set up, providing residents and families with technical support, coordinating the schedules and logistics of the virtual visits on top of regular therapeutic recreation programming, cleaning the devices between the virtual visits, and, for residents with cognitive limitations, staying with the resident and chatting with their families during the virtual visits.

> …normally in our department we will have a high functioning program and a low functioning program so we'll do hand massages and music for the lower functioning and maybe the higher functioning you might do an exercise class or take them on an outing, but now we had to scrap those from the schedule and just focus on virtual visits… and you're not having these bigger group programs where you can actually engage 6-8 people, 12 people in a program because you have to focus on bringing the stand and doing the visit and making sure that both the resident and the family

> member either are able to engage or their questions are answered, so it kind of changed things up quite a bit. (Allied Healthcare Staff)

One participant shared details about an issue related to the increased deployment of technology that was little discussed by other participants – that of cleaning protocols that were also necessary for infection control, especially if the devices were to be shared between residents. Cleaning took time, and therefore had associated labour costs. As they described:

> I sometimes feel that we're dishonest to infection control because we don't want to be and or you know what, to follow all these rules is going to cost more money so don't let infection control know about it. ... wait a minute where are your cleaning protocols? … And of course there's nothing, absolutely nothing and I said you can't do this and who cleans your equipment now? (Nursing Staff)

Only one other participant in the study talked about the need to clean tablets between residents during virtual visits, and this was discussed in passing, in the context of heavy workload-

> We added on virtual visits, is what we call them. So sometimes there would be five a day. They last about half an hour, sometimes longer and you'd have to run between people, clean equipment between people, dial up the families, some residents it was easy, you would get down there, you would set the cleaned equipment up, hook up with their families, say hello and they could converse without you having to help. (Allied Healthcare Staff)

Technical Issues, Inadequate Infrastructure and Hardware Problems

In the shift to a different way of service provision from in-person to one mediated by technology, LTC staff faced issues regarding the use of technology, including problems with

infrastructure and hardware. For example, some staff reported hardware issues with older equipment that limited their ability to participate in virtual meetings. As noted by an allied healthcare staff, "…there's a bit of a slight shift using more like video chats rather meeting in person, although I still prefer meeting in person. I find, especially because my laptop is terrible, like I'm not able to participate."

A number of participants talked about connectivity issues and poor Wi-Fi as well as hardware within the LTC homes that led to difficulties with virtual visits and virtual meetings. Participants reported that the NHA offered a private Wi-Fi network that supported the electronic medical records program and other systems involved with direct care, and a public Wi-Fi network that was for everything else, including recreation activities, but the public Wi-Fi network was not able to support the bandwidth demands that virtual recreation activities required. An allied healthcare staff noted, "…we're on the public [Wi-Fi] system and it's been a struggle cause sometimes we can't get the programs… we can't have smart TV's cause our Wi-Fi can't support it." Participants supporting virtual visits for LTC residents also reported having to stay in the room with the resident because, in the event of a dropped signal, they would have to help the resident with the logging in and reconnecting the call.

Participants noted that there was a demand for access to work computers by staff but a lack of availability of computers in general due to the additional activities that had been moved from in-person or on paper to the computer, including training, virtual meetings and new staff orientation. As well, participants shared they used to access information on the Intranet or check work emails from home but could no longer do so because they could not figure out the changes in the remote sign in process.

> And yes, most people have computers at home, that's true, lots of people don't have access to Northern Health stuff and now they have all these billion very complicated things to set up to get into Northern Health stuff now with all this encryption and I don't know the words of all that computer stuff…even going onto my Northern Health and it is not an easy site by any means. I still write down step by step the clicks I have to do to get into places on Northern Health. I do. It's hard. (Nursing Staff)

One participant spoke of about the impact of technology changes in another department (Staffing) and how that negatively affected their own department (Nursing)–- they noted that the staffing office made a switch to a new staffing system that automated the posting of short calls when somebody called in sick. According to the participant, these short calls were texted to staff and posted on an online portal and the staffing office no longer called staff anymore. The result was that not only shifts went unfilled and staff worked short, the LTC staff themselves communicated within their own group to try fill the short shifts-

> We have had to do our own staffing because the new system that Northern Health has adopted. Not just COVID and that part, we work short a lot because of this new staffing system. …. It works really great for the rest of Northern Health because it decreases the amount of workload on staffing … so they actually legitimately do not call staff at all anymore. So if a shift goes out and it's a short call… if they don't fill it, they didn't fill it. … so basically it comes down to on top of everything else let's just text everybody we know that works there, can you come in, we're short. (Nursing Staff)

Impact from Changes in Work Responsibilities and High Workload

In addition to having to manage the significant challenges from technology as described earlier, such as inadequate technology infrastructure, inadequate availability and access to equipment, lack of training, scheduling conflicts with having to support workflow coordination and scheduling of residents' virtual activities as well as technology needs on top of their usual jobs of resident care, participants noted that increased technology led to increased workload on their shoulders at a time of significant staff shortages. While participants of different disciplines talked about challenges with increased workload and staff shortages, all participants in Recreation described the amount of work that went into virtual visits as well as their preference to stop doing them.

> …we have had several times where we've kind of had to go through the list and say okay, well, can we stop some of these virtual visits? Not because again that we don't want to do them but because we're so short staffed and our resources are so hard pressed… (Allied Healthcare Staff)

Participants described job scope changes, especially those worked after-hours, such as helping with activities related to connecting residents with families and others-

> …Recreation let us have access to the tablet that they used even though that's not technically our job, like if a loved one called and said oh can I FaceTime with my mom it's my birthday, we would try to work that in so they could have some time to talk to that person even though I guess that's not technically not part of our job, it would be more of a recreation job. (Nursing Staff)

In the context of rapid loss of nursing staff in healthcare, one participant worried that they were the only person in their LTC home that had the knowledge to use a computer program which was a licencing requirement.

> … there's a program called MDS RAI and it's a statistical tool that's used by nurses and at some point I'm the only one doing it. I can't do my regular job and keep current with that and it's a licencing requirement that the facility in order to stay open has it. So it's huge." (Nursing Staff)

Emotional Load from Technology-Mediated Activities

Participants became emotional as they talked about their challenges working in LTC during the COVID-19 pandemic. While technology enabled people in LTC to remain connected with those outside LTC, participants noted that technology itself contributed to the emotional load that the LTC staff faced. Participants reported that they experienced emotionally charged conversations and events through ICTs, especially when there was differing expectations, and that required some deftness in handling by the LTC staff. For example, a participant in a management role reported providing emotional support to residents after video-calls with their families.

> You'd see them having an FaceTime call and you could see them getting emotional because they can't touch them, they can't hold them, they can't kiss them. They were missing out on their great-grandchildren or their grandchildren's lives so now you're contending with okay I need to and I used to say this to some of my care aides, I need to go and spend some time with them, I'm going to be in this room, I'm probably going to be there for at least half an hour because I needed to allow them to decompress over their emotions. (Leadership/Management)

Participants that were present during virtual visits between residents and families reported that families had questions about resident care that the participants were not able to answer due to scope of practice and thus had to redirect these questions.

> Sometimes they'd [Families of Residents] asked questions that we weren't allow to answer because it wasn't to do with the visit, it was to do with the resident's health and they needed to talk to the nurse or the doctor about that or their concerns about the care and stuff. (Allied Healthcare Staff)

Participants with work phones described taking calls from families that were upset when they could not come into LTC. A nursing staff shared, "Now everybody has our nursing cellphone number and they would call us and they would berate us and be like it's a hoax, why aren't you letting people in, I can't see my loved one."

Participants also talked about feeling the impact of negative information coming from traditional media and social media. Controversies regarding the management of the COVID-19 pandemic, including policies regarding the use of masks, visitation, vaccines, as well the occurrence of outbreaks, these played out in mass media and social media, and spilled into LTC.

> I don't think people realize just what sacrifices we had to make in order to keep those that they loved so dearly so safe. And every time there was an outbreak in another facility there was ... fear mongering [in the media] … and all of a sudden it became of case of okay I don't even want to admit that I work in long-term care (Leadership/Management)

Participants discussed dealing with the emotional fallout from the media and not being able to respond.

> And we can't share with them well ya, you did that down in the family room and now I've got [a number of] elders that are sick, so who's going to take responsibility for that? I have to be quiet, I have to let the Northern Health system message out what we want them to message out and trying to keep my nurses from reacting to that in social media is very hard. (Leadership/Management)

A participant in a Leadership/Management role expressed concern that the negativity may result in recruitment challenges, especially in smaller LTC homes in more rural and remote areas.

> But when you see your name in Facebook or your [facility] in Facebook to hear the uncaring and almost professional slander, I fear that the small [facilities] are going to pay the price for that because we won't be able to staff. I hope I'm wrong. (Leadership/Management)—

Chapter 5: Discussion

This study examined how technology was used by LTC staff in northern B.C. during the COVID-19 pandemic via the analysis of interview transcripts of LTC staff that described their experiences working in northern B.C. during the COVID-19 pandemic. On technology use, participants described the technologies and devices they saw, circumstances of which the residents or the staff themselves used technology, the supports that the residents needed as well as that of the staff that may or may not be provided. Participants also described the benefits and barriers that they encountered with the rapid rollout of technology in the context of the COVID-19 pandemic in LTC. Participants described technology use in the form of ICTs – tablets, computers, video-conferencing and video calls software such as Zoom, FaceTime, and Teams – to support residents-centred activities as well as staff-centred activities.

Residents-centred Activities

Resident-centred activities reported by participants included the use of ICTs such as tablets by LTC residents for social interactions to improve the quality of life of residents in the form of virtual visits with families, virtual activities such as virtual spiritual services, and access to entertainment content on the internet such as music and videos on YouTube, and personal content sent from families to the LTC home. Participants noted that resident engagement and interest varied. For some LTC residents, participants reported low interest and lower attendance rates in virtual activities compared to in-person visits. The literature review showed that similar resident-centred activities were conducted in other LTC homes in North America to allow residents to remain socially connected in the context of social isolation, including virtual visits (Chu et al., 2022; Freidus et al., 2021; Prophater et al.,

2021; Saad et al., 2022; Schuster & Cotten, 2022; Straker & Choi, 2021), virtual activities (Prophater et al., 2021; Saad et al., 2022; Schuster & Cotten, 2022), virtual spiritual activities (Kuepfer, 2022). While the implementation of virtual programs was due to the necessity of meeting residents' social interaction needs within the context of the COVID-19 pandemic, an unprecedented healthcare crisis, the wide variety of activities that were able to be implemented even under such difficult circumstances suggests that there is under-tapped potential of the use of technology to improve the quality of life of LTC residents.

The current study raised valuable insights into residents' use of technology in resident-centred activities from the perspectives of staff and not the perspectives of residents themselves. An analysis of the eight studies in literature review that discussed resident-centred activities showed that three described the perspectives of LTC staff only (Freidus et al., 2021; Schuster & Cotten, 2022; Prophater et al., 2021) and two described the perspectives of families (Chu et al., 2022; Straker & Choi, 2021); only three studies obtained perspectives from LTC stakeholders of which LTC residents were included (Hardy et al., 2022; Hung, Mann, Perry, et al., 2022; Saad et al., 2022). There is a need for future studies in North America investigating technology use in resident-centred activates to obtain the perspectives of LTC residents who are actually using the devices and technologies, so that residents can contribute to decisions about the use of resident-centred technologies rather than having decisions made for them.

Another resident-centred use of ICTs for LTC residents is for LTC residents to access virtual healthcare and attend medical appointments via ICTs. However, in this study participants discussed the use of ICTs for inter-professional communication with care providers to discuss residents' medical care needs and did not emphasize use of ICTs for

telehealth applications in the form of residents attending virtual medical appointments or that clinical staff conducting virtual assessments for residents. This is in contrast with studies in the literature review that showed increased technology use for the provision of telehealth applications in the United States (Bogin et al., 2022; Ford II et al., 2022; Powell et al., 2022) including virtual medical doctor appointments on video-conferencing software (Bogin et al., 2022; Ford II et al., 2022; Powell et al., 2022), and the use of integrated stethoscopes and otoscopes (Powell et al., 2022). Further research would be helpful to investigate the current extent as well as future potential of telehealth services for LTC residents in northern B.C.

Some of the technologies reported in this study as implemented in LTC for resident use, such as tablets, and FaceTime and Zoom for virtual visits, were originally designed for general consumers living in the community. No technologies discussed were designed specifically for the LTC setting - there was a lack of consideration given to the special needs of the population including usability by persons with physical and cognitive limitations. Of the articles in the Northern American literature review, there were three that discussed the implementation of technologies designed with these limitations in mind – robotic pets (Hung, Mann, Perry, et al., 2022; Van Orden et al., 2022) and tablets with an app designed for LTC residents to use that locked down the tablets and provided curated content (Prophater et al., 2021), and the subjects in these studies shared positive experiences about the implementation of the technologies. The lack of tailoring for technologies to address the wide range of user abilities among LTC residents and the technology literacy levels necessary to adopt to new technologies may have contributed the challenges described by participants on supporting LTC residents to transition to broader use of technology during the COVID-19 pandemic. There is need for further research in North America to design technologies and devices more

suited for use by LTC residents in the LTC setting – technologies that are designed for use in LTC may help alleviate some of the workload needed to support residents on technology use that was described by the participants that worked in LTC.

Staff-centred Activities

Staff-centred activities reported by participants in this study included the use of ICTs to support staff to communicate with other staff and with medical and healthcare professionals outside LTC. This supported overcoming social distancing requirements as per IPC processes and policies. Participants accessed a range of ICTs including virtual education and training, virtual meetings with LTC between and within departments, virtual interdisciplinary meetings, as well as communication between LTC nursing staff and medical professionals outside LTC.

Perceptions of Long-term Care Staff on Technology Use in Northern British Columbia

The perspectives of the participants regarding the impact of technology on their work were far from homogeneous – there were significant differences based on their work roles and the purposes and settings in which technology was used.

Virtual Meetings and Inter-professional Collaborations

Some participants reported that there were no changes in the type of their daily work though there was a shift from in-person versions to virtual alternates - for example, participants reported attending intra-departmental meetings and inter-professional rounds online and information was disseminated via emails and memos. In some cases, there was not only an increased number of virtual meetings (compared to in-person) but also an increased number of emails as well. Some participants had negative feedback about the increased volume of meetings and emails that resulted from increased technology use, though

others appreciated the timely updates from emails. Participants in management/leadership roles reported attending regular scheduled meetings with their peers where they discussed protocol changes and challenges and they felt emotionally supported during these meetings. There were no studies in the North American literature review that investigated ICT use by LTC staff for the purpose of inter-department, intra-department or inter-professional communications. However, in the studies that reported about Project ECHO® in the literature review (details of Project ECHO® described in a previous section), subjects reported feeling emotional support during these regularly scheduled training sessions (Baughman et al., 2021; Lingum et al., 2021; Prophater et al., 2021). These observations were similar to those reported by participants in management/leadership roles that reported attending regularly scheduled meetings. Future research in North America may be warranted in this area to investigate the impact of different types of technologies on the efficiency and effectiveness of inter-department, intra-department or inter-professional staff communication in the LTC setting, as well as the effects of the use of these technologies on staff morale.

Medical and Clinical Care via Information and Communication Technologies

While there were no physicians that participated in the study, participants described technology-mediated medical care from the perspective of how staff within the LTC home facilitated remote assessments for the physicians outside LTC using ICTs. Participants described misgivings about the quality of medical care that was provided to LTC residents using telemedicine technologies; they were concerned that remote medical care was impersonal and not resident-centred while acknowledging its convenience for physicians. There were similar concerns expressed by the subjects in the literature review - subjects that were interviewed expressed concerns about the depersonalization of care with technology -

though in that study researchers investigated the "perceived risks and ethical concerns about the adoption of robots in LTC" (Hung, Mann, Perry, et al., 2022) and not about the use of telehealth technologies per se. The literature review reported benefits of telehealth implementation such as increased access to specialists for LTC residents living in rural or remote areas, saving transportation costs on sending residents for in-person appointments (Ford II et al., 2022; Powell et al., 2022; Shaughnessy et al., 2022), though these benefits were not mentioned by the participants that worked in northern B.C.

Allied healthcare participants reported already using technology as part of their daily desk-based work for information and communication before the COVID-19 pandemic, though there were limitations on how much they could do remotely since medical charts and other information needed for assessments were not all available online. As well, participants reported trialing clinical assessments and counselling with the residents over the telephone, though they found that this did not really work for their clinical practices. Participants reported doing their assessment– in person mostly - no participant reported the use of video-conferencing technologies to assess LTC residents virtually. The problem of lack of access to the necessary medical information was also reported in studies in the literature review that noted low levels of interoperability between systems resulting in medical professionals not having access to all the information on the computer and was a barrier for telehealth expansion in LTC (Alexander et al., 2021; Ford II et al., 2022; Powell et al., 2022). The needs of allied health professionals to provide care virtually to LTC residents via telehealth technologies, however, is underexplored in North American literature – only one study described the experiences of rehabilitation staff that reported a shift from in-person group sessions to individual bedside sessions via telehealth technologies and this was seen as

beneficial for LTC residents (Reddy et al., 2021). More research is required from North America post-COVID-19 pandemic lockdown on this topic.

Online Education and Training

Online education and training were identified as technology-mediated activities, though information beyond stating that online training was not provided. It was unclear whether the training sessions were synchronous or asynchronous, in the form of self-paced slides, online videos or virtual meetings with other people, and others. This is in contrast with the descriptions of different synchronous and asynchronous methods of training and education in the studies in the literature review (Baughman et al., 2021; Beaudreau et al., 2022; Hung, Mann, & Upreti, 2022; Lingum et al., 2021; Penna et al., 2022; Prophater et al., 2021), all of which reported positive responses and interest by the staff that attended these trainings. In these studies, the researchers found that online education and training was effective and staff retained information from these sessions (Baughman et al., 2021; Hung, Mann, & Upreti, 2022; Lingum et al., 2021; Penna et al., 2022; Prophater et al., 2021), supported peer engagement and emotional support (Baughman et al., 2021; Hung, Mann, & Upreti, 2022; Lingum et al., 2021; Prophater et al., 2021), and were flexible with staff schedules (Beaudreau et al., 2022; Hung, Mann, & Upreti, 2022). On the other hand, researchers also noted the low digital literacy of some LTC staff, access to tablets and computers, and access to protected time for virtual training as barriers to online training and education (Hung, Mann, & Upreti, 2022). Future North American research is warranted to investigate online education and training modalities that are more suited for LTC staff, especially for more hands-on processes such as donning and doffing of personal protective

equipment, techniques for nursing care and safe feeding for LTC residents with dementia, and others.

Care Conferences

Resident care conferences are "team meetings where care plans are reviewed" (Northern Health, 2019) by the healthcare team, and residents and families are invited and encouraged to attend these meetings to participate in discussions on the care provided to LTC residents. Participants communicated enthusiasm that families were now able to attend care conferences remotely. These positive emotions were echoed in the study by Connelly et al. (2022) that investigated the implementation of family-based virtual care planning in two LTC homes in Ontario.

Virtual Visits in the Context of Social Isolation in Long-term Care

The increased social isolation of LTC residents due to the visitation restrictions had negative effects on residents' health and well-being. It was important for LTC residents to remain connected to their families, and thus LTC homes organized virtual visits for residents and families to allow residents and families to maintain some contact and communication. This was a common occurrence in other LTC homes in North America with commonly reported increases in social isolation by LTC residents (Chu et al., 2022; Davitt & Brown, 2022; Freedman et al., 2021; Hung, Mann, Perry, et al., 2022; Prophater et al., 2021; Saad et al., 2022) as well as increases in the availability of ICTs in LTC for residents to connect with families (Chu et al., 2022; Hardy et al., 2022; Prophater et al., 2021; Saad et al., 2022; Schuster & Cotten, 2022). However, participants questioned the effectiveness of ICT-mediated communications in virtual visits as LTC residents struggled with virtual visits, especially those with physical or cognitive challenges. The concern that LTC residents with

physical or cognitive challenges may not be able to use ICTs effectively for virtual visits was reflected in Freidus (2021) who interviewed LTC staff, in Chu et al. (2022) and in Hardy et al. (2022) who interviewed families of LTC residents, as well as in Ford et al. (2022) which investigated telehealth applications in LTC homes in the United States during the COVID-19 pandemic. As Freidus (2021) noted, "For dementia residents, this type of technology was less useful even though they were the most vulnerable to the effects of isolation... Interfacing with technology whereby loved ones attempted to communicate with them was often disorienting".

Participants reported having to manage scheduling conflicts as well as family expectations around and during virtual visits and suggested that virtual visits may be of more value to the families than to the residents. This was not supported by the research by Chu et al. (2022) that investigated the virtual visits but from the perspectives of families instead of LTC staff. Chu et al. (2022) found that in the context of deficits in digital infrastructure, technological devices, staffing levels and implementation, families also found virtual visits challenging and unsatisfactory. On the other hand, LTC staff found the tablets "useful in improving loneliness and mood in residents and allowing them to stay in touch with family and friends" (Prophater et al., 2021). Of note, Prophater et al. (2021) was the only ICT study included in the literature review where researchers specifically stated that the tablets had a specific interface designed for older adults. The evidence from the literature from North America is unclear as to whether the challenges from LTC residents' physical and cognitive impairment are insurmountable regarding their use of ICTs for virtual visits or telehealth are insurmountable, or whether supports may help ameliorate this challenge. Other studies that described resident-centred uses of ICTs, including virtual visits and telehealth applications,

listed the lack of technology and digital infrastructure and inadequate staffing levels as barriers but not physical and cognitive deficits of LTC residents (Bogin et al., 2022; Powell et al., 2022). More research from North America is necessary to investigate the role of ICTs and virtual visits in LTC as well as the acceptance of LTC residents to ICT-mediated communications for connecting with their families as well as receiving remote medical care from healthcare professionals.

Barriers to Technology Use in Long-term Care

Technological challenges included poor Wi-Fi connectivity in LTC homes, access to adequate equipment, and having to set up and use unfamiliar programs without adequate support in the form of more staff or training from the Health Authority. The lack of adequate existing technology support and digital infrastructure in LTC as well as connectivity issues are pervasive problems across a range of care settings and geographic locations (Alexander et al., 2021; Bogin et al., 2022; Chu et al., 2022; Davitt & Brown, 2022; Ford II et al., 2022; Hung, Mann, Perry, et al., 2022; Ostrowsky et al., 2022; Singer et al., 2022). Ease of access is necessary to promote technology uptake (Prophater et al., 2021), as such, more research may be warranted regarding the role of improved digital infrastructure in the encouragement of uptake of technologies in LTC for residents and staff, such as ICT-based telehealth technologies for remote medical care.

Ongoing struggles with staff shortages and high workload greatly affected those that provided direct nursing care to residents. The volume of work increased significantly though technology did not significantly change the type of tasks from their daily routine. There was more coordination with other departments to work with and around virtual visits. Those that provided therapeutic recreation described complete changes in their daily work as well as

significant increases in technology use and significant increases in workload since that department was responsible for setting up and scheduling virtual visits for residents during visitor restriction in LTC. As well, participants in the study also described that there was work required to sanitize equipment that was shared between staff and residents between every use to meet IPC guidelines.

Interestingly, no studies in the literature review that mentioned IPC implementation of having increased number of technological devices in LTC settings handled by both LTC residents and staff, such as the need for enhanced cleaning. That said, the challenges of staff shortages and high workload as barriers to technology use in LTC were well-described in the literature - researchers noted that increases in technology use led to increases in workload for LTC staff as they had to facilitate remote assessments, as well as provide administrative and technical support (Ford II et al., 2022; Powell et al., 2022; Shaughnessy et al., 2022). These findings were also reflected in the research by Chu et al. (2022), Schuster and Cotton (2022), and Davitt et al. (2022), of which researchers noted that LTC staff reported the need to support LTC residents in the use of technology but were overwhelmed with work and lack time to do so.

The perspectives shared by the participants in this study, as well as the research by Ford II et al. (2022) and Powell et al. (2022) demonstrate that challenges of staff shortages and high workload are considerable in the LTC setting and not unique to northern B.C. However, the study by Cruz et al. (2022) is evidence that these challenges may not be insurmountable to the promotion of technology use in LTC. Cruz et al. (2022) reported that registered care aides working in two LTC homes in Alberta showed high acceptance of a tablet-compatible app that allowed them to do their work more easily.

Virtual Care Conferences and Virtual Visits

Where and how the technology was deployed had a major impact on whether the adoption of technology had sustained rather than reverted to a previous process. Table 3 shows the comparison of participants' observations of Virtual Care Conferences with Virtual Visits. Both activities used tele- or video-conferencing technologies housed on computers, tablets, or telephones, and both activities involved the attendances of LTC staff, residents and/or families. For both activities, participants reported struggles with getting familiar or using the hardware devices, and unstable Wi-Fi connections. For virtual care conferences, there was interest in the continued practice of providing the option for virtual attendance to the future due to the convenience of this technology for the LTC staff and residents' families. In contrast, for virtual visits, there was significant pressure on staff workloads with the need to support residents and their families on top of their usual work of in-person care activities. There was a significant scale back of virtual visits after the visitation restrictions were lifted, and those that had continued to provide this service voiced their desire for either more staffing supports or for the frequency of virtual visits to be further reduced.

Table 3

Comparison of Barriers Encountered with Virtual Care Conferences and Virtual Visits

Barriers	**Virtual Care Conferences**	**Virtual Visits**
Infrastructure	N/A	• Unstable Wi-Fi Connection
Equipment Access	N/A	• Tablets • Use of Personal Cellphones
Training Needs	• Equipment	• Equipment • Know-how for Facilitation of Tech-mediated Communications between Families and Residents

Workflow Organization	• Part of pre-COVID usual workload for meeting attendees	• Post COVID addition on top of usual workload for LTC staff
Staffing Levels	N/A	• Short staffed, no time for this
Others	N/A	• Hand-held tablets shared between residents to be cleaned at every use, as per Infection Control requirements
Participant Quote	"…family members who are involved but live out of town are now able to attend care conferences which … I think pretty cool"	"…we are doing the minimal virtual visits but every opportunity we're trying to cut them down because of our lack of resources"

Note: N/A denotes the technology was not directly commented on by participants in the current study.

Strengths and Limitations of the Study

Long-Sutehall et al. (2011) pointed out that secondary analysis methodology could be a valuable method for exploring sensitive issues with an elusive population. The COVID-19 pandemic has been a difficult and challenging period for LTC staff, and the healthcare staff continue to live with the negative effects of pandemic, including staff shortages. As such, not only do the findings of this research study remain relevant and timely, conducting a secondary analysis for this study also helped to relieve the burden of participation from research participants, many of whom shared experiences of exhaustion and trauma during the primary study. While Canadian provinces adopted different COVID-19 policies and responses, there are likely similarities in access to technology for LTC homes in rural and remote areas prior to and during the COVID-19 pandemic. As such, the findings of this study may be applicable to those settings in other provinces. The large number of participants (n=52) as well as the diversity of work roles that participants did in LTC are also strengths of

the study – this allowed the capture of a wide range of perspectives of technology use in LTC in northern B.C.

One limitation of the current study was that it focused on LTC homes within NHA, where nearly all LTC homes are owned and operated by NHA. Therefore, it was not possible to examine differences in staff experiences between public versus private ownership. For this research study, there were limitations related to the issue of rigor as I was unable to return to LTC staff for member checking after the analysis.

As a Registered Dietitian who had experience volunteering and working in LTC in Ontario and northern B.C., and also additional lived experience working in LTC in northern B.C. both before and during the COVID-19 pandemic, I have shared commonalities in my experiences with the participants. This was both a strength and a weakness – I had an understanding of the specifics of the roles and the work that participants did, as well as what they were referring to when their use of organization-specific jargon and acronyms (such as the NHA intranet site "OurNH", or "The Learning Hub - an online education and training portal that contained self-paced training modules and offered synchronous education sessions used by NHA staff). During the analysis, I tried to be careful to pay close attention to the participants' expressions of their experiences and not to let my own assumptions colour my analysis. I also practised active reflection of my biases throughout my thesis study and journaled about my thoughts. Last and not least, I checked in regularly with my thesis supervisor who was also the primary investigator on the original study.

The findings of research study have alignment with those found in the studies that discussed technology use in LTC in Canada during COVID-19 (Chu et al., 2022; Hardy et al., 2022; Hung, Mann, Perry, et al., 2022). This suggests that my results were reflections of

the perspectives of the LTC staff that were interviewed in northern B.C. and not merely of my own observations and perspectives from having worked in LTC during COVID-19.

Conclusion

In conclusion, the research study was conducted to describe the role of technology and its impact on the experiences of LTC staff working in Northern British Columbia during the COVID-19 pandemic. A secondary analysis was conducted using transcripts of one-hour semi-structured interviews with participants from the primary study "*LTC Staff Working During COVID-19 in Northern BC"*. Transcripts of participants who discussed any technology use were included in the data set (N=52). The qualitative data was analysed thematically using Braun and Clarke's thematic analysis approach. Many LTC staff in the study reported that technology was reported to be helpful in enabling communication between those within LTC to those outside LTC. They reported the need to adapt to new and innovative uses of technology to communicate and collaborate with medical and healthcare professionals that remained outside the LTC homes, as well as to enhance residents' communications with their family and friends. However, the LTC staff in the study also reported having to provide usual care to residents in addition to managing significant challenges without additional supports which led to increased workload. Examples of the challenges that were reported included inadequate infrastructure, inadequate availability and access to equipment, lack of training, scheduling conflicts, supporting residents' virtual activities as well as technology needs, and managing emotional loads of residents and families.

Chapter 6: Summary, Implications and Recommendations

Summary

This study provides insight into the perspectives of some LTC staff working in northern B.C. during the COVID-19 pandemic. Technology played a significant role in LTC in northern B.C. during the COVID-19 pandemic – nearly all study participants described the impact of technology on their work. The usability, feasibility, and impact of the broad range of technologies described varied. Technology was useful for accessing information and collaboration, and the ability to communicate with others on video calls in real-time was beneficial. However, technology was also less desirable for those who wanted in-person connection with others. The ability to see and hear people on video calls was not the same to satisfy the need for an in-person presence for all residents. These issues were more acute for residents with physical or cognitive impairments. Even when a technology solution worked, some participants expressed concerns and questioned whether virtual care could truly be considered resident-centred care. These findings suggest the importance of choosing technologies to implement specific to the needs and context of the LTC setting, as well as ensuring staff support in the prioritization and implementation of technologies in LTC.

Implications

There is great potential for increased use of technology in LTC in northern B.C. for resident-focused applications as well as staff-focused applications, however barriers exist that need to be addressed. Not all applications of technologies worked the same for all persons. For example, ICTs were seen as useful for accessing information and collaboration, and the ability to communicate with others on video calls in real-time was beneficial. In contrast, ICTs were reported to be less desirable for those who wanted to feel connected with

other people – while the ability to see and hear people on video calls was better than nothing that was not quite enough to satisfy the need for an in-person presence. As well, there was uneasiness reported by some LTC staff in northern B.C. about increasing technology use in this setting. Despite recognizing the ability of technology to allow the provision of some kinds of medical care remotely, staff expressed concerns about the negative effects of technology on person-centred care. Staff also expressed concern regarding the ability of LTC residents to use ICTs independently as many had physical and cognitive deficits that required staff support.

Recommendations

Based on the observations and opinions shared by the participants working in LTC in northern B.C. during the COVID-19 pandemic, the recommendations and possible areas of exploration may encourage technology uptake in LTC in northern BC.

1. Adequate digital infrastructure to ensure stable and reliable access to the internet at adequate speeds for all areas in the LTC homes, including the rooms of residents. Stable internet access is essential for technologies that can support improved workflow for LTC staff and to allow for operations by a remote worker or machine. Access to the internet can also help keep LTC residents connected with social circles that are outside the LTC walls regardless of geographical distances.
2. The introduction of new technologies and processes may impact on operations, processes and protocols in LTC homes and should therefore be considered carefully and planned with input from all stakeholders so that any disruption on operations and negative impact on staff may be minimized.

3. Adequate training and education for LTC staff is essential when technologies are implemented to enhance familiarity with the programs and/or devices. Offering a variety of training such as self-paced modules, videos, as well as synchronous or asynchronous modes may better meet the diverse learning needs of LTC staff.
4. Technologies that are implemented in LTC may have impact on staff workload. Sufficient time should to be allocated for LTC staff to integrate use of technology into their workload.
5. Personnel and technological support during the implementation phase of new technologies should be sustained to support long-term use of the technology.
6. Technologies to be implemented in LTC for use by residents should be co-designed with residents to meet the needs of this population.
7. Technologies to be implemented in LTC for use by staff should be co-designed with LTC staff. This may be helpful in producing processes and protocols that staff feel are helpful in managing their workload and thus welcome the changes. This may help with staff buy-in regarding the implementation of these new technological solutions and help ameliorate issues with staff burnout and turnover in the LTC setting.
8. Adequate numbers of devices should be made available and accessible for staff and residents, as appropriate.
9. Social isolation has negative impact on the physical and mental health of LTC residents. Residents, isolated on the unit or confined to their rooms, should be offered access to virtual visits from families and/or other virtual activities to maintain social connection.

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Appendix A: Database Search Strategies

The following tables show the search strategies used for the databases – in the final step of the search strategies, search was run by combining all three search themes using the Boolean operator AND.

Table 4

Search Strategy for Pubmed

Theme	Title/Abstract Keywords
Long Term Care	("nursing homes"[Title/Abstract] OR "care homes"[Title/Abstract] OR "long term care"[Title/Abstract] OR "long-term care"[Title/Abstract] OR "residential care"[Title/Abstract] OR "aged care facility"[Title/Abstract]) OR ("nursing homes"[MeSH Terms] OR "long-term care"[MeSH Terms] OR "long-term care"[MeSH Terms] OR "homes for the aged"[MeSH Terms])
Technology	technolog*[Title/Abstract] OR electronic[Title/Abstract] OR internet[Title/Abstract] OR tele*[Title/Abstract] OR comput*[Title/Abstract] OR virtual[Title/Abstract]
COVID-19	((COVID-19[Title/Abstract]) OR (pandemic[Title/Abstract])) OR (COVID-19[MeSH Terms])

Table 5.

Search Strategy on EBSCOhost Research Databases for CINAHL Complete, APA PsycInfo & SocIndex

Theme	Title/Abstract Keywords
Long Term Care	TI ("nursing homes" or "care homes" or "long term care" or "long-term care" or "residential care" or "aged care facility") OR AB ("nursing homes" or "care homes" or "long term care" or "long-term care" or "residential care" or "aged care facility") OR SU ("nursing homes" or "care homes" or "long term care" or "long-term care" or "residential care" or "aged care facility")
Technology	TI (technolog* or electronic or internet or tele* or comput* or virtual) OR AB (technolog* or electronic or internet or tele* or comput* or virtual) OR SU (technolog* or electronic or internet or tele* or comput* or virtual)
COVID-19	TI (covid-19 or pandemic) OR AB (covid-19 or pandemic) OR SU (covid-19 or pandemic)

Table 6.

Search Strategy for Web of Science

Theme	Title/Abstract Keywords
Long Term Care	TI =("nursing homes" or "care homes" or "long term care" or "long-term care" or "residential care" or "aged care facility") OR AB =("nursing homes" or "care homes" or "long term care" or "long-term care" or "residential care" or "aged care facility") OR SU =("nursing homes" or "care homes" or "long term care" or "long-term care" or "residential care" or "aged care facility")
Technology	TI =(technolog* or electronic or internet or tele* or comput* or virtual) OR AB =(technolog* or electronic or internet or tele* or comput* or virtual) OR SU= (technolog* or electronic or internet or tele* or comput* or virtual)
COVID-19	TI =(covid-19 or pandemic) OR AB =(covid-19 or pandemic) OR SU =(covid-19 or pandemic)

Appendix B: Data Extraction Matrix – Article Background

Citation	Journal name	Year	Country of Study	Study Purpose	Study Design	Method	Study Design Limitations	Key findings relevant to research
Alexander, GL; Powell, Kimberly R; Deroche, Chelsea B. An evaluation of telehealth expansion in U.S. nursing homes. https://www.doi.org/10.1093/jamia/ocaa253	Journal Of The American Medical Informatics Association	2021	USA	"to examine the use of telehealth services being reported in a random sample of U.S. nursing homes…. 1. Did telehealth expansion, beginning March 6, 2020, increase telehealth uptake in U.S. nursing homes? 2. What are nursing homes using telehealth for? 3. Are there differences in nursing home telehealth uptake pre– and post–telehealth expansion based on facility characteristics" (p343)	Analysis of a national survey results that examined "trends in information technology (IT) maturity over 3 years. As part of this evaluation, researchers are using a nursing home survey that measures the extent of telehealth use in resident care and clinical support domains (eg, laboratory, radiology, pharmacy)" (p343)	"descriptive statistics to compare our study sample with the national sample relative to ownership, bed size, and location. ... Next, we incorporated poststratification weighting procedures to reweight the nursing homes to national proportions regarding these variables. Using poststratified weights, the team looked at differences in total telehealth use scores among each of the 6 survey questions contributing to the total telehealth use score. Next, we used logistic regression for survey data to examine the relationship between each type of telehealth use, based on the 6 survey questions, and nursing home characteristics including location ... , bed size..., and type of ownership .... Location was determined using rural-urban commuting area codes established from census data population statistics... Finally, with poststratified data, we assessed relationships between telehealth use in nursing homes completing surveys prior to and after telehealth expansion on March 6, 2020, by incorporating an additional variable into the logistic regression models to calculate odds ratios (OR) and 95% confidence intervals while adjusting for nursing home characteristics." (p342-3)	"Recruitment for this study was grouped according to state. Because we had only begun recruiting nursing homes in some states for our national survey, some states had fewer strata represented, especially for larger, nonprofit nursing homes." (p345)	"Significant relationships were found between nursing home characteristics and telehealth use, and specifically, larger metropolitan homes reported greater telehealth use. Ownership had little effect on telehealth use. Nursing homes postexpansion used telehealth applications for resident evaluation 11.24 times more ($P < .01$) than did nursing homes pre-expansion." (p342)"The overall mean telehealth use scores reported by the majority of these nursing homes is on the lower end of the range, which indicates that there is much room for improvement. These findings are supported because adoption of newer forms of technology have struggled to achieve a maximum adoption level. Some reasons nursing home administrators struggle include a need for systematic implementation processes and evidenced based protocols, lack of technology support and infrastructure, low levels of interoperability among disparate systems, and poor investments in staff training." (p345)

Baughman, AW; Renton, M; Wehbi, NK; Sheehan, EJ; Gregorio, TM; Yurkofsky, M; Levine, S; Jackson, V; Pu, CT; Lipsitz, LA. Building community and resilience in Massachusetts nursing homes during the COVID-19 pandemic. https://www.doi.org/10.1111/jgs.17389	Journal Of The American Geriatrics Society	2021	USA - Massachusetts	"To better implement evidence-based infection prevention and safety practices to protect nursing home residents and staff across the nation, the Agency for Healthcare Research and Quality (AHRQ), the University of New Mexico's ECHO® Institute, and the Institute for Healthcare Improvement (IHI) joined together to create the AHRQ ECHO National Nursing Home COVID-19 Action Network (hereinafter referred to as the Network).8 The Massachusetts Senior Care Association (MSCA) and Hebrew SeniorLife (HSL) joined the Network as a Training Center to support nursing homes in Massachusetts in infection control best practices." (p2717)	Descriptive	"This educational program provided 16 weeks of free weekly virtual educational sessions led by clinicians trained in geriatrics and nursing home leaders, as well as various subject matter experts and coaches trained by IHI in Quality Improvement methods... The 16 sessions were 90 min each and included topics such as COVID-19 prevention, outbreak management, and return-to-work policies. Each session followed a structured format, which started with a 20-min didactic component, followed by a 20-min pre-prepared case presentation, and then a 20-min portion on quality improvement strategies. The final 30 min was left open for questions and discussion. The curriculum was also modified in real time by the Training Center team as well as the cofacilitators to address current issues as they arose such as vaccine clinic implementation, changes in COVID-19 treatment options (e.g., monoclonal antibody therapy), and staff burnout." (p2717)	"Interactive virtual learning programs during crises may be an effective strategy for building community and resilience among participants at scale." (p2717) "While the Network was originally designed to enhance technical competencies such as infection control knowledge in nursing homes, the weekly interactive video conferencing model also created a safe space for nursing home leaders and staff to share and validate their own experiences, participate in peer mentorship, and become a supportive community. The Network fostered engagement opportunities during the pandemic that may not have otherwise been available. By promoting connection, interpersonal support in an interactive platform, the Network has been a valuable mechanism to support resilience and wellbeing for long-term care staff and advance improvements in COVID-19 preparedness, safety, and infection prevention. Finally, the Network also provided a focused effort to improve the clinical care and experience during the pandemic for our older adult population that receives short-term post-acute care as well as longterm care in nursing homes."

Beaudreau, SA; Otero, MC; Walker, JA; Gould, CE; Sisco, S; White, P; Pella, K; Wiley, E; Voorhees, K; Wetherell, JL. Problem Solving Training for Veterans with Complex Comorbidities: Treatment Delivery Adaptations during COVID-19. https://www.doi.org/10.1080/07317115.2021.1963382	Clinical Gerontologist	2022	USA	To summarize adaptations due to COVID-19 for VA Problem Solving Training (PST) for clinicians serving medically complex patients and to compare patient mental health outcomes in the year before (2019) and during COVID-19 (2020) (p1)	"a mixed-methods design, collecting qualitative information from key stakeholders (e.g., program experts leading consultation groups with clinicians) and quantitative information about Veteran improvement on critical mental health symptom measures." (p4)	"Clinicians attended a multi-day workshop and up to 6 months of small-group consultation for two training cases. In 2019 and 2020, 122 Veteran patients completed baseline and posttreatment measures of depression (Patient Health Questionnaire-9), anxiety (Generalized Anxiety Disorder-7 item), and negative problem-solving beliefs (Negative Problem Orientation Questionnaire). Qualitative data were collected on clinician's pandemic-related treatment implementation challenges." (p1)	"Program adaptations during COVID-19 addressed challenges due to delivering treatment by telephone, video, or in person; Veteran patient recruitment barriers; and privacy issues for telephone and video. Veterans in both pre-pandemic and COVID-19 cohorts had significant improvements in depression, anxiety, and negative problem-solving beliefs, with no significant differences in the amount of improvement between the two cohorts." (p1)"Results of the current program evaluation provide qualitative and empirical evidence to support the feasibility and effectiveness of a brief PST training program implemented during the COVID-19 pandemic with primarily older patients with complex medical comorbidities." (p10)

Bogin, MH; Chandra, A; Manggaard, J; Thorsteinsdottir, B; Hanson, GJ; Takahashi, PY. Telehealth Use and Hospital Readmission Rates in Long-term Care Facilities in Southeastern Minnesota During the COVID-19 Pandemic. https://www.doi.org/10.1016/j.mayocpiqo.2022.03.001	Mayo Clinic Proceedings. Innovations, Quality & Outcomes	2022	USA - Minnesota	"To determine whether the length of a telehealth visit predicted the risk of hospital readmission at 30 days in skilled nursing facilities (SNFs) in southeastern Minnesota" (p186) during COVID-19	"retrospective cohort study" (p186)	"The primary predictor was the duration of video visits, and we collected the data regarding other known predictors of hospitalization. We used the c2 test for categorical variables and multivariate conditional logistic regression." (p186)	"our sample size was smaller than anticipated because of patients either not giving consent for research purposes or because they did not receive a video visit during the specified time frame (eg, those who were evaluated by an in-person provider). The results of this study were determined by hand abstraction; although careful efforts were made to keep the abstraction consistent (ie, how to indicate missing information, decision to include a video visit if it happened on the last day of data collection, etc), human error is always a possibility.... We relied on provider estimation of time during the encounter, which could present some potential recall issues.... the population was overwhelmingly White (96.1%)... the scope of this study did not include reviewing the content clinical review and information exchange during the visit as additional quality metrics." (p191)	"we did not find a difference in the length of video visits between those hospitalized and those in the referent group (without hospitalization) within 30 days. This indicates that the hospitalized group did not have a longer or shorter visit." (p189)

Chu, CH; Yee, A; Stamatopoulos, V. Poor and Lost Connections: Essential Family Caregivers' Experiences Using Technology with Family Living in Long-Term Care Homes during COVID-19. https://www.doi.org/10.1177/07334648221081850	Journal Of Applied Gerontology	2022	Canada	"To understand EFCs' virtual visitations experiences during COVID-19 in two Canadian provinces." (p1547)	Qualitative	"Seven focus groups were conducted with EFCs. Thematic analysis was used to identify themes at micro, meso, and macro levels." (p1547)	"Four themes were found: 1) a lack of technology and infrastructure; 2) barriers to scheduling visitations; 3) unsuitable technology implementation; and 4) inability of technology to adapt to residents' needs.... Virtual visitations showcased a confluence of micro, meso, and macro factors that, in some cases, negatively impacted the EFCs, residents, and the relationship between EFCs and residents. Structural and home inequities within and beyond the LTCH impacted the quality of technology-based visitations, underscoring the need to support technology infrastructure and training to ensure residents are able to maintain relationships during visitation bans." (p1547)

Connelly, D; Hay, M; Garnett, A; Hung, L; Yous, M; Furlan-Craievich, C; Snelgrove, S; Babcock, M; Ripley, J; Snobelen, N; Gao, H; Zhuang, R; Hamilton, P; Sturdy-Smith, C; O'Connell, M. Video conferencing with residents and families for care planning during COVID-19: experiences in Canadian long-term care. https://www.doi.org/10.1093/geront/gnac154	The Gerontologist	2022	Canada - ON	"describes the experiences of a multidisciplinary research team in implementing an evidence-based intervention for familycentred, team-based, virtual care planning – PIECES(TM) approach – into clinical practice." (p1)	Qualitative descriptive design, "A deductive approach to coding and assigning themes were employed using qualitative content analysis" (p5)	A 23-member team of researchers, PIECES experts, research trainees, RPNs, family/care partners, older adult residents, and directors of LTC brainstormed adaptation of the PIECES(TM) approach to be delivered via videoconferencing using PHIPA (Personal Health Information Protection Act)-approved ZOOM within two partner LTC homes. The research process included weekly team meetings. Over 9 months, the virtual PIECES intervention was shepherded by an on-site RPN champion and supported by an expert team of clinicians, Behavioral Supports Ontario. (p4)	"circumstantial factors surrounding subsequent repeated COVID-19outbreaks among residents and staff at both partner LTC homes ultimately did affect the capacity of the research team and frontline staff for executing research-oriented tasks" (p9)	"Findings highlighted how aspects related to planning, engagement, execution, reflection, and evaluation influenced the implementation process from the perspectives of stakeholders. Involving expert partners on the research team to bridge research and practice, developing relationships from a distance, empowering frontline champions, and adapting to challenging circumstances led to shared commitments for intervention success." (p1)"authentic engagement of frontline RPN championswithin the LTC homes was understood as essential in liaisingbetween the clinical settings and the research team... They ensured that staff were following appropriate processes in terms of referrals and next steps for planning for care conferences held by video with families and residents in LTC." (p7)"Key lessons learned within this implementation effort included the importance of meaningful early and ongoing stakeholder involvement, clarity around expectations, and readiness and commitment for implementation." (p8)"RPN stakeholders were truly embedded in the virtual delivery of PIECES as they received paid training and education and were provided with shifts where they would focus solely on PIECES." (p9)

Cruz, AM; Portillo, HPL; Daum, C; Rutledge, E; King, S; Liu, LL. Technology Acceptance and Usability of a Mobile App to Support the Workflow of Health Care Aides Who Provide Services to Older Adults: Pilot Mixed Methods Study https://www.doi.org/10.2196/37521	JMIR Aging	2022	Canada - AB	"The purpose of this study was to investigate the technology acceptance and usability of a mobile app in a real-world environment, while it is used by health care aides who provide services to older adults." (p1)	"This pilot study used a mixed methods design: sequential mixed methods (QUANTITATIVE, qualitative)." (p1)	"Our study included a pre– and post–paper-based questionnaire with no control group (QUAN). Toward the end of the study, 2 focus groups were conducted with a subsample of health care aides (qual, qualitative description design). Technology acceptance and usability questionnaires used a 5-point Likert scale ranging from disagree (1) to agree (5). The items included in the questionnaires were validated in earlier research as having high levels of internal consistency for the Unified Theory of Acceptance and Use of Technology constructs. A total of 60 health care aides who provided services to older adults as part of their routine caseloads used the mobile app for 1 month. Comparisons of the Unified Theory of Acceptance and Use of Technology constructs' summative scores at pretest and posttest were calculated using a paired t test (2-tailed). We usedthe partial least squares structural regression model to determine the factors influencing mobile app acceptance and usability for health care aides. The α level of significance for all tests was set at P≤.05 (2-tailed)." (p1)	"...conducted in only one long-term care facility... all but one of our participants were identified as female ... it would be ideal to have anequal number of men and women represented in the data analyses to examine gender differences....the health care aides who returned the technology acceptance and usability questionnaire might have been inclined to prefer the mSCS ... the results of our pre- and posttest for our variables resulted in a statistical power that was lower than the conventional cutoff value of 0.80....future studies should pursue larger sample sizes when the effect size is low... ...the cultural or language demographic characteristics of the health care aides [were not recorded]... unable to assert whether cultural or language factors affect the technology acceptance and usability of the mSCS for this population. Finally, we experienced a ceiling effect (ie, most of the values obtained for our constructs approached the upper limit of the technology acceptance and usability	"acceptance of the mSCS was high among health care aides, performance expectancy construct was the strongest predictor of intention to use the mSCS, intention to use the mSCS predicted usage behavior. The qualitative data support the quantitative findings and showed health care aides' strong belief that the mSCS was useful, portable, and reliable, although there were still opportunities for improvement, especially with regard to the mSCS user interface." (p1)"The combined results of performance expectancy, effort expectancy, and social influence on intention to use the mSCS suggest the following: in a nonmandatory health care setting, no matter how difficult it is to use the mSCS, or whether there is external social pressure to use the mSCS, health care aides will only accept the mSCS if they perceive it will help them attain their goals at work" (p12)

							questionnaire). Thus, in future studies, it would be reasonable to use a 7-point Likert scale in technology acceptance and usability studies, especially when the scale is new. (p12)	
Davitt, JK; Brown, J. Using Voice and Touchscreen Controlled Smart Speakers to Protect Vulnerable Clients in Long-Term Care Facilities https://www.doi.org/10.1093/geroni/igac024	Innovation In Aging	2022	USA - Maryland	"This pilot focused on understanding the potential challenges and benefits of using these devices and strategies for assuring smooth implementation of the devices in the statewide rollout." (p3)	Qualitative.	Two focus groups were conducted. "The interview guide included questions on challenges to doing casework during the pandemic, challenges to installing and operating the devices, benefits of the Echoshow 8, and strategies for troubleshooting challenges. The focus groups were conducted virtually" (p3)		"many of the facilities had challenges using technology to help with video access to their clients. Either they do not use cell phones, do not know how to use them, or have limited Wi-Fi capability such that ICTs are not supported… having to wait for the right staff person to be on duty to use technology. Moreover, there are Maryland DHS restrictions on the types of software caseworkers are allowed to use..." (p3)

Ford II, JH; Jolles, SA; Heller, D; Langenstroer, M; Crnich, C. There and back again: the shape of telemedicine in U.S. nursing homes following COVID-19. https://www.doi.org/10.1186/s12877-022-03046-y	BMC Geriatrics	2022	USA - Wisconsin	"1) characterize facility plans for continuing telemedicine following COVID-19; 2) characterize staff and provider perspectives on the value and utility of telemedicine; and 3) identify the barriers NHs face with conducting telemedicine encounters." (p2)"Without this knowledge, there is a risk of telemedicine de-adoption in NHs as safety concerns around COVID-19 abate." (p2)	"a mixed methods convergent study… sample of nine NHs that had newly adopted or significantly expanded telemedicine during the COVID-19 pandemic were purposively selected..." (p2)	"Data collection from members of the NH administrative staff was conducted using semi-structured interviews. These Interviews focused on the following areas: 1) facility experience and challenges with implementing and using telemedicine during COVID-19; 2) facility plans for using telemedicine after COVID-19; 3) the relative advantages and disadvantages of telemedicine versus face-to-face encounters; 4) the types of resident encounters most amenable to telemedicine; and 5) the tools and resources that can make telemedicine encounters easier and/or more effective.... Directed content analysis was used to characterize the advantages and disadvantages of telemedicine when delivering primary care or sub-specialty care." (p2)	"The interviews were conducted with a convenience sample of NH staff and providers ... Sub-specialist interviews were limited to a convenience sample of infectious disease, psychiatry, and wound care providers….the findings from the survey were limited to one long-term care APP group affiliated with a midwestern healthcare system." (p10-1)	"All participating NHs reported encountering difficulties with one or more aspects of telemedicine expansion or implementation. ... NHs experienced issues related to hardware and equipment availability/supply. Connectivity problems as well as software issues were experienced ... all NHs experienced challenges with sufficient staff availability and different procedural tasks related to telemedicine (e.g., training staff on use of different telemedicine platforms). Many of the technological issues improved during the early implementation of telemedicine in NHs. However, many of the work system issues, as will be shown, remained a persistent problem in participating NHs."(p3)"All participating NHs indicated a preference to continue telemedicine after COVID-19. Urgent assessments of resident change-in-condition and cognitively based sub-specialty consultations were identified as the encounter types most amenable to telemedicine. Reductions in resident off-site encounters and minimization of resident therapy interruptions were identified as major benefits of telemedicine. Twelve work system enhancements needed to better sustain telemedicine were identified, including improvements to: 1) equipment/IT infrastructure; 2) scheduling; 3) information exchange; and 4) telemedicine

								facilitators." (p1)"Intensity of the physical exam is a determinative factor in whether telemedicine can be substituted for a face-to-face encounter" (p4)
Fosdick, BK; Bayham, J; Dilliott, J; Ebel, GD; Ehrhart, N. Model-based evaluation of policy impacts and the continued COVID-19 risk at long term care facilities https://www.doi.org/10.1016/j.idm.2022.07.003	Infectious Disease Modelling	2022	USA - Colorado	"his model's purpose is to study the spread of SARS-CoV-2 in a long-term care facility environment over a short time window, e.g. 3e6 months, under various vaccination levels of staff and residents and differing testing protocols. It is designed to allow facility managers to understand the trade-offs between adopting, for example, a vaccination mandate versus rapid testing staff weekly versus requiring qRT-PCR tests biweekly. The primary outcomes considered are the total number of infected individuals in the facility and the number of staff workday missed as a result of isolation." (p472)	"programed an agent-based model that simulates the key daily behaviors and events that impact disease transmission in a facility. Like the traditional infectious disease compartmental models, all agents (staff and residents) are labeled as either susceptible, exposed, asymptomatic infected, symptomatic infected, or immune (also referred to as recovered). Each agent transitions between these states based on events in the simulation." (p465)	"dashboard quantifies the continued risk for COVID-19 infections within a facility given a designated testing schedule and vaccine requirements." (p463) "the model includes three types of entities: day staff, night staff, and residents. Each entity is an individual and is characterized by their vaccination status (vaccinated or unvaccinated), their current infection state (Susceptible, Exposed, Asymptomatic infected, symptomatic Infected or Recovered) and whether they are in quarantine from a positive test. An all-or-nothing vaccine model is assumed such that 5% of vaccinated individuals are still susceptible to infection, while the remaining 95% are fully protected after being vaccinated... Vaccine status of each entity is held constant. The simulation proceeds 1 day at a time, where entity infection and quarantine status is updated." (p472)	"some parameters were not well studied at this time….We assumed a contact structure between staff and residents that is static over the simulation…increased risk to facilities whose staff work at other facilities...was not explicitly modeled here... The testing protocol is determined at the beginning of the simulation and does not change." (p466)	"Key findings were that choice of COVID-19 diagnostic (ex. nasal swab qRT-PCR vs rapid antigen) and testing cadence has less impact on attack rate and staff workdays missed than does vaccination rates among staff and residents. Specifically, low vaccine uptake among staff at long-term care facilities puts staff and residents at risk of ongoing COVID-19 outbreaks." (p463)"We simulate the LTCF-ABM to illustrate two continued risks to LTCFs: 1) low staff vaccination rates, and 2) relaxed screening protocols. LTCF staff are a conduit for risk to LTCF residence because they interact with the outside community when not at work. Our model suggests that outbreaks are likely to occur when 78% of residents and 37.5% of staff are vaccinated even with a weekly testing protocol in place" (p466)

Freedman, VA; Hu, M; Kasper, JD. Changes in older adults' social contact during the COVID-19 pandemic. https://www.doi.org/10.1093/geronb/gbab166	The Journals Of Gerontology. Series B, Psychological Sciences And Social Sciences	2021	USA	"To understand changes during the coronavirus disease 2019 (COVID-19) pandemic in weekly contact with nonresident family and friends for U.S. adults aged 70 and older in residential care and community settings." (p1)	Restrospective cohort. "Using data from the National Health and Aging Trends Study (NHATS), we compare older adults' frequency of social contact before and during the pandemic. We document levels and changes by mode and how these findings differ for three groups: those in residential care settings, in the community with limitations, and in the community with no limitations. We then explore the extent to which setting influenced change by mode after controlling for demographic characteristics, prepandemic need and opportunities for nonresident contact, and openness to technology." (p2)	"Participants in the National Health and Aging Trends Study COVID-19 mail supplement (N = 3,098) reported frequency of phone, electronic, video, and in-person contact with nonresident family and friends in a typical week before and during the pandemic. We examined less than weekly contact by mode for those in residential care settings and community residents with and without limitations. We estimated multinomial logit models to examine predictors of change to less than weekly contact (vs. maintaining weekly or more contact) by mode, overall, and stratified by setting." (p1)	"Prepandemic measures of contact were collected retrospectively. ... Seasonal influences on contact, particularly for face-to-face visits, also cannot be ruled out... because of limited sample sizes, in stratified (supplemental) models, we combined those living in residential care and in the community with limitations. We were therefore unable to explore whether family/network and technology use had different effects in these settings. Moreover, this analysis focused on the frequency of social contacts and did not address the quality of interactions or extent of emotional support related to such contacts, nor did it explore other kinds ofsocial participation that may have taken place during the pandemic. " (p6)	"During the pandemic, weekly in-person contact fell most for those in residential care so that eight out of 10 older adults in these settings—double the prepandemic level—had less than weekly in-person contact with nonresident family or friends. In adjusted models, the chances of changing to less than weekly contact were highest for those in assisted living and nursing home settings, followed by independent living settings. These findings highlight the challenges posed by the pandemic to settings that have been characterized as centered on providing opportunities for social engagement" (p6)"this study is the first to document the extraordinary declines during the COVID-19 pandemic in face-to-face visits across residential settings for a national sample of older adults. Particularly striking are the substantial declines for in-person visits and low levels of regular video use with family and friends, especially in residential care settings." (p6)

Freidus, A; Shenk, D; Wolf, C. Integrating Praxis Through the Research Process: Caregivers for Older Americans During the COVID-19 Pandemic. https://www.doi.org/10.1111/napa.12166	Annals Of Anthropological Practice	2021	USA - North Carolina	"This three-phase rapid qualitative assessment is focused on the perspectives of workers providing LTC to older adults in central North Carolina during the pandemic" (p165)	Case study - qualitative assessment	"We conducted interviews with 76 people from June to November 2020.Weincluded participants from all types of congregate LTC communities and also workers providing inhome and community-based services....Interviews were video-recorded using a webbased platform and were transcribed verbatim. Similar questions were posed in each phase in semistructured interviews ranging from 23 to 145 minutes. We asked these workers about the overall impact of the epidemic on their provision of care as well as their key concerns. We recorded a total of 67 hours of interviews with the 76 participants and generated codes for these data through an ongoing, inductive approach." (p165)	"A key finding that emerged beginning with Phase 1 was the impact social isolation was having on both staff and residents." (p166)"the use of technology to address social isolation was an issue for most LTC communities and home and community-based programs. The use of tablets, smartphones, baby monitors, and headphones to aid in connecting families with their loved ones has proven invaluable although often insufficient...it was not uncommon for workers to use their own cell phones to facilitate video calls between residents and their loved ones... For dementia residents, this type of technology was less useful even though they were the most vulnerable to the effects of isolation.....Interfacing with technology whereby loved ones attempted to communicate with them was often disorienting." (p167)"Robotic pets are known to provide positive interaction for people with dementia ..., but this resource was not extended to residents in congregate care communities.

Getson, C; Nejat, G. The adoption of socially assistive robots for long-term care: During COVID-19 and in a post-pandemic society. https://www.doi.org/10.1177/08404704221106406	Healthcare Management Forum	2022	Canada - ON	"present the first exploratory Human-Robot Interaction (HRI) study in a LTC home with a SAR for autonomous health screening and investigate staff overall experiences with the robot, cognitive and affective attitudes, perceived safety, efficiency, and intent to use the robot" (p301)	Descriptive	"Pre- and post-study questionnaires were handed out to participants, which included 5-point Likert questions. The questions... focused on 7 attributes: screening experience, perceived efficiency, cognitive attitude, freeing up staff, perceived safety, affective attitude, and intent to use the robot for the screening task. Participants also provided demographic information: age range, gender, occupation, as well as previous robot experience." (p303)	Quantitative questionnaires using 5-point Likert questions	"Results show that overall, staff were positive about the screening robot, and that autonomous screening with a social robot is a potential application in long-term care homes." (p301)"Technology alone is not enough for the successful adoption of SARs; people from within all levels of the organization should be involved in its implementation. On-site pilot and validation studies of the robotic technology are important, as is collecting real-world interaction data so as to monitor the safety and effectiveness of the robotic technology... training and familiarity with the robot are key to its successful implementation, so healthcare workers can quickly engage the robot to perform specific tasks or give effective guidance on how to use the robot to others who need it." (p307)

Hardy, MS; Fanaki, C; Savoie, C; Dallaire, C; Wilchesky, M; Gallani, MC; Gagnon, MP; Laberge, M; Voyer, P; Cotec, A; Couture, V; Dallaire, B. Acceptability of videoconferencing to preserve the contact between cognitively impaired long-term care residents and their family caregivers: A mixed-methods study https://www.doi.org/10.1016/j.gerinurse.2022.09.006	Geriatric Nursing	2022	Canada - QC	"to describe the acceptability of electronic tablets used to preserve and promote contact by cognitively impaired Canadian residents with and their family caregivers." (p65)	"convergent mixed method design. Both quantitative and qualitative approaches were used to collect data, and then integrated them into the interpretation of the overall results" (p66)	"Participating family caregivers who chose to use videoconference as their main communication mode received a document informing them on how to prepare for their meeting with their relative suffering from a neurocognitive disorder. ... videoconference meetings were scheduled once a week, with no duration limit and at a time that would be most convenient for all of them. " (p66)"all interviews were conducted remotely (e.g., by telephone or videoconference). Semi-structured individual interviews were conducted with 13 dyads using an interview guide inspired by the Theoretical Framework of Acceptability.The interviews were designed to uncover the participants' current experiences in communicating with older adults, as well as the challenges and resources that helped them during the use and implementation of the intervention." (p66)	"Although a sample of 13 dyads was appropriate for a pilot study of a logistically complex intervention, the small sample size may affect the external validity of quantitative data. Moreover, this study was conducted in the context of the COVID-19 pandemic, which constitutes one of its strengths. Yet, the results obtained could differ if a similar study were conducted in a different context, thus limiting the generalizability of the corresponding findings." (p72)	"Family caregivers showed a positive attitude toward the use of videoconferencing (mean score of 8.6 out of 10). The use of tablets had a good fit with their value system (Ethicality mean score 9.2 out of 10), was perceived as an effective tool to establish communication with their loved ones (perceived effectiveness mean score of 7.1 out of 10) and was beneficial (mean score 9.1 out of 10). Moreover, they positively evaluate their capacity for using the tablets (self-efficacy mean score 8.5 out of 10). They perceived that the use of videoconferencing to communicate with residents, required little effort (burden mean score 2.3 out of 10) and was low cost (mean score 1.8 out of 10)" (pg67)"Overall, caregivers reported very positive feelings about being able to keep the communication going considering the visiting restrictions imposed due to the pandemic"(p67) " "These feelings were also shared by many residents.... the experience was not always pleasant or easy for everyone. Some family members felt that the quality of the virtual communication was not optimal ... According to most caregivers, communicating via tablets can be demanding, especially when the resident is unable to understand or uphold the conversation, due to their condition and the severity of their cognitive deficits... depending on the level of functional decline of the

								residents, it was difficult for them to hold the tablet without the support of staff members... tablets were not optimal to residents' sensory needs (p68)"Upon restrictions on face-to-face meetings, virtual meetings were an alternative for some caregivers to maintain contact with their loved ones. Face-to-face meetings were perceived as more humane and more adapted to interact and take care of the residents." (p68) "Similarly, some residents preferred the physical presence of their relatives, however they still enjoyed being able to see them." (p69)
Hung, L; Mann, J; Upreti, M. Using the Consolidated Framework for Implementation Research (CFIR) to foster the adoption of a new dementia education game during the COVID-19 pandemic. https://www.doi.org/10.1093/geront/gnac138	The Gerontologist	2022	Canada - BC	"we developed and implemented an online game-based dementia education at 10 Canadian hospitals and 10 LTC homes to teach practical person-centered care communication techniques." (p2)	Qualitative research design using the Consolidated Framework for Implementation Research	"Six codesigned workshops were conducted in two acute medicine units and one mental health unit to identify user needs and preferences. The Information and Technology team in the hospital provided support in producing the game-based education. Three iterations of user testing were performed to ensure the content was relevant and well-accepted." (p2)	"a lack of staff time and leadership turnover in our study sites are prevalent barriers to implementing dementia care interventions in hospitals and LTC homes. ... study pertains to data from one province in Canada, and our findings are limited by the lack of preintervention baseline data for comparison. We also did not assess behavioral changes in staff practice (staff outcome) over time. Future research should evaluate behavioral change, such as staff person-centered care practice, staff injury resulting from behavioral events, and patient satisfaction." (p10)	"Our analysis identified 5 effective strategies: Easy access, Give extrinsic and intrinsic rewards,Apply implementation science theory, Multiple tools, and Engagement of champion. The CFIR provided a systematic process, a comprehensive understanding of barriers, and possible enabling strategies to implement gamified dementia education." (p1)"Our findings suggested that the social experience positively influenced implementation, bringing enthusiasm through story sharing within and between sites. In addition, the feedback of positive outcomes shared in staff huddles and local clinical meetings encouraged uptake and spread of the dementia education intervention." (p9)

Hung, LL; Mann, J; Perry, J; Berndt, A; Wong, J. Technological risks and ethical implications of using robots in long-term care https://www.doi.org/10.1177/20556683221106917	Journal Of Rehabilitation And Assistive Technologies Engineering	2022	Canada - BC	"This article draws on the data from a qualitative descriptive study that explores ethical issues in using assistive technologies in LTC. We provide a detailed analysis of technology risks and ethical implications based on a diverse group of stakeholders: LTC residents and families, frontline staff, operation leaders, and ethics experts in dementia care." (p2)	"qualitative descriptive study"	"Semi-structured interviews were conducted to obtain information regarding perceived risks and ethical concerns about the adoption of robots in LTC….. Thematic analysis was performed in six steps, guided by Braun and Clarke" (p2)	"First, we only interviewed a small number of stakeholders in each group. It was challenging to recruit residents and family members, as well as frontline staff during the COVID-19 pandemic. ... Second, the participants in the two LTC sites are privileged to have access to social assistive robots. It is possible that previous research project activities aiming to encourage robotic adoption influenced people's perception about technological risks and ethical implication. Also, both homes are large urban sites; rural homes may have very different preferences, perspectives, and opinion about technology use. Third, education, income, sex and gender, and generational status can contribute to digital inequity among older adults. We did not investigate intersectionality; how multiple identity factors may impact digital perspectives and experiences." (p8)	"First it expands the understanding of the perceived ethical concerns and risk in robotic use among LTC residents. Participants in the study explained residents, families, and staff have various preferences, needs, and perspectives….Second, the study results provide a rich and direct voice of people living and working in the frontline LTC. The two LTC sites have the social robot PARO and the telepresence robot Double and used them during the times of COVID-19 pandemic when many residents experience social isolation and loneliness. Most participants agreed on the positive benefits of the assistive robots to support residents' needs. Despite the risk of robots replacing human carer has been repeatedly raised by our participants, social and emotional needs are substantial motivators for uptake. Third, if technology is carefully developed and implemented with frontline staff, technology can lead to an empowerment of the workforce in the digital age." (p6)

Kuepfer, J. Supporting Spirits in Changing Circumstances: Pandemic Lessons for Long-Term Care and Retirement Homes https://www.doi.org/10.3390/rel13070584	Religions	2022	Canada - ON	"reports and reflects upon the experiences of spiritual care providers (SCPs) in these settings in Ontario, Canada as they each endeavored to adapt to their circumstances" (p1)	Qualitative	"Qualitative data were gathered from 27 participants through a variety of means, including natural focus group opportunities, email responses to questions, and in-depth virtual interviews."	"Opportunities to personalize spiritual care using technology, and the value of small, intimate gatherings were realized, along with the value of employing an in-house SCP who truly gets to know residents and can continue to creatively adapt to meet changing needs in changing circumstances." (p1)"Virtual worship services to share with residents in their home areas on Smart TVs, or in their rooms on tablets, computers or even smartphones. (p4) "Zoom was also used to host virtual bible studies and reflection times, a 'Fireside Philosopher' group, and a virtual piano recital. Memorial services using Zoom welcomed family members from a distance. Telephones were used to connect older adults in retirement homes for worship. Seniors WithOut Walls (WOW) technology allows people to call in or receive a call, to connect as a group from their own phone. One SCP used her home's" (p5)"Restrictions forced SCPs to imagine and implement spiritual care in new ways, searching out and learning to use resources, including technology, to uphold spirits. (p10)

Lingum, NR; Sokoloff, LG; Meyer, RM; Gingrich, S; Sodums, DJ; Santiago, AT; Feldman, S; Guy, S; Moser, A; Shaikh, S; Grief, CJ; Conn, DK. Building Long-Term Care Staff Capacity During COVID-19 Through Just-in-Time Learning: Evaluation of a Modified ECHO Model. https://www.doi.org/10.1016/j.jamda.2020.10.039	Journal Of The American Medical Directors Association	2021	Canada - ON	"This study aimed to determine whether Project ECHO (Extension for Community Healthcare Outcomes) Care of the Elderly Long-Term Care (COE-LTC): COVID-19, a virtual education program, was effective at delivering just-in-time learning and best practices to support LTC teams and residents during the pandemic." (p238)	"mixed methods evaluation of ECHO COE-LTC: COVID-19 involving quantitative and qualitative analyses." (p238)	"ECHO COE-LTC: COVID-19, which was planned for an initial 4 weeks, was expanded in blocks of 4 weeks to a total of 12 weeks due to high engagement, number of attendees, and requests for more sessions from participants as the pandemic continued to affect LTC homes across Ontario. In anticipation of changing demands and schedules of HCPs in LTC, a rolling enrolment process was implemented whereby participants could flexibly attend 1 or more sessions, but did not need to commit to 75% attendance. A total of 12 weekly, 1-hour sessions were offered. The typical case submission by partner and spoke homes was modified in order to accommodate the increased demands on HCPs for pandemic efforts. Instead, cases in our sessions were related to participants' personal experiences and narratives, which were elicited and shared spontaneously during the 1-hour session; these reflected the current situation in their LTC home (referred to hereafter as situational exemplars). A trained Hub member with clinical and leadership expertise in LTC facilitated each session to encourage dialogue and exchange of ideas. Recordings of the didactic presentations and summarized transcriptions of situational exemplars were posted on the Ontario CLRI website. In addition to the recordings and transcriptions, relevant articles and tools for	"... the rolling enrolment process meant that some participants may not participate in all sessions and therefore could not benefit from the entire program. ... we did not measure changes in knowledge due to planning the curriculum in 4-week blocks. ... LTC homes had varied levels of preparedness and readiness around COVID-19 and therefore some information may be affirming rather than new knowledge....only a subset of participants provided responses to certain open-ended questions, as this was not a mandatory requirement for all questions. This limitation was mitigated by data triangulation between qualitative and quantitative data, which complemented and strengthened each other." (p243)	"Of the 252 registrants for ECHO COE-LTC: COVID-19, 160 (63.4%) attended at least 1 weekly session. Nurses and nurse practitioners represented the largest proportion of HCPs (43.8%). Overall, both confidence and comfort level working with residents who were at risk, confirmed, or suspected of having COVID-19 increased after participating in the ECHO sessions (effect sizes 0.7, Wilcoxon signed rank P < .001). Participants also reported impact on intent to change behavior, resident care, and knowledge sharing." (p238)

						practice were shared on the ECHO COE Community of Practice website.... Participants completed surveys at pre-ECHO (prior to attending their first session), following each weekly session, and at post-ECHO (at the completion of the 12-week program). We define the effectiveness of ECHO COE-LTC: COVID-19 by reach, satisfaction with the program, self-efficacy, intent to change behavior, impact on resident care, and knowledge sharing." (p239)		
Miller, SL; Mukherjee, D; Wilson, J; Clements, N; Steiner, C. Implementing a negative pressure isolation space within a skilled nursing facility to control SARS-CoV-2 transmission. https://www.doi.org/10.1016/j.ajic.2020.09.014	American Journal Of Infection Control	2021	USA - Pennsylvania	"we designed, implemented, and validated an isolation space at a skilled nursing facility in Lancaster, PA. The overall goal was to minimize disease transmission between residents and staff within the facility. " (p438)	Pilot. Descriptive	"We created an isolation space by modifying an existing HVAC system of the SNF. We measured pressure on-site and performed computational fluid dynamics and Lagrangian particle-based modeling to test containment and possible transmission extent given the isolation space is considered negative rather than individual rooms." (p438)	"the solution described in this paper should be viewed as a temporary and emergency solution. Further discussion needs to take place surrounding Life Safety Codes that incorporate air handling equipment either retrofitted or installed into new construction; thus, making it possible to transition spaces to meet airborne infection isolation room requirements under outbreak conditions.: (p445)	"ressure data shows the isolation space maintained an average (standard deviation) hourly value of -2.3 Pa (0.12 Pa) pressure differential between it and the external hallway connected to the rest of the facility. No transmission of SARS-CoV-2 between residents isolated to the space occurred, nor did any transmission to the staff or other residents occur. The isolation space was successfully implemented and, as of writing, continues to be operational through the pandemic." (p438)

Ostrowsky, BE; Weil, LM; Olaisen, RH; Stricof, RL; Adams, EH; Tsivitis, MI; Eramo, A; Giardina, R; Erazo, R; Southwick, KL; Greenko, JA; Lutterloh, EC; Blog, DS; Green, C; Carrasco, K; Fernandez, R; Vallabhaneni, S; Quinn, M; Kogut, SJ; Bennett, J; Chico, DM; Luzinas, M; New York COVID-19 Response Team. Real-time virtual infection prevention and control assessments in skilled nursing homes, New York, March 2020-A pilot project https://www.doi.org/10.1017/ice.2021.100	Infection Control And Hospital Epidemiology	2022	USA - New York	"To describe a pilot project infection prevention and control (IPC) assessment conducted in skilled nursing facilities (SNFs) in New York State (NYS) during a pivotal 2-week period when the region became the nation's epicenter for coronavirus disease 2019 (COVID-19)." (p351)	Descriptive	"A telephone and video assessment of IPC measures in SNFs at high risk or experiencing COVID-19 activity... A 3-component remote IPC assessment: (1) screening tool; (2) telephone IPC checklist; and (3) COVID-19 video IPC assessment (ie, "COVIDeo")." (p351) "The IPC assessment was designed to facilitate a structured 2-way discussion of IPC recommendations with SNF administrators, directors of nursing, or infection preventionists." (p352)	"First, interrater reliability was not measured. The infection prevention and control knowledge of the health department epidemiologists conducting the assessments could have biased the results of the telephone checklist and COVIDeo because skill level may have influenced how the elements were assessed. Second, although results obtained in SNFs in the greater New York metropolitan area are highly representative of this locale, they may not be generalizable to other areas. Third, the impact of the assessments was not systematically evaluated. Outcome measures for assessments were not feasible due to limited resources in the face of emergency. During this time, testing was not widely available and multiple interventions were implemented at once. Fourth, the entire tool kit took ~1 hour to complete, which limited the number of facilities 1 investigator could reach per day. Also, the facilities that agreed to the COVIDeo assessments might have differed in	"In total, 92 SNFs completed the IPC screening tool and checklist: 52 (57%) were conducted as part COVID-19 investigations, and 40 (43%) were proactive prevention-based assessments. Among the 40 proactive assessments, 14 (35%) identified suspected or confirmed COVID-19 cases. COVIDeo was performed in 26 (28%) of 92 assessments and provided observations that other tools would have missed: personal protective equipment (PPE) that was not easily accessible, redundant, or improperly donned, doffed, or stored and specific challenges implementing IPC in specialty populations. The IPC assessments took ~1 hour each and reached an estimated 4 times as many SNFs as on-site visits in a similar time frame." (p351)

							their IPC implementation practices from those that only participated in the telephone checklist." (p354)	
Penna, Austin R.; Hunter, Jennifer C.; Sanchez, Guillermo V.; Mohelsky, Romy; Barnes, Laura E. A.; Benowitz, Isaac; Crist, Matthew B.; Dozier, Tiffany R.; Elbadawi, LI; Glowicz, JB; Jones, H; Keaton, AA; Ogundimu, A; Perkins, KM; Perz, JF; Powell, KM; Cochran, RL.; Stone, ND; White, KA; Weil, LM. Evaluation of a Virtual Training to Enhance Public Health Capacity for COVID-19 Infection Prevention and Control in Nursing Homes. https://www.doi.org/10.1097/PHH.0000000000001600	Journal Of Public Health Management & Practice	2022	USA	"describe the development and implementation of the COVID-19 IPC 101 for Healthcare-Associated Infections and Antibiotic Resistance (HAI/AR) Programs (COVID IPC 101) course, its impact on learners and participating HAI/AR Programs, and the potential for application of lessons learned to other healthcare IPC capacity-building initiatives for the public health workforce." (p683)	Descriptive	CDC conducted interviews, identified new and less-experienced HAI/AR staff using small/medium cohorts. Sessions focused on application of "interim CDC COVID-19 healthcare IPC guidance for nursing homes using pretraining reading materials, case-based scenarios, didactic presentations, peer-learning opportunities, and subject matter expert(SME)-led discussion... learners... to attend all live virtual training sessions and to review self-study materials, including pretraining reading materials summarizing relevant healthcare IPC guidance for nursing homes. Learners were also encouraged to perform 2 on-site and 2 remote COVID-19 IPC assessments in nursing homes within 4 weeks of course completion.. (p683)		"Evaluation findings suggest that the CDC's virtual COVID IPC 101 course was effective in increasing knowledge and confidence among new or less-experienced HAI/AR Program staff in supporting COVID-19 healthcare IPC for nursing homes." (p687)"Given the expanding role and capacity of local health departments to participate in and lead HAI/AR activities, future healthcare IPC training initiatives could also be targeted toward the local health department workforce. A virtual approach, such as the one described in this report, could be used to achieve this goal and might also facilitate training of local health department staff in rural areas." (p690)

Powell, KR; Winkler, AE; Liu, JF; Alexander, GL A mixed-methods analysis of telehealth implementation in nursing homes amidst the COVID-19 pandemic https://www.doi.org/10.1111/jgs.18020	Journal Of The American Geriatrics Society	2022	USA	"to investigate implementation of TH in NHs amidst the COVID-19 pandemic from a human factor's perspective...using the System Engineering Initiative for Patient Safety (SEIPS) model" (p2)	"A mixed sequential design was used beginning with a quantitative phase measuring the extent to which TH use changed in NHs pre- and post-modified TH regulations (March 6, 2020) during the COVID-19 pandemic. This was followed by a qualitative phase consisting of semistructured interviews with NH leaders and clinicians who had completed surveys about TH adoption." (p3)	Quantitative: "a survey designed to measure NH health information technology (HIT) maturity, defined as the extent to which facilities possess and use diverse technological devices and software that are integrated across resident care, clinical support and administrative activities... NHs were randomly selected from each state using the Care Compare dataset...	"we used secondary data for the quantitative portion of the study, analyses were limited to TH data available in the NH HIT maturity survey….the qualitative participants were based on a convenience sample...we did not include residents in this evaluation because our focus was on the work system." (p9)	"Qualitative analysis revealed facilitators of telehealth including training, use of integrated equipment, having staff present for the visit, and using telehealth for different types of visits. Barriers included using smart phones to conduct the visit, billing, interoperability and staffing." (p1)"While some NHs ... increased the extent to which they used TH, others ...reported a decrease ... despite regulatory changes intended to simplify and expedite TH implementation, including financial incentives and relaxed regulatory oversight" (p8)"only NHs who experienced a positive change in TH score reported any training, thus we consider this to be a facilitator of use."

Prophater, LE; Fazio, S; Nguyen, LT; Hueluer, G; Peterson, LJ; Sherwin, K; Shatzer, J; Branham, M; Kavalec, A; O'Hern, K; Stoglin, K; Tate, R; Hyer, K. Alzheimer's Association Project VITAL: A Florida Statewide Initiative Using Technology to Impact Social Isolation and Well-Being https://www.doi.org/10.3389/fpubh.2021.720180	Frontiers In Public Health	2021	USA - Florida	"to assess the effectiveness of technology, specifically tablets, in reducing feelings of social isolation and increasing mood among residents during the COVID-19 pandemic." (p2)	Descriptive	"Through two phases, 600 personalized Wi-Fi-enabled iN2L tablets were distributed to 300 senior care communities (55% assisted living communities, 37% skilled nursing communities, 6% memory care communities, and 2% adult family-care homes) to connect and engage residents and their families. Different phases also included Project ECHO, a video-based learning platform, Alzheimer's Association virtual and online education and support for family caregivers, evidence-based online professional dementia care staff training and certification, and Virtual Forums designed to explore ways to build sustainable, scalable models to ensure access to support and decrease social isolation in the future. Tablet usage was collected over an 11-month period and an interim survey was designed to assess the effectiveness of the tablets, in preventing social isolation and increasing mood among residents during the COVID-19 pandemic." (p1)	First, for the care community surveys, there was a relatively low response rate...which may limit the generalizability of our findings.... Second, staff responded with their perceptions of the residents' mood, feelings of loneliness, and table usage. ... Third, as part of the project design, the surveys were anonymous... there was not a question about the type of community they work at (e.g., assisted living) or more specifics about their residents (number, demographics, etc.)... we cannot examine potential differences that may exist between... those that may arise from differences in level of care. ... Fourth, we were not able to collect data prior to the implementation of the tablets. This would have allowed us to directly compare some measures before and after the implementation (for example, those related to the mood of residents and social isolation). Lastly, the lack of demographics and evaluation for the VITAL Virtual Forums impeded the ability to	"A total of 105 care community staff (whose community used the tablets) completed the survey and overall, these staff showed a high level of agreement to statements indicating that residents struggled with loneliness and mood, and that the tablet was useful in improving loneliness and mood in residents and allowing them to stay in touch with family and friends... Overall, the tablets were shown to be an effective way to engage residents and connect them with friends and family, as well as being a useful tool for staff members." (p1)"[Re iN2L tablets] The content items that were accessed most frequently suggest that the tablets are commonly used for cognitive engagement and relaxation.... findings suggest that technology needs to be ubiquitous and accessible across care communities to benefit the well-being of residents, families, and staff." (p6)"staff responded with their perceptions of the residents' mood, feelings of loneliness, and table usage" (p6)"

							capture learnings and benefits. (p6)	
Reddy, A; Resnik, L; Freburger, J; Ciolek, DE; Gifford, DR; Whitten, MJ; Baier, RR. Rapid Changes in the Provision of Rehabilitation Care in Post-Acute and Long-Term Care Settings During the COVID-19 Pandemic. https://www.doi.org/10.1016/j.jamda.2021.08.022	Journal Of The American Medical Directors Association	2021	USA - Rhode Island	"To understand how the pandemic affected the provision of rehabilitation" (p2241)	"we administered an electronic survey to a convenience sample of clinical and administrative staff." (p2241)	"two of the authors sent a link for the electronic survey to groups convened by their organization that include professionals with rehabilitation and nursing experience who work in post-acute and long-term care settings…. This brief report presents themes derived from respondents' responses to open-ended questions" (p2241)		"respondents described how telehealth and Medicare waivers enabled new ways to connect with patients and wondered whether waivers would be extended after the public health emergency." (p2240)

Saad, A; Magwood, O; Benjamen, J; Haridas, R; Hashmi, SS; Girard, V; Sayfi, S; Unachukwu, U; Rowhani, M; Agarwal, A; Fleming, M; Filip, A; Pottie, K. Health Equity Implications of the COVID-19 Lockdown and Visitation Strategies in Long-Term Care Homes in Ontario: A Mixed Method Study https://www.doi.org/10.3390/ijerph19074275	International Journal Of Environmental Research And Public Health	2022	Canada - ON	"explore the health equity implications of emerging visitation strategies in the context of long-term care (LTC) homes in Ontario during the COVID-19 pandemic." (p3)	"exploratory sequential (quantitative → qualitative) mixed-methods" (p3)	"we collected survey and interview data from the same sample and used triangulation to increase the validity of our findings. Further, the qualitative data aimed to complement, contextualise and deepen our understanding of the trends seen in the quantitative component... inclusive multi-stakeholder approach" (p3)	"Our access to LTC homes was limited and the population we targeted was severely impacted, both mentally and cognitively, by the COVID-19 pandemic and the public health restrictions that followed….we relied on LTC homes to recruit on our behalf as they saw fit (e.g., internal and external communication with staff, family members, and residents) and thus, we were unable to reliably ascertain the number of individuals reached or to calculate a response rate....the exploratory and pragmatic nature of our study has allowed us to explore the ever-changing policies around long-term care visitations, but our sample size was limited, and we were not able to analyse between-group differences in survey ratings and qualitative perspectives.our survey and interview were administered in the two official languages of Canada (i.e., English and French), and were not translated into other languages. This may have limited our understanding of the perspectives of culturally and	"Participants commented on how certain transitional visitations strategies, such as window and virtual visits, lessened some of the inequities that residents suffered from during the initial lockdown." (p8)"Vistation stratgegies were highly valued when they allowed for emotional connection. In-person interactions, such as designated caregiver, outdoor, and window visits were prioritised and perceived to be more valuable than remote interactions, such as virtual visits, pre-recorded audio and video messages, and printed emails." (p9)

		linguistically diverse (CALD) populations and the inequities specific to their context. Fifthly, only two stakeholders with managerial decision-making capacity responded to the survey, thus preventing our findings from covering the perspectives of those with more in-depth insight into the implementation context of visitation strategies. Sixthly, while our findings regarding the impact of the COVID-19 lockdown and other visitation strategies on the physical, mental, and cognitive health of LTC residents resounded across all interviews, they need to be interpreted with caution, as we only relied on self-reported stories and experiences of individuals to describe a decline in these outcomes." (p15)

Schuster, AM.; Cotten, SR. COVID-19's Influence on Information and Communication Technologies in Long-Term Care: Results From a Web-Based Survey With Long-Term Care Administrators. https://www.doi.org/10.2196/32442	JMIR Aging	2022	USA - South Carolina	This study explored ICT access and use in LTC facilities and how LTC facilities adapted to try to enhance social connections for their residents during the COVID-19 pandemic." (p1)	Web-based survey	"LTC administrators in South Carolina (United States) were invited to complete a web-based survey exploring ICT access and use in LTC facilities and whether access and use changed as a result of the COVID-19 pandemic." (p1)"Questionnaires that had been completed up to 73% or more were included in the analysis. Given the exploratory nature of this study and the small sample size, the data were initially analyzed descriptively. A binary logistic regression model was used to investigate whether facility characteristics (ie, type, ownership, and bed size) influenced ICTs purchased during the COVID-19 pandemic. In line with the aim of this study, exploring ICT changes in LTC facilities during the pandemic, the dependent variable was the binary measure that assessed whether facilities purchased ICTs for residents' use during the COVID-19 pandemic." (p4)	"the data were collected from LTC facilities in South Carolina, which limits the generalizability of this study. Consistent with the LTC industry, our sample is predominately for profit LTC facilities. However, the majority bed size for both the ALFs and NHs in this study is not representative of the LTC facilities in South Carolina or the United States....the number of NHs that participated in the study was very small (n=12)." (p9)	"Since March 2020, a total of 53% ... of the LTC facilities have purchased ICTs for residents' use. ICTs have mainly been used for videoconferencing with family members (... 86%), friends (... 69%), and health care providers (... 72%). NHs were 10.23 times more likely to purchase ICTs for residents' use during the COVID-19 pandemic than ALFs ..." (p1) "Per the LTC administrators, residents have predominately used the newly purchased ICTs for videoconferencing with family members (... 86%), health care providers (... 72%), and friends (... 69%). Residents have also used the ICTs for entertainment such as playing games (... 28%), shopping (... 25%), and searching for information (... 22%). Though most of the LTC facilities did not have a dedicated person to assist residents with technology use, administrators reported that residents mainly learned to use the ICTs with help from LTC staff members (... 97%)." (p8)

Shaughnessy, L; Brunton, S; Chepke, C; Farmer, JG; Rosenzweig, AS; Grossberg, G. Using Telemedicine to Assess and Manage Psychosis in Neurodegenerative Diseases in Long-Term Care. https://www.doi.org/10.1016/j.jamda.2021.12.033	Journal Of The American Medical Directors Association	2022	USA	"a multi-disciplinary consensus panel was convened to collate a list of best practices for LTC facilities and specialists when conducting telemedicine with residents with dementia-related psychosis or PD-related psychosis (PDP)." (p1145)	Consensus panel	"6 panelists ... convened (in a single meeting) to discuss best practices for applying telemedicine to assess and manage psychosis in people with neurodegenerative diseases. Authors discussed recommendations until unanimous assent was reached" (p1146)	"LTC staff can provide specialists with valuable information about their patients to aid in evaluation and diagnosis. Specialists can facilitate this exchange of information by speaking to staff who work closely with the resident about any signs of hallucinations or delusions they may have observed. Educational efforts can increase staff understanding of dementia and PDP and empower them to engage with, and facilitate the resident's treatment plan" (p1145)"A Team-Based Telemedicine Approach Is Recommended… a collaborative effort on the part of the specialist, the LTC administrator, and staff….acceptance by administrators sets a positive tone regarding the use of telemedicine and, thereby, empowers staff in resident care to participate in and support telemedicine visits... Education of LTC staff about telemedicine and disease-related topics plays a key role in building and strengthening the partnership between specialist and staff." (p1145-6)"burden of administrative and technical responsibilities surrounding telemedicine consultations falls largely on the LTC facility... Ideally, the facility will have real-time support or an information technology staff available to address connectivity or other technology issues that occur. Although telemedicine is often video-based, technical difficulties or residents who do

		not do well with video interaction could necessitate a switch to audio-based interaction. Although audio-based visits can make cognitive evaluations more difficult, some telephone-based measures exist that could still inform the specialist of the patient's condition" (p1147-8)"A telemedicine platform that allows participants to contribute from multiple locations may facilitate inclusion of family members, enabling a more comprehensive assessment that may not be possible with an office visit that requires the family members to coordinate travel with the resident, specialist, and LTC staff." (p1149)

Sheperis, DS; Gomez, R; Wathen, C; Frank, M; Brown, LM. Addressing isolation, loneliness and mental health during COVID: A university training partnership with senior living communities. https://www.doi.org/10.1080/02701960.2022.2096602	Gerontology & Geriatrics Education	2022	USA - California	"This manuscript outlines a model of partnership between long-term care assisted living organizations and clinical training programs at a west coast university to meet community and educational needs of older residents." (p1)	Descriptive	"The university brought together three resources to meet the needs of the older adult community: the student group interested in gerontology; students in their practica and internship who had an interest in gerontology; and a newly formed eClinic, an online university-based counseling clinic serving the community at large." (p3)		"Keys to implementing a telemental health outreach and psychoeducation program" - "Have adequate tech support."; "Engage student clinicians in training for older adult care as well as in the delivery of telemental health"; "Involve the community resident board... in the communication process."; "Be aware of language needs and be ready to provide written materials and services in languages other than English" (p8)"Some participants indicated a desire for additional psychoeducational groups as well as the potential for group therapy and individual counseling. Staff facilitated the ability to make referrals to the university eClinic, an online counseling clinic, that provides services using Zoom and telephone, to offer confidential, free, counseling to those who were interested" (p6)
Singer, R; Rodriguez, G; Garcia, B; Nutt, A; Merengwa, E. Remote infection control assessments in long-term care facilities during COVID-19 pandemic in Texas, 2020. https://www.doi.org/10.1016/j.ajic.2022.07.007	American Journal Of Infection Control	2022	USA - Texas	"to evaluate COVID-19 infection prevention and control (IPC) knowledge and practices using a standardized assessment tool." (p1110)	Retrospective cohort study	"Data from tele-ICARs conducted between March 1 and October 30, 2020 were analyzed to assess major gaps across LTCF types. A major gap was defined as 10% or more of facilities not satisfying a specific IPC measure, excluding missing data. Gaps were also assessed by tele-ICAR type: proactive or responsive. Fisher's exact tests and univariate logistic regression were used to characterize significant associations between major IPC gaps and LTCF or tele-ICAR type." (p1110)	"There was no inter-rater reliability performed to determine consistency of how the questions were asked and answers recorded… Findings from these data are not generalizable to other facility types nor outside of Texas…Another important limitation is that there was no systematic evaluation of tele-ICAR outcomes" (p1115)	"Rather than the traditional on-site ICAR, assessments were conducted remotely. ... Similar to the estimate provided by Ostrowsky et al. in New York, Texas DSHS was able to reach approximately 4 times as many LTCFs with remote assessments compared to on-site visits in the same time frame." (p1114)

Straker, JK; Choi, MS. Facility and Family Communication during the COVID-19 Visit Restriction: Early Perspectives of Family Members. https://www.doi.org/10.1080/01634372.2021.1969714	Journal Of Gerontological Social Work	2021	USA	"a cross-sectional research design to examine the relationship between the communication of LTCFs and the perspectives of family who have residents in those facilities." (p4)	Cross-sectional	"An online survey consisting of items about the mode and frequency of communication, the presence of COVID-19 cases in the facility, family member concerns about the resident, as well as considerations for removing the resident from the facility was developed. Two items assessing overall perceptions about the facility from Ohio's nursing home and residential care family satisfaction surveys were also included." (p4)	"although we collected data on a national scale, the sample collected was small and was social media and internet based... not representative of the perceptions of family members of LTCF residents in general. ... data was collected between April and June 2020. Beginning in June, national data on COVID-19 cases among staff and residents in nursing homes became available.... [information from the facility... may not hold true once information was available from other sources." (p10)	"This study showed that respondents felt peace of mind when there were multiple communication channels to contact the resident. Also, respondents reported being less likely to recommend the facility to others when they did not know the facility situation regarding the presence of confirmed cases in the resident's facility. Additionally, respondents indicated less intention to move out of the facility when they were aware there were no confirmed cases in the resident's facility. ... Overall, respondents' positive perspectives of the facility were associated with having information on whether or not the facility had confirmed cases. We found that when respondents did not know whether confirmed cases existed in a facility, they had more negative perspectives toward the facility. ... Lack of transparency may also cause feelings of distrust among families." (p9)

Van Orden, KA; Bower, E; Beckler, T; Rowe, J; Gillespie, S. The Use of Robotic Pets with Older Adults during the COVID-19 Pandemic. https://www.doi.org/10.1080/07317115.2021.1954122	Clinical Gerontologist	2022	USA - New York	"Our primary objective is to describe these projects to inform implementation of these programs in real-world settings. A secondary objective is to raise research questions that can be tested to maximize benefit from robotic pets in real-world settings." (p2)	Descriptive"Demonstration projects are a means of promoting innovation and disseminating best practices by describing innovative programs in real-world situations" (p2)	"14 robotic pets purchased for Adoption Day" in a "Dementia care unit in VA Community Living Center" (p2)		"Staff observed benefit (reduced anxiety and/or increased socialization) in 4 out of 9 residents who adopted pets"
Walters, MS; Prestel, C; Fike, L; Shrivastwa, N; Glowicz, J; Benowitz, I; Bulens, S; Curren, E; Dupont, H; Marcenac, P; Mahon, G; Moorman, A; Ogundimu, A; Weil, LM; Kuhar, D; Cochran, R; Schaefer, M; Slifka, KJ; Kallen, A; Perz, JF. Remote Infection Control Assessments of US Nursing Homes During the COVID-19 Pandemic, April to June 2020. https://www.doi.org/10.1016/j.jamda.2022.03.015	Journal Of The American Medical Directors Association	2022	USA	"To assess whether telephone and video-based infection control assessment and response (TeleICAR) strategies could efficiently assess NH preparedness and help resolve gaps." (p909)	Mixed Methods	"[Researchers] offered to perform NH TeleICARs on behalf of health department Healthcare Associated Infections (HAI) Programs ….. At the conclusion of the TeleICAR consultation, we asked permission to contact facility representatives for a brief follow-up. ... Facilities were asked to complete a telephone evaluation to assess whether the facility made changes in IPC policies or practices and whether the TeleICAR consultation changed understanding of specific COVID-19 prevention practices." (p910)"We assessed overall numbers and proportions of NH that had not implemented each infection control element (gap) and proportion of NH that reported making 1 change in practice following the assessment." (p909)	small proportion of sample size no of nursing homes, "responses may have been biased toward reporting changes...Facility referrals among jurisdictions that requested TeleICAR assistance reflected a range of factors including local COVID-19 incidence, CMS quality rating, and history of past outbreaks or infection control gaps. Therefore, although our findings highlight common themes, they are not generalizable." (p915)	"The TeleICAR strategy proved useful for identifying critical areas where NHs could improve COVID-19 prevention and preparedness….The use of video also enabled more tailored, concrete, and observation-based recommendations. This aligned well with the overall ICAR imperative of providing real-time education and coaching to address identified gaps, which differentiates ICAR from regulatory inspection activities." (p912)

Appendix C: Data Extraction Matrix – User Perspectives

Citation	Characteristics of LTC Homes	Characteristics of Study Participants	Inclusion and Exclusion Criteria of Study Participants	How are Study Participants Involved with the Technology?
Alexander, GL; Powell, Kimberly R; Deroche, Chelsea B. An evaluation of telehealth expansion in U.S. nursing homes. https://www.doi.org/10.1093/jamia/ocaa253	"The nursing home sample (n = 664) was reflective of the population (N = 13 958) according to location but not according to bed size or ownership. This sample had a greater proportion of smaller (<60 beds) and medium-sized (60-120 beds) nursing homes but had fewer large nursing homes (>120 beds) compared with the national sample. The sample also had a larger proportion of nonprofit facilities." (p343)	LTC administrators who completed the survey		
Baughman, AW; Renton, M; Wehbi, NK; Sheehan, EJ; Gregorio, TM; Yurkofsky, M; Levine, S; Jackson, V; Pu, CT; Lipsitz, LA. Building community and resilience in Massachusetts nursing homes during the COVID-19 pandemic. https://www.doi.org/10.1111/jgs.17389	295 nursing homes in 9 cohorts of 30-33 nursing homes in Massachussetts	"Nursing home participants included medical directors, directors of nursing and infection preventionists, frontline clinical staff including nurses, and certified nurse assistants." (p2717)		Participants attended sessions on zoom.
Beaudreau, SA; Otero, MC; Walker, JA; Gould, CE; Sisco, S; White, P; Pella, K; Wiley, E; Voorhees, K; Wetherell, JL. Problem Solving Training for Veterans with Complex Comorbidities: Treatment Delivery Adaptations during COVID-19. https://www.doi.org/10.1080/07317115.2021.1963382	Community Living Centers (LTC) for veterans	PST consultants - psychologistsClinicians - licensed clinical psychologists; a smaller subset of clinicians were licensed clinical social workers.Residents receiving care from clinicians - Veterans in Community Living Centers (LTC)		They took part in the workshops, whether as instructors or participants
Bogin, MH; Chandra, A; Manggaard, J; Thorsteinsdottir, B; Hanson, GJ; Takahashi, PY. Telehealth Use and Hospital Readmission Rates in Long-term Care Facilities in Southeastern Minnesota During the COVID-19 Pandemic. https://www.doi.org/10.1016/j.mayocpiqo.2022.03.001	"14 nursing homes in southeastern Minnesota... The population in southeastern Minnesota generally represents the population of the upper Midwest." (p187)	"The study population included patients who were dismissed from the hospital and admitted for PALTC. All patients in nursing homes from March 2020 until July 2020 were potentially included in the study. We conducted our study in 14 nursing homes" (p187)	"The exclusion criteria included the lack of an index hospitalization or an index video visit. Residents were also excluded if they refused medical record review" (p187)	Physicians and advanced practice providers conducted video visits with residents, and "nursing facilities provided telemedicine presenters (often nurses) to facilitate the visit with the resident." (p187)

Chu, CH; Yee, A; Stamatopoulos, V. Poor and Lost Connections: Essential Family Caregivers' Experiences Using Technology with Family Living in Long-Term Care Homes during COVID-19. https://www.doi.org/10.1177/07334648221081850	"publicly owned (municipal)" (50%, n = 15) compared to "private, not for profit" (10%, n =3)and"private, for profit" (26.7%, n = 8) LTCHs" (p1549)	"All but one [essential family caregiver] was female (96%, n = 29). Caregivers were predominantly (76%, n = 23) the daughters of the LTCH residents. Most of the caregivers were between the ages of 55–64 (50%, n =15)and employed (63%, n = 19)." (p1549)	"1) they were family members of loved one(s) living in an LTCH and were restricted access to their loved one(s) in LTCH due to policies related to COVID-19; 2) able to speak and understand English; 3) able to provide informed consent; 4) lived in Canada; and 5) have internet access." (p1548)	Participated in virtual visits with residents

Connelly, D; Hay, M; Garnett, A; Hung, L; Yous, M; Furlan-Craievich, C; Snelgrove, S; Babcock, M; Ripley, J; Snobelen, N; Gao, H; Zhuang, R; Hamilton, P; Sturdy-Smith, C; O'Connell, M. Video conferencing with residents and families for care planning during COVID-19: experiences in Canadian long-term care. https://www.doi.org/10.1093/geront/gnac154	"two LTC home facilities in Ontario...Both are midsized homes in operation for more than 30 years. One home operates as a for-profit venture and has 136 beds located in basic, semiprivate, and private rooms. In addition to basic services (e.g., family physician, nursing and personal care, housekeeping, meals, laundry, and leisure activity programming), services within the community for scheduling are available (costs covered by provincial health care plan or no fee for service) such as physiotherapist, social worker, x-ray, and ultrasound services. The staffing mix consists of a registered nurse (i.e., degree-certified nurse) and a RPN on duty 24 hours a day, 7 days a week. A ratio of one personal support worker for 10 residents. The second home operates as nonprofit, has 146 beds, and offers varying levels of care. Private rooms and two-ward rooms are available. Additional services available are provided by the following: physiotherapist, registered dietitian, registered dental hygienist, nurse practitioner, Behavioral Supports Ontario trained staff, social worker, and foot care nurse. Behavioral supports Ontario aims to support persons living with behaviors associated with complex mental health, dementia, or other neurological conditions in LTC homes or independent living settings. With regards to staffing levels, at every shift, there is at least one registered nurse and RPN and 1–4 personal support workers on every floor for about 26–32 residents. (p3-4)	"Participants (N = 12) were members of the research team, who all offered reflections on their experiences throughout the implementation science process. Individuals represented the academic, LTC, and community organiztion settings, as well as older adult residents and families/care partners." (p5)	"To select participants, we stratified individuals into categories of role on the research team. All members of the research team who were considered to be key stakeholders (i.e., LTC administrators, RPN champions, older adult residents, family/care partners, and community partners) were invited to participate in allowing for a variety of perspectives." (p4)	Participants met weekly for 9 months to discuss and brainstorm the adaptation and implementation of the PIECES into LTC. "This research prioritized the integration of key stakeholders as expert partners on the research team representing the voices of those affected by the research and ensuring compatibility between the proposed processes and practices within LTC settings" (p6)
Cruz, AM; Portillo, HPL; Daum, C; Rutledge, E; King, S; Liu, LL. Technology Acceptance and Usability of a Mobile App to Support the Workflow of Health Care Aides Who Provide Services to Older Adults: Pilot Mixed Methods Study https://www.doi.org/10.2196/37521	LTC home in Alberta that provides culturally specific programs and services to Chinese older adults	60 health care aides	Inclusion criteria - "to be familiar with using digital technologies such as smartphones or tablets." (p3)	Participants used the app and filled in survey for user feedback. "Toward the end of the study, 2 focus groups were conducted with a subsample of health care aides (qual, qualitative description design)." (p3)

Davitt, JK; Brown, J. Using Voice and Touchscreen Controlled Smart Speakers to Protect Vulnerable Clients in Long-Term Care Facilities https://www.doi.org/10.1093/geroni/igac024	LTC facilities in Maryland	Caseworkers and the institutionized guardianship clients, (all lived in LTC facilities) that they servicedCaseworkers were all females with MSW degrees		Caseworkers monitored their guardianship clients in LTC using the devices
Ford II, JH; Jolles, SA; Heller, D; Langenstroer, M; Crnich, C. There and back again: the shape of telemedicine in U.S. nursing homes following COVID-19. https://www.doi.org/10.1186/s12877-022-03046-y	"A convenience sample of nine NHs [in South Central Wisconsin] that had newly adopted or significantly expanded telemedicine during the COVID-19 pandemic were purposively selected" (p2)	"Participating NH staff were either the Director of Nursing, Associate Director of Nursing, Nursing Home Administrator, Unit Coordinator, Volunteer Services Coordinator, and/or Regional RN" (p2)	"Members of participating NH nursing administrative staff, long-term care advanced practice providers (APPs) that provided NH care in the region and sub-specialty care providers in the same region were purposively recruited. " (p2)	"Data collection from members of the NH administrative staff was conducted using semi-structured interviews." (p2)
Fosdick, BK; Bayham, J; Dilliott, J; Ebel, GD; Ehrhart, N. Model-based evaluation of policy impacts and the continued COVID-19 risk at long term care facilities https://www.doi.org/10.1016/j.idm.2022.07.003				
Freedman, VA; Hu, M; Kasper, JD. Changes in older adults' social contact during the COVID-19 pandemic. https://www.doi.org/10.1093/geronb/gbab166		Participants in the National Health and Aging Trends Study COVID-19 mail supplement,	Inclusion: Seniors >70 years	Participated in national survey

Freidus, A; Shenk, D; Wolf, C. Integrating Praxis Through the Research Process: Caregivers for Older Americans During the COVID-19 Pandemic. https://www.doi.org/10.1111/napa.12166	LTC in central North Carolina	"participants from all types of congregate LTC communities... Phase 1 focused on administrative and nongovernmental advocacy groups that work with LTC communities, including residents, families, and the direct care providers within these homes, as well as providers of in-home and community-based aging programs. Phase 2 included a sample of administrators of LTC communities as well as the workers providing hands-on care in 15 congregate care communities. We included workers in Continuing Care Retirement Communities, nursing homes, assisted living communities, adult care homes, and memory care for people with dementia. Participants included dining staff, housekeepers, chaplains, marketing staff, certified nursing assistants, medical technicians (Med Techs), activities staff, nurses, nurse practitioners, and administrators. Phase 3 focused on community- and home-based care workers who provide services and assistance to older adults living in the community, including managers and 2 Residents, clients, and family members were not interviewed for this project. staff providing information and referral, staffing adult day cares, providing home care and home health care, distributing home-delivered meals, running senior centers, and providing transportation and some medical care." (p165)	Participants shared observations of technology use in LTC

Getson, C; Nejat, G. The adoption of socially assistive robots for long-term care: During COVID-19 and in a post-pandemic society. https://www.doi.org/10.1177/0840470 4221106406	1 LTC home in Toronto, ON	"Eighty-four participants were recruited from approximately 200 staff members working at the home." (p302)		"We obtained 56 pre-study and 34 post-study completed questionnaires from them.... Staff members participated in the robot screening at the start of two different shifts, at 6:30 a.m. and at 2:30 p.m. As staff entered the front door, they would be screened by Pepper" (p302)
Hardy, MS; Fanaki, C; Savoie, C; Dallaire, C; Wilchesky, M; Gallani, MC; Gagnon, MP; Laberge, M; Voyer, P; Cotec, A; Couture, V; Dallaire, B. Acceptability of videoconferencing to preserve the contact between cognitively impaired long-term care residents and their family caregivers: A mixed-methods study https://www.doi.org/10.1016/j.gerinur se.2022.09.006	4 LTC homes in Quebec	Dyad of family caregivers and LTC residents with a nuerocogntive disorder	"...family caregivers must meet the following criteria: (1) Be 18 years of age or older; (2) have a relative with cognitive problems; (3) have a close relative who does not have mental health problems or intellectual disabilities; 4) have a relative who has lived in a long-term care home for at least 1 month. Residents had to satisfy the following criteria: (1) Being cognitively impaired (regardless their stage of cognitive impairment); (2) not being diagnosed with mental health issues or intellectual disabilities; (3) being a resident of the long-term care homes for at least 1 month (4) being able to speak in the region'sofficial language (French)." (p66)	LTC residents and family caregivers - attended Residents required assistance in many activities of daily living, therefore their care staff (occupational therapist, specialized educator, recreational educator, etc.) were usually involved in organizing and establishing communication with family caregivers.
Hung, L; Mann, J; Upreti, M. Using the Consolidated Framework for Implementation Research (CFIR) to foster the adoption of a new dementia education game during the COVID-19 pandemic. https://www.doi.org/10.1093/geront/g nac138	10 LTC homes in BC	"The target audience for the intervention included interdisciplinary health care workers (e.g., nurses, care aides, physicians, and rehabilitation staff)." (p4)		70 participants codesigned the game. 1059 participants from LTC trailed the intervention.

Hung, LL; Mann, J; Perry, J; Berndt, A; Wong, J. Technological risks and ethical implications of using robots in long-term care https://www.doi.org/10.1177/2055668 3221106917	2 LTC homes in BC	"A total of 30 people participated: five LTC residents, two family members, 10 interdisciplinary staff (three nurses, two rehabilitative staff, two recreation staff and three care workers), seven operational leaders, and six ethics experts within dementia care." (p3)	"a balance of participants with various demographic backgrounds (ethnic origin, age range, genders, job and experience representations....a snowballing approach was taken to recruit more respondents through recommendations and referrals by the informants." (p2-3)	"Staff participants were asked: (1) What is your opinion on using robots (e.g. social robot PARO, and telepresence robot) in LTC homes. (2) What are the technological risks and ethical issues associated with the adoption of assistive technologies in LTC homes? (3) What is needed to manage the risks for safe and ethical use? We added an additional question about cost for the operational leaders." (p3)
Kuepfer, J. Supporting Spirits in Changing Circumstances: Pandemic Lessons for Long-Term Care and Retirement Homes https://www.doi.org/10.3390/rel13070 584	LTC homes in southern ON; "There was considerable demographic variety among the homes served, including both rural (n = 4) and urban (n = 23), for-profit (n = 14), not-for-profit (n = 9) and municipal (n = 4) homes" (p2-3)	"25 spiritual care providers (10 women, 15 men)" (p2)		"Fourteen individual chaplains participated in at least one of these meetings. Five chaplains provided an email response to questions about the impact of the pandemic on spiritual care. Interviews, using Zoom or telephone, allowed nine spiritual care providers to talk in detail about their experience." (p2)
Lingum, NR; Sokoloff, LG; Meyer, RM; Gingrich, S; Sodums, DJ; Santiago, AT; Feldman, S; Guy, S; Moser, A; Shaikh, S; Grief, CJ; Conn, DK. Building Long-Term Care Staff Capacity During COVID-19 Through Just-in-Time Learning: Evaluation of a Modified ECHO Model. https://www.doi.org/10.1016/j.jamda. 2020.10.039	"participants were from more than 140 LTC homes primarily across Ontario, with 41.9% practicing in rural or remote environments." (p240)	"All participants were interprofessional HCPs working in LTC or redeployed to work in LTC and had the basic technology requirements to join the live weekly sessions." (p239)		Participants attended virtual training sessions and " completed surveys at pre-ECHO (prior to attending their first session), following each weekly session, and at post-ECHO (at the completion of the 12-week program)" (p239)
Miller, SL; Mukherjee, D; Wilson, J; Clements, N; Steiner, C. Implementing a negative pressure isolation space within a skilled nursing facility to control SARS-CoV-2 transmission. https://www.doi.org/10.1016/j.ajic.20 20.09.014	1 skilled nursing facility			

Ostrowsky, BE; Weil, LM; Olaisen, RH; Stricof, RL; Adams, EH; Tsivitis, MI; Eramo, A; Giardina, R; Erazo, R; Southwick, KL; Greenko, JA; Lutterloh, EC; Blog, DS; Green, C; Carrasco, K; Fernandez, R; Vallabhaneni, S; Quinn, M; Kogut, SJ; Bennett, J; Chico, DM; Luzinas, M; New York COVID-19 Response Team. Real-time virtual infection prevention and control assessments in skilled nursing homes, New York, March 2020-A pilot project https://www.doi.org/10.1017/ice.2021.100	"SNFs in 14 New York counties, including New York City." (p351)	"10 public health epidemiologists with infection prevention expertise" (p352)"administrators, directors of nursing, or infection preventionists" (p352) from LTC		"public health epidemiologists with infection prevention expertise were involved in the development and/or use of the IPC assessment tools."Participants from LTC conducted the virtual IPC screenings procedures within the LTC homes
Penna, Austin R.; Hunter, Jennifer C.; Sanchez, Guillermo V.; Mohelsky, Romy; Barnes, Laura E. A.; Benowitz, Isaac; Crist, Matthew B.; Dozier, Tiffany R.; Elbadawi, LI; Glowicz, JB; Jones, H; Keaton, AA; Ogundimu, A; Perkins, KM; Perz, JF; Powell, KM; Cochran, RL.; Stone, ND; White, KA; Weil, LM. Evaluation of a Virtual Training to Enhance Public Health Capacity for COVID-19 Infection Prevention and Control in Nursing Homes. https://www.doi.org/10.1097/PHH.0000000000001600		new and less experienced HAI/AR Program staff (p683)		participants attended the training
Powell, KR; Winkler, AE; Liu, JF; Alexander, GL A mixed-methods analysis of telehealth implementation in nursing homes amidst the COVID-19 pandemic https://www.doi.org/10.1111/jgs.18020	Nursing homes	Qualitative: Administrators and clinicians (physicians and/or nurses.	Quantitative: "all NHs in the data set located within the United States." (p3)Qualitative: "a maximum variation approach to select participants who had a net positive and net negative change from Y1 to Y2 in their TH score. Our rationale for this approach was to elicit factors contributing to successful implementation (facilitators) as well as factors contributing to unsuccessful implementation (barriers)." (p4)	"asked for the person responsible for TH implementation at the NH. We invited that person to participate in an interview and then used a snowball approach to identify other “end users” of TH. Administrators identified these end users as clinicians (physicians and/or nurses) therefore we extended an invitation to those individuals to participate in the study." (p4)

Prophater, LE; Fazio, S; Nguyen, LT; Hueluer, G; Peterson, LJ; Sherwin, K; Shatzer, J; Branham, M; Kavalec, A; O'Hern, K; Stoglin, K; Tate, R; Hyer, K. Alzheimer's Association Project VITAL: A Florida Statewide Initiative Using Technology to Impact Social Isolation and Well-Being https://www.doi.org/10.3389/fpubh.2021.720180	"a total of 300 care communities comprised of assisted living communities (55%), skilled nursing communities (37%), memory care communities (6%), and adult family-care homes (2%) [in Florida]. Of these communities, 14% had 1–9 beds, 15% had 10–49 beds, 31% had 50–99 beds, 29% had 100–149 beds, and 11% had more than 150 beds." (p2)	iN2L tablets - ResidentsProject ECHO / Alzheimer's Association Professional Training and Certification - Professional care workersVITAL Virtual Forum - LTC stakeholders consisting "Caregivers, industry administrators, professional care providers, state aging units, and the general public" (p3)	iN2L Tablets - Residents used the tablets, but "staff responded with their perceptions of the residents' mood, feelings of loneliness, and table usage" (p6)Project ECHO/Alzheimer's Association Professional Training and Certification - staff completed evalution surveysVITAL Virtual Forums - "Attendees came together through Zoom to engage in virtual discussions and presentations" (p3)
Reddy, A; Resnik, L; Freburger, J; Ciolek, DE; Gifford, DR; Whitten, MJ; Baier, RR. Rapid Changes in the Provision of Rehabilitation Care in Post-Acute and Long-Term Care Settings During the COVID-19 Pandemic. https://www.doi.org/10.1016/j.jamda.2021.08.022	"Respondents most frequently reported working with residents in assisted living communities (n¼13, 43.3%) or nursing homes (skilled nursing: n¼29, 93.3%; long-term care: n¼25, 83.3%)." (p2241)	"respondents were rehabilitation clinicians (eg, physical therapists, occupational therapists, or speech language pathologists) (n¼11, 36.7%) or administrators (n¼13, 43.3%); the remainder (n¼6, 20.0%) were in nursing (n¼3) or in another role (n¼3)." (p2241)	Respondents answered survey questions

Saad, A; Magwood, O; Benjamen, J; Haridas, R; Hashmi, SS; Girard, V; Sayfi, S; Unachukwu, U; Rowhani, M; Agarwal, A; Fleming, M; Filip, A; Pottie, K. Health Equity Implications of the COVID-19 Lockdown and Visitation Strategies in Long-Term Care Homes in Ontario: A Mixed Method Study https://www.doi.org/10.3390/ijerph19074275	"… a list of LTC homes serving the population of Ontario [39], and initiated contact with a random sample of n = 235 homes (p3)	"Stakeholders included LTC residents, their family members and designated caregivers, as well as clinical and managerial healthcare workers. " (p3)	"The term “family members” in the context of our study was inclusive of LTC residents’ “family of choice” and not only biologically/legally related family members. Furthermore, the term “healthcare workers” was inclusive of frontline LTC staff directly providing care to residents (e.g., registered nurses, physicians, personal support workers), and those in managerial and decision-making positions (e.g., executives, directors of care, policymakers)....In order to participate in the survey, a participant had to be (a) a resident of the province of Ontario; (b) over the age of majority in the province (i.e., 18 years old); (c) able to communicate in either of the official languages of Canada (i.e., English or French); and (d) fall under the definition of a key stakeholder...." (p3)	200 participants completed surveys, 15 particpants-stakeholders directly engaged in visits (i.e., residents and their family members/designated caregivers) participated in interviews
Schuster, AM.; Cotten, SR. COVID-19's Influence on Information and Communication Technologies in Long-Term Care: Results From a Web-Based Survey With Long-Term Care Administrators. https://www.doi.org/10.2196/32442	"The LTC facilities (N=70) were located throughout South Carolina" (p5)	LTC administrators in South Carolina		
Shaughnessy, L; Brunton, S; Chepke, C; Farmer, JG; Rosenzweig, AS; Grossberg, G. Using Telemedicine to Assess and Manage Psychosis in Neurodegenerative Diseases in Long-Term Care. https://www.doi.org/10.1016/j.jamda.2021.12.033		"6 panelists representing the multidisciplinary fields of geriatrics, geriatric psychiatry, movement disorders, and neuropsychology, and including extensive experience with telepsychiatry in the LTC setting" (p1146)		Participants discussed"best practices for applying telemedicine to assess and manage psychosis in people with neurodegenerative diseases" in a consensus panel (p1146)

Sheperis, DS; Gomez, R; Wathen, C; Frank, M; Brown, LM. Addressing isolation, loneliness and mental health during COVID: A university training partnership with senior living communities. https://www.doi.org/10.1080/02701960.2022.2096602	"The first two agencies were assisted living facilities where the older adults were largely majority culture, affluent, and English speaking.... The third agency was comprised of older adults who also lived in independent apartments but were from largely minoritized backgrounds with many adults not speaking English as a primary or even comfortable language and from lower socio-economic status." (4)	Students- "The student organization consisting of doctoral and master's level students" (p3)Residents - "While residents from the first two communities had access to technology via computers and/or smart phones, most of the residents of the third community had no such access." (p4)		
Singer, R; Rodriguez, G; Garcia, B; Nutt, A; Merengwa, E. Remote infection control assessments in long-term care facilities during COVID-19 pandemic in Texas, 2020. https://www.doi.org/10.1016/j.ajic.2022.07.007	"428 unique LTCFs in Texas"			
Straker, JK; Choi, MS. Facility and Family Communication during the COVID-19 Visit Restriction: Early Perspectives of Family Members. https://www.doi.org/10.1080/01634372.2021.1969714	LTC homes from 21 US states	198 respondents who are family to LTC residents		Participants answered surveys re communication between facility and family during COVID-19 vistatation restrictions
Van Orden, KA; Bower, E; Beckler, T; Rowe, J; Gillespie, S. The Use of Robotic Pets with Older Adults during the COVID-19 Pandemic. https://www.doi.org/10.1080/07317115.2021.1954122	Veterans Administration dementia care residence	Older veterans - "The ages of those who were more actively engaged with the pets ranged from 71–102 years, with a length of residence in the CLC ranging from a few weeks to 13 years." (p3)"Eight CLC team members provided observations about the robotic pet program including the neighborhood's secretary, recreation therapist, 4 nurses, social worker, and physician." (p3)		"The level of engagement ranged from "keeping him company" to believing the robotic pet was real and providing care (e.g., feeding the pet)." (p3)"Staff were specifically asked to offer their observations on resident interaction with the pets, including how many actively adopted a pet, how many appeared to enjoy the pet, and any surprises or key tips for successful use of the pets to improve resident well-being." (p3)

Walters, MS; Prestel, C; Fike, L; Shrivastwa, N; Glowicz, J; Benowitz, I; Bulens, S; Curren, E; Dupont, H; Marcenac, P; Mahon, G; Moorman, A; Ogundimu, A; Weil, LM; Kuhar, D; Cochran, R; Schaefer, M; Slifka, KJ; Kallen, A; Perz, JF. Remote Infection Control Assessments of US Nursing Homes During the COVID-19 Pandemic, April to June 2020. https://www.doi.org/10.1016/j.jamda.2022.03.015	"629 NHs from 19 states: Alabama (69), Arizona (9), California (9), Colorado (30), Connecticut (45), Georgia (20), Illinois (15), Kansas (76), Kentucky (31), Maryland (43), Minnesota (40), North Carolina (22), North Dakota (42), Nebraska (37), South Carolina (40), Tennessee (15), Virginia (36), West Virginia (23), and Wyoming (27)." (p911)	" facility administrator, director of nursing, infection preventionist, or other administrative staff; multiple facility staff were able to participate if desired." (p910)	"TeleICARs were facilitated by trained staff" (p910) "At the conclusion of the TeleICAR consultation, [researchers] … contact(ed) facility representatives for a brief follow-up"

Appendix D: Data Extraction Matrix – Technology

Citation	Type	Description	Purpose	Who were consulted re its use?	Advantages	Disadvantages	Ethical Concerns	Misc Notes
Alexander, GL; Powell, Kimberly R; Deroche, Chelsea B. An evaluation of telehealth expansion in U.S. nursing homes. https://www.doi.org/10.1093/jamia/ocaa253	Telehealth		"1. Telehealth for evaluation of residents and pretransfer arrangements ... 2. Telehealth for transmission of diagnostic images and/or consultations and second opinions... 3. Electronic reporting of laboratory test results to nursing home ... 4. Electronic transmission and reception of laboratory results for interpretation (eg, pathology) ... 5. Telehealth for results capturing and interpretation by radiologists ... 6. Remote order entry for medications from locations outside of the nursing home (eg, MD access from home, office or clinic)" (taken from telehealth survey questions, p343)		"Telehealth technology is thought to be a critical access point to health care for vulnerable populations, chronically ill nursing home residents, and people living in rural settings…..One solution is to encourage the proliferation of telehealth with continued relaxed regulations that can reduce isolation and preserve limited resources (eg, personal protective equipment) while maintaining proper distancing parameters and allowing for timely care delivery and social connectedness everywhere." (p345-6)			

Baughman, AW; Renton, M; Wehbi, NK; Sheehan, EJ; Gregorio, TM; Yurkofsky, M; Levine, S; Jackson, V; Pu, CT; Lipsitz, LA. Building community and resilience in Massachusetts nursing homes during the COVID-19 pandemic. https://www.doi.org/10.1111/jgs.17389	ICT - Audio/Video Telephony	Zoom virtual conferencing platform	Platform for virtual education	"The program adapted Project ECHO®'s video conferencing model, which promotes collaborative learning, All-teach All-learn concept, and is especially effective in contexts where access to subspecialty expertise may be limited." (p2717)"The Network provided a forum to build relationships that fostered collaboration and a feeling of esprit de corps." (p2718)"In addition to providing education and ideas, the weekly Network meetings offered a source of emotional and moral support." (p2719)"Although this work describes the experiences with a 16-week training program in Massachusetts, the Network was also rapidly scaled across the nation, with 9017 nursing homes participating.12 Additional training sessions beyond the 16-week program continue to support safety improvements and maintain engagement with peers." (p2718)

Beaudreau, SA; Otero, MC; Walker, JA; Gould, CE; Sisco, S; White, P; Pella, K; Wiley, E; Voorhees, K; Wetherell, JL. Problem Solving Training for Veterans with Complex Comorbidities: Treatment Delivery Adaptations during COVID-19. https://www.doi.org/10.1080/07317115.2021.1963382	Telephone, ICT - Audio/Video Telephony	"Training Workshops via "completely virtual (phone or video) modality" (p2)"	"virtual training for clinicians through didactics, clinical demonstrations, and small group experiential role-plays. To simulate the experience of delivering PST-HBPC by phone, some of the 2020 clinical demonstrations and the small group role-plays were conducted with video disabled so it was presented via audio only."	PST consultants - psychologistsClinicians - licensed clinical psychologists; a smaller subset of clinicians were licensed clinical social workers.Residents receiving care from clinicians - Veterans in Community Livin Centers (LTC)	"Flexibilities afforded to clinicians in the training during the pandemic addressed key obstacles and barriers to recruitment and implementation of the treatment. Importantly, adaptations such as allowing for telephone delivery of the protocol or added flexibility to training requirements for clinicians did not diminish the effectiveness of the intervention. On average, patients enrolled in PST-HBPC during the pandemic experienced significant reductions from baseline to post-treatment in depression and anxiety symptom severity, negative attitudes about problem-solving, and on single-item ratings of suicidal ideation and functional limitations due to depression. Patients experienced similar benefits in the pre-pandemic and pandemic years, based on no significant training cohort differences in the amount of reduction on any treatment outcome." (p10-1)	"... clinician demonstration of skills was hindered by personal protective equipment covering their face during in-person sessions or by lack of visuals in a telephone format. Far more common were logistical considerations unrelated to the treatment protocol, such as ensuring that environmental distractions were minimized, that privacy was maintained during telephone and video sessions, and that Veterans had a way to navigate session setup and manipulation of materials... clinicians reported that COVID-19 restrictions in the CLC or community became a new obstacle to consider for some Veterans when guiding the planful problem-solving steps for addressing goals to increase socialization and reduce loneliness." (p12)

Bogin, MH; Chandra, A; Manggaard, J; Thorsteinsdottir, B; Hanson, GJ; Takahashi, PY. Telehealth Use and Hospital Readmission Rates in Long-term Care Facilities in Southeastern Minnesota During the COVID-19 Pandemic. https://www.doi.org/10.1016/j.mayocpiqo.2022.03.001	Telemedicine; Audio/Video Telephony	iPads with InTouch software "the standard platform for the clinical practice. This platform used only video visits, without peripheral devices" (p187)	Video visits between residents and medical professionals. "Before the mandatory shelter-inplace orders, residents were routinely seen within 5 days by a physician and earlier if needed by the advanced practice providers." (p187)	"Commonly identified challenges in video-based telemedicine include issues with connectivity, privacy, use of equipment, payment, and performing the visit itself." (p190)	"The guarantee of patient privacy and security of information when using video telehealth modalities is an issue of high priority, and we used an iPad with InTouch program that ensured privacy standards and provided an encrypted network for video telehealth visits. ... there are currently no unified, federally mandated guidelines for telehealth use in SNFs, with a considerable state-wide variation." (p190)

Chu, CH; Yee, A; Stamatopoulos, V. Poor and Lost Connections: Essential Family Caregivers' Experiences Using Technology with Family Living in Long-Term Care Homes during COVID-19. https://www.doi.org/10.1177/07334824221081850	ICT - Audio/Video Telephony	Video-conferencing	Virtual visits	Essential caregivers	"video calls were not a substitute for in-person visitations… they were often the only option for EFCs to connect with their loved ones during the first year of the pandemic." (p1552)	Lack of devices and inadequate technology infrastructure; impact on staff privacy; barriers in scheduling visitations; "the value of video conferencing was greatly diminished because staff inappropriately set up the technology—for example, the tablet was not properly positioned and/or the distance of the device from the resident'sface was too far." (p1551); "the environmental factors and physical/sensory impairments of residents" (p1552); technology was not appropriate or suitable to meet residents' needs (i.e., physical and/or cognitive impairments)" (p1552)

Connelly, D; Hay, M; Garnett, A; Hung, L; Yous, M; Furlan-Craievich, C; Snelgrove, S; Babcock, M; Ripley, J; Snobelen, N; Gao, H; Zhuang, R; Hamilton, P; Sturdy-Smith, C; O'Connell, M. Video conferencing with residents and families for care planning during COVID-19: experiences in Canadian long-term care. https://www.doi.org/10.1093/geront/gnac154	ICT - Audio/Video Telephony	PHIPA-approved Zoom virtual conferencing platform	"Weekly research team meetings were held virtually with representation from the academic, LTC, and professional organizations to track progress and develop strategies to simplify execution." (p6)Implementation of virtual care conferences and virtual care planning	Participiants included 1 Academic researcher and educator, 2 Long-term care administrators, 2 Registered Practical Nurse champions, 2 Older adult residents, 2 Family care partners, 3 Community partners. (p5)	Allowed engagement of multiple stakeholders - "Each team member was engaged in the research design, planning, and implementation. Fostering empowering partnerships was emphasized by one academic member" (p6)	"Competing priorities challenged by the context of the COVID-19 pandemic influenced participants' experiences of facilitating the implementation process within the LTC settings." (p8)

Cruz, AM; Portillo, HPL; Daum, C; Rutledge, E; King, S; Liu, LL. Technology Acceptance and Usability of a Mobile App to Support the Workflow of Health Care Aides Who Provide Services to Older Adults: Pilot Mixed Methods Study https://www.doi.org/10.2196/37521	Mobile app that supports workflow of care aides	"the Mobile Smart Care System (mSCS)… is a tablet-compatible web-based app that allows access to an electronic medical record system…. The mSCS was installed on tablets using the Android operating system." (p3)	"The mobile user interface of the mSCS enables health care aides to access their clients' care plans and observations (eg, bathing, feeding, grooming, dressing, bowel control, bladder control, toilet use, transfer in and out of bed, and mobility) previously uploaded to the electronic medical record by their supervisors (ie, nurse managers). The health care aides recorded their observations and reported their completed activities. The mSCS also enabled supervisors (nurse managers) to monitor health care aides' care plan activities and observations with an integrated module on the client's history (previous appointments)." (p3)	Care aides	"according to health care aides' responses, they believed the mSCS was useful (high performance expectancy), easy to use (low effort expectancy), fit with their needs (high facilitating conditions), and the influence of others on their use was high. Importantly, health care aides would be willing to use the mSCS in the future" (p7)	App had "interface issues", "the little dots to input the selection [are a very small interface]… sometimes when you're clicking it clicks [and you go] onto the different [places]... [and it causes] a wrong selection… the font size needed to be enlarged...The health care aides mentioned that visual indicators or aids, such as color, could help to quickly and easily confirm that information was entered correctly. The lack of these interface elements led to incorrect documentation and sometimes made the mSCS confusing to use." (p11)

Davitt, JK; Brown, J. Using Voice and Touchscreen Controlled Smart Speakers to Protect Vulnerable Clients in Long-Term Care Facilities https://www.doi.org/10.1093/geroni/igac024	Voice and touchscreen controlled smart speakers	Amazon Echoshow 8 voice and touchscreen controlled smart speakers (VTCSS). These devices have HD smart display with Alexa (voice commands) and 13 MP camera and require only Wi-Fi connection and power (p2)	"enable caseworker access to their guardianship clients and enhance the quality of care monitoring" (p2)"First, to enable caseworkers to visually connect with clients during the pandemic lockdown to better monitor client well-being. Second, to help clients connect to family/friends, and to the outside world, via the internet to reduce social isolation and maintain engagement." (p2)	Caseworkers with LTC residents clients	"These devices have HD smart display with Alexa (voice commands) and 13 MP camera and require only Wi-Fi connection and power, making them relatively easy and inexpensive to use. Clients with visual impairments can use the device through voice commands, while those with hearing impairments can use the captioning and touchscreen control. The larger screen, lower purchase cost, and lack of monthly access fees make these better alternatives than smartphones." (p2)	"...biggest challenges ... was the need for facility staff help since the caseworkers were not allowed in the facility. Many facilities did not have staff that understood technology…caseworkers had to depend on staff to demonstrate device operation to the clients; when facility staff was overwhelmed, there were delays in setting-up devices...Caseworkers sometimes needed staff to troubleshoot problems once the device was installed, such as dropped Wi-Fi connection or showing the client how to answer the device." (p4)Other challenges : caseworker [in]ability to operate the device, creating a separate amazon account, and navigating device features.... Eg trouble with a facility changing the settings to Do Not Disturb... having more than one client with a device and how the system would handle alerts or announcements... since amazon tracks usage, the caseworkers worried about having two devices with two very different clients. ... all caseworkers wondered if they could use the call feature of the device to connect clients with other social services, such as the client's nurse or attorney. The devices, however, can only provide audio connections when being used to call someone	"that facility staff raised concerns about resident privacy...All caseworkers discussed if unannounced virtual visits could be an invasion of the client's privacy." (p5)

		without an Echo/amazon device. Also, when the client calls someone using the Echo, the caseworker's number appears. " (p5)

Ford II, JH; Jolles, SA; Heller, D; Langenstroer, M; Crnich, C. There and back again: the shape of telemedicine in U.S. nursing homes following COVID-19. https://www.doi.org/10.1186/s12877-022-03046-y	Telemedicine	Enables health care professionals to see and provide care to residents virtually	"Participating NH staff were either the Director of Nursing, Associate Director of Nursing, Nursing Home Administrator, Unit Coordinator, Volunteer Services Coordinator, and/or Regional RN" (p2)	"Telemedicine can enhance the efficiency and effectiveness of acute resident change-in-condition assessments...Using telemedicine to conduct a routine encounter is preferable to off-site face-to-face encounters...Having [primary care providers] on-site provides benefits that extend beyond the individual clinical encounter...Telemedicine can enhance resident access to sub-specialty care...Telemedicine can enhance information exchange and collaboration between the sub-specialist providers and other care team members...Telemedicine can reduce interruptions in needed rehabilitative care when scheduled appropriately" (p4-5)	"...participating NHs reported experiencing ongoing work system challenges that degraded the quality and effectiveness of telemedicine encounters." (p8)Tools: Telemedicine platform used by consulting health system sends encounter invite to resident rather than NH staff; Internet connectivity issues; Lack of EHR interoperability between NH & health system"Tasks: Difficulty scheduling telemedicine encounters; Traning staff on new technology; NH had to learn how to navigate different telemedicine platforms; High information exchange demand from providerPeople: Telemedicine encounters are less effective for residents with auditory, visual, and/or cognitive impairments; Telemedicine encounters were less effective when facilitated by a non- clinical staff member; Telemedicine results in a loss of personal connection; Some residents prefer face-to-face visitsOrganization: Telemedicine services increased NH staff workload; Access to appropriate types and/or amounts of equipment to conduct telemedicine encounters effectively; Challenges with coordinating resident, staff, and provider schedules; Limited IT support; Billing IssuesEnvironment:

						Resident rooms were not ideal for conducting telemedicine encounters; Each Healthcare system utilized a different platform; Uncertain regulatory environment" (p6-7)
Fosdick, BK; Bayham, J; Dilliott, J; Ebel, GD; Ehrhart, N. Model-based evaluation of policy impacts and the continued COVID-19 risk at long term care facilities https://www.doi.org/10.1016/j.idm.2022.07.003	Modelling	"This model adapts a basic SEIR agent-based model to a LTCF environment by incorporating variability in day and night staff schedules, as well as the relative number of contacts between day staff, night staff and residents." (p469)	"This model's purpose is to study the spread of SARS-CoV-2 in a long-term care facility environment over a short time window, e.g. 3e6 months, under various vaccination levels of staff and residents and differing testing protocols. It is designed to allow facility managers to understand the trade-offs between adopting, for example, a vaccination mandate versus rapid testing staff weekly versus requiring qRT-PCR tests biweekly. The primary outcomes considered are the total number of infected individuals in the facility and the number of staff workday missed as a result of isolation." (p468)		"decision support tool was created to help LTCFs and regional public health departments develop strategies to mitigate the risk of outbreaks and contain them as they emerge….an example of how a rich infectious disease model can be programed and integrated into a user-friendly dashboard to serve public health administrators. Importantly, this tool could also be adapted relatively easily to model the particulars of any existing or future respiratory pathogen." (p467)	
Freedman, VA; Hu, M; Kasper, JD. Changes in older adults' social contact during the COVID-19 pandemic. https://www.doi.org/10.1093/geronb/gbab166	Telephone, ICT - Audio/Video Telephony		contact with family and friends outside LTC	Participants who are LTC residents		

Freidus, A; Shenk, D; Wolf, C. Integrating Praxis Through the Research Process: Caregivers for Older Americans During the COVID-19 Pandemic. https://www.doi.org/10.1111/napa.12166	A) ICTsB) Robotic pets	A) "tablets, smartphones, baby monitors, and headphones" (p167)B) Robotic cats and dogs	A & B) Social connection for residents	LTC staff	"Robotic pets are known to provide positive interaction for people with dementia" (p168)	"Barriers include the fact that busy staff have been forced to take on additional responsibilities, may not have the skills and experience to know how to write up a small grant proposal or may not be aware of the effectiveness of particular types of resources such as animatronic pets." (p168)	
Getson, C; Nejat, G. The adoption of socially assistive robots for long-term care: During COVID-19 and in a post-pandemic society. https://www.doi.org/10.1177/0840470422110640 6	Robots	"Socially Assistive Robots (SARs) are robots that interact with people using natural verbal and non-verbal communication modes" (p301)			"They can be easily disinfected and are well-suited for contactless and repetitive tasks." (p301)	"ome of the challenges of implementing social robots in healthcare from a staff perspective include user acceptance (setting user expectations), familiarity with the robot, and training. Technical challenges include speech recognition, navigation, and autonomy.... A main technical challenge to implementing social robots in a healthcare environment.. is speech recognition. Noisy environments, such as a lobby or front entrance of a healthcare facility, make it difficult for robots to detect speech, particularly if there are multiple people talking at once. Multimodal inputs for the robot (speech, touchscreen, and gestures) are essential for HRI as users have different needs and expectations, and environment conditions can vary." (p307)	"Ethical challenges include data privacy. Policies can be put in place to help safeguard and regulate data collection and data sharing." (p307)

Hardy, MS; Fanaki, C; Savoie, C; Dallaire, C; Wilchesky, M; Gallani, MC; Gagnon, MP; Laberge, M; Voyer, P; Cotec, A; Couture, V; Dallaire, B. Acceptability of videoconferencing to preserve the contact between cognitively impaired long-term care residents and their family caregivers: A mixed-methods study https://www.doi.org/10.1016/j.gerinurse.2022.09.006	ICT - Audio/Video Telephony	"... long-term facilities provided residents with electronic tablets. … As for family caregivers, they could use the device of their choice to connect to the meetings." (p66)	Connect family caregivers with LTC residents	Family and Caregivers were consulted. Staff that were involved with assisting residents were not	"many caregivers had used tablets and similar technology in their daily life." (p70)	"some older caregivers were unfamiliar with the communication software that was used for virtual meetings, such as Zoom or Teams." (p70)	"Upon restrictions on face-to-face meetings, virtual meetings were an alternative for some caregivers to maintain contact with their loved ones. Face-to-face meetings were perceived as more humane and more adapted to interact and take care of the residents." (p68)"Other caregivers welcomed virtual meetings, focusing on the overall goal, which is to preserve and promote communication, through all possible means... However, the use of tablets raised privacy issues for some participants.	"The staff support during virtual meetings increased the sense of competence and confidence of caregivers in this respect. The staff, who often held the tablet for the residents or supervised the operation, would usually interfere to guide caregivers to use the software programs and/or stimulate residents"

							The consistent presence of the staff members during the video calls to ensure a proper functioning of the intervention was reported as uncomfortable" (p68-9)	
Hung, L; Mann, J; Upreti, M. Using the Consolidated Framework for Implementation Research (CFIR) to foster the adoption of a new dementia education game during the COVID-19 pandemic. https://www.doi.org/10.1093/geront/gnac138	e-learning game	Online-game based education	Dementia education	"The e-learning game was codesigned with 70 interdisciplinary clinicians (nurses, unit clerks, care workers, occupational therapists, physiotherapists, physicians, and a student in the game design program of a local college) in three units of a large urban hospital." (p2)	"In our study, the staff played the games for fun, and they talked about the game-playing experiences and shared stories with peers in the hospital and LTC." (p9)"our games brought enjoyment of learning and supported retention of information. This was evidenced by staff using the new knowledge in huddles and care planning." (p10)	"Some staff in our study had low digital literacy and needed support to learn how to play the games. In addition, not all staff have access to tablets and computers that work for the game. Participants in our study also wanted more leadership support to enable staff to access digital training with protected time." (p10)		"Future research should also investigate the potential of online game-based education in rural areas where classroom education can be costly and challenging." (p10)

Hung, LL; Mann, J; Perry, J; Berndt, A; Wong, J. Technological risks and ethical implications of using robots in long-term care https://www.doi.org/10.1177/20556683221106917	Robots	"social robot PARO, and telepresence robot"		LTC staff	"leadership participants told us that the cost is not an issue as long as there are sufficient justifications in terms of resident effects and benefits. According to the leadership participants, residents can be entertained by the social robot and the robots can be objects of conversations and improved social connectedness among residents in the LTC units....Participants in general agreed that robots can offer support for social connection in LTC....most participants believed the robots could be used as tools to improve efficiency" (p5) "participants across groups see the benefits of having the robots to allow safe virtual visits, especially when the resident is in isolation with COVID infection....(p6)	"Safety risk has been viewed as one of the most significant risk concerns for robot use in LTC….Staff also brought up the issue of extra work that is required to care for the robots….According to the participants, privacy is another major risk relevant to both staff and residents." (p4) "The infrastructure for the LTC home is also vitally important; for example, the Wi-Fi system needs to provide consistent high-speed service. Many staff members complained that they do not have strong internet connection in every resident's room....many also voiced their concerns about robots replacing human care. One participant argued that the social robot PARO can be left with the resident when staff do not have time to spend with the residents:" (p5)	Whole article discusses ethical considerations.
Kuepfer, J. Supporting Spirits in Changing Circumstances: Pandemic Lessons for Long-Term Care and Retirement Homes https://www.doi.org/10.3390/rel13070584	ICT - Internet	Youtube, zoom, Rogers TV access	Virtual worship services ... on Smart TVs...on tablets, computers or even smartphones. (p4) Zoom was also used to host virtual social activities	Spiritual Care Advisors	Able to provide virtual services and activities virtually. "Homes also learned that they could deliver spiritual care religious practices in residents' own rooms, in their own languages, even connecting them to their own church community online." (p10)	"They found it especially challenging to meet needs for touch, community, mental health care, and processing grief." (p11)	

Lingum, NR; Sokoloff, LG; Meyer, RM; Gingrich, S; Sodums, DJ; Santiago, AT; Feldman, S; Guy, S; Moser, A; Shaikh, S; Grief, CJ; Conn, DK. Building Long-Term Care Staff Capacity During COVID-19 Through Just-in-Time Learning: Evaluation of a Modified ECHO Model. https://www.doi.org/10.1016/j.jamda.2020.10.039	ICT - Audio/Video Telephony	Zoom virtual conferencing platform	Training workshops	"All participants were interprofessional HCPs working in LTC or redeployed to work in LTC and had the basic technology requirements to join the live weekly sessions." (p239)	"ECHO COE-LTC: COVID-19 is an example of an intervention that facilitates the rapid uptake and sharing of LTC-specific clinical practice evidence with HCPs who are able to enact changes in practice. These ECHO sessions highlighted HCP needs as COVID-19 related protocols and system practices changed daily, further amplifying the need for just-in-time knowledge sharing.... As reported by participants, feelings of increased connectedness through hearing the shared experiences of others working in LTC during the COVID-19 pandemic were insightful and affirming. ... Additionally, participants reported an increased sense of well-being after implementing wellness and burnout management strategies learned." (p243)

Miller, SL; Mukherjee, D; Wilson, J; Clements, N; Steiner, C. Implementing a negative pressure isolation space within a skilled nursing facility to control SARS-CoV-2 transmission. https://www.doi.org/10.1016/j.ajic.2020.09.014	Renovations; Computational modeling	"Systematic modifications were made to existing building HVAC units. These modifications were not resource intensive and were rapidly established. Continuous pressure differential measurements and computational modeling were used to validate the isolation space performance with respect to containment of airborne particles." (p439)	To build and maintain continuous negative pressure isolation space to reduce airborne infection risk	" the medical director, administrative team, environmental director, Human Resources director, and director of nursing." (p440)	"an in-house modification to an established HVAC system will be able to sustain negative pressures that meet or exceed CDC guidelines as previously reported in hospital modifications. Modifications to existing infrastructure can typically be less resource-intensive and can be rapidly conducted with existing expertise and promptly utilized. Full-scale computational modeling can be used to evaluate efficacy of such modifications, and validate sustained negative pressures, as demonstrated here." (p445)"the community benefited from the expansion of available health services and decreased community spread in facilities that lacked sufficient mitigation strategies. Residents avoided the stress associated with transfers to and from emergency facilities. Thus, the resulting isolation space operated successfully through the ongoing pandemic." (p445)	"the solution described in this paper should be viewed as a temporary and emergency solution" (p445)

Ostrowsky, BE; Weil, LM; Olaisen, RH; Stricof, RL; Adams, EH; Tsivitis, MI; Eramo, A; Giardina, R; Erazo, R; Southwick, KL; Greenko, JA; Lutterloh, EC; Blog, DS; Green, C; Carrasco, K; Fernandez, R; Vallabhaneni, S; Quinn, M; Kogut, SJ; Bennett, J; Chico, DM; Luzinas, M; New York COVID-19 Response Team. Real-time virtual infection prevention and control assessments in skilled nursing homes, New York, March 2020-A pilot project https://www.doi.org/10.1017/ice.2021.100	Telephone, ICT - Audio/Video Telephony	Telephone, Video-conferencing	"direct observation of IPC recommendations implemented by facilities" (p352)	public health epidemiologits, and administrators, directors of nursing, or infection preventionists from LTC	"The COVIDeo component was a novel element using standard smartphone technology that allowed for real-time assessment by IPC subject-matter experts... benefits including improved communication with SNFs through face-to-face interaction, more objective observations of IPC practices, and targeted quality improvement recommendations to address identified gaps in real-time in the actual setting of care....By eliminating commuting time, COVIDeo allowed for an estimated 4 times as many facilities to be assessed compared to on-site assessment while providing the virtual presence of public health epidemiologists. In addition, virtual visits removed additional exposure to the facility staff and residents.COVIDeos were well accepted... " (p353)	"they were conducted in fewer than one-third of facilities. ... the pilot project took place early in the COVID-19 pandemic when video technology was not as commonly used and facilities often lacked easy access to phone or computers video applications. Facility administrators and infection preventionists were experiencing heavy workloads and competing interests limiting available time. Additionally, virtual IPC assessment was an unfamiliar method, and administrators may have been skeptical at first even though they were nonregulatory. Public health epidemiologists were also gaining comfort with the tool and may not have consistently offered video assessments." (p353)

Penna, Austin R.; Hunter, Jennifer C.; Sanchez, Guillermo V.; Mohelsky, Romy; Barnes, Laura E. A.; Benowitz, Isaac; Crist, Matthew B.; Dozier, Tiffany R.; Elbadawi, LI; Glowicz, JB; Jones, H; Keaton, AA; Ogundimu, A; Perkins, KM; Perz, JF; Powell, KM; Cochran, RL.; Stone, ND; White, KA; Weil, LM. Evaluation of a Virtual Training to Enhance Public Health Capacity for COVID-19 Infection Prevention and Control in Nursing Homes. https://www.doi.org/10.1097/PHH.0000000000001600	ICT - Audio/Video Telephony	Video-conferencing	Training workshops	Workshop participants	" A virtual approach, such as the one described in this report, could be used to achieve this goal and might also facilitate training of local health department staff in rural areas." (p690)"use of a virtual course curriculum, case-based and peer-learning strategies, sessions focused on the applicationof knowledge to practice, and the organization of learners into smaller groups to aid discussion were instrumental in building capacity through shared learning among staff. ... The course also reinforced the CDC COVID-19 healthcare IPC guidance for nursing homes using multiple formats (ie, pretraining reading materials, casebased scenarios, didactic presentations, peer-learning opportunities, and SME-led discussion) simultaneously... flexibility to introduce new or updated topics (eg, COVID-19 vaccination)... also created a low risk environment for learners to practice addressing realistic challenges while receiving immediate feedbackfrom SMEs and peers, techniques supported in successful capacity-building initiatives. (p690)	"... not commonly reported in either the immediate postcourse assessment or the 6-month postcourse assessment; however, a small proportion of learners did report needing further training, perhaps reflecting a need for additional training as the CDC COVID-19 healthcare IPC guidance for nursing homes continued to evolve." (p690)

Powell, KR; Winkler, AE; Liu, JF; Alexander, GL A mixed-methods analysis of telehealth implementation in nursing homes amidst the COVID-19 pandemic https://www.doi.org/10.1111/jgs.18020	Telemedicine, including integrated equipment; Audio/Video Telephony	Tablets (ipads), laptops, integrated equipment (stethospcoes and otoscopes), smartphones, videoconferencing software, software specifically for telehealth	"devices and information systems used to conduct TH visits" (p6)	Administrators and clinicians	"Sources of motivation for using TH were diverse among participants from both groups and included improving resident safety, transportation associated cost savings, improved communication, improved quality of care, and saving time for the provider." (p6)	"Interoperability was perceived as a barrier by many participants in our study. Participants reported difficulty with disparate systems requiring multiple logins to access information." (p7)"All NHs in our sample reported that increased use of TH had increased what NH staff were required to do (e.g. setting up, facilitating, and documenting TH visits), however, none of the NHs reported adding staff to accommodate for the increased use of TH" (p8)

Prophater, LE; Fazio, S; Nguyen, LT; Hueluer, G; Peterson, LJ; Sherwin, K; Shatzer, J; Branham, M; Kavalec, A; O'Hern, K; Stoglin, K; Tate, R; Hyer, K. Alzheimer's Association Project VITAL: A Florida Statewide Initiative Using Technology to Impact Social Isolation and Well-Being https://www.doi.org/10.3389/fpubh.2021.720180	ICT - Internet, Audio/Video Telephony, Computers	TabletsVideo-conferencing softwareComputer-based self-paced online training	iN2L tablets - "Samsung Galaxy tablets, pre-programmed with iN2L proprietary software aimed to facilitate connections between residents living with ADRD and families through various means. The tablet device was WiFi-enabled and was created to be intuitive and simple to use and included security features to keep seniors safe during use...The interface provided simple touch access to an array of content specifically designed and curated for older adults, such as games, puzzles, trivia, music, sing-alongs, music therapy, audiobooks, movies and TV shows, virtual tours, history, and spiritual content. The tablets were also equipped with applications for direct video call connection to residents' family members, COVID-19 information and tips, and Alzheimer's Association programs, services, and resources. The tablets allowed content to be tailored to the residents' likes and interests and provided single touch connectivity for video calls.." (p2)Project ECHO - "is an evidence-based distance-learning model ... a team of multidisciplinary experts come together with community-based partners in regularly scheduled collaborative learning sessions to participate in case-based discussions and hear experts present on best-practice care." (p2-3)Alzheimer's Association Professional Training and Certification - "Alzheimer's Association Person-Centered Dementia Care Training Program ... is a self-paced, online training that provides 4 h of educational content and covers	LTC staff "professional care givers" (p3)	"purpose-built, senior-friendly technology can bring to older adults' lives, particularly in care communities. The tablet usage data demonstrates that residents used the tablets frequently and that they remained engaged with the tablet each time they used it... tablets helped staff to proactively connect residents with their families" (p5)"Professional training and certification provided the foundation knowledge of quality care practices... Project ECHO provided case-based learning and support... Virtual Forums engaged stakeholders in exploring ways to build sustainable, scalable models for increasing access to support and decreasing social isolation in the future." (p5)

			foundational information on Alzheimer's and dementia and four topic areas of the Dementia Care Practice Recommendations" (p3)			
Reddy, A; Resnik, L; Freburger, J; Ciolek, DE; Gifford, DR; Whitten, MJ; Baier, RR. Rapid Changes in the Provision of Rehabilitation Care in Post-Acute and Long-Term Care Settings During the COVID-19 Pandemic. https://www.doi.org/10.1016/j.jamda.2021.08.022	Telemedicine; Audio/Video Telephony	not described	"to improve rehabilitation care… need for technology and telehealth platforms" (2242)	rehabilitation clinicians or administrators	"healthcare professionals are much more open to telemedicine as a result of the pandemic, and changes in practice, like telehealth, would have taken much longer to occur without the need for it during the pandemic." (p2242-2243)	"Tele-rehab is promising, but we've been living in a technology desert and suddenly having to stand up infrastructure, educate staff, and implement anything new during a pandemic exposed the terrible inadequacies of our existing system." (p2243)

Saad, A; Magwood, O; Benjamen, J; Haridas, R; Hashmi, SS; Girard, V; Sayfi, S; Unachukwu, U; Rowhani, M; Agarwal, A; Fleming, M; Filip, A; Pottie, K. Health Equity Implications of the COVID-19 Lockdown and Visitation Strategies in Long-Term Care Homes in Ontario: A Mixed Method Study https://www.doi.org/10.3390/ijerph19074275	ICT - Audio-Video Telephony	"video teleconferencing software, such as Skype, FaceTime or Zoom." (p4)	Virtual visits	residents and families	"our quantitative survey results that showed virtual visits as a feasible strategy compared to other strategies" (p10)	"Virtual visits... were perceived as challenging for residents to partake in...many LTC residents were not familiar with them or able to use them independently." (p10)	"Furthermore, one participant highlighted issues regarding privacy, trust, and ethics when visits were facilitated by an LTC staff member. This participant described the visits as being “guarded”, resulting in no trust between the LTC staff and visitors, and consequently no confidentiality, privacy, or intimacy during the visit. They also expressed privacy concerns regarding the discussion of personal business, such as filing annual income taxes or selling a property" (p11)

Schuster, AM.; Cotten, SR. COVID-19's Influence on Information and Communication Technologies in Long-Term Care: Results From a Web-Based Survey With Long-Term Care Administrators. https://www.doi.org/10.2196/32442	ICT - Internet, Audio/Video Telephony	"The top three ICTs purchased by LTC administrators for their residents (nonmutually exclusive) were tablet devices (27/37, 73%), smartphones (8/37, 22%), and laptops (8/37, 22%)." (p6)	"5 of the 37 administrators who purchased ICTs during the COVID-19 pandemic reported that the primary reason for purchasing ICTs was to help residents communicate with their family members. Additional reasons for purchasing ICTs included enabling telehealth and providing a secure communication channel for their staff." (p7)		"Benefits of ICT use included residents feeling connected to their family members, friends, and other residents. " (p1)"The most commonly reported benefits reported by LTC administrators were that using ICTs helped residents feel connected to their family members (26/34, 77%) and friends (16/34, 47%), and using ICTs allowed the residents to socialize more with others" (p8)	"Barriers to ICT use included staff not having time to assist residents with using the technology, nonfunctional technology, and residents who do not want to share technology." (p1)"staff not having time to assist residents with technology, brok en technology, and residents who did not want to share technology, although these barriers were each reported by <25% (9/34) of respondents." (p9)
Shaughnessy, L; Brunton, S; Chepke, C; Farmer, JG; Rosenzweig, AS; Grossberg, G. Using Telemedicine to Assess and Manage Psychosis in Neurodegenerative Diseases in Long-Term Care. https://www.doi.org/10.1016/j.jamda.2021.12.033	Telehealth			"6 panelists representing the multidisciplinary fields of geriatrics, geriatric psychiatry, movement disorders, and neuropsychology, and including extensive experience with telepsychiatry in the LTC setting" (p1146)	"Telemedicine can offer a number of benefits over in-person visits, primarily arising from the reduction in logistical hurdles associated with remote visits. By removing the need for travel, services can be provided to individuals in rural locations or who have difficulty traveling, can enable specialists to spend more of their time seeing and treating residents, and can facilitate subsequent monitoring visits. Telemedicine can also provide a solution for LTC facilities that face physical, personnel, or financial challenges to enabling in-person specialist visits, expanding the services available to their residents." (p1146) "With telemedicine, residents are also introduced to a foreign experiencedvideo-based interaction with a specialistdwhich may allow the provider to witness a resident's unique reaction." (p1146)	"Coordinating telemedicine visits may create added challenge for LTC staff, who may already be overworked" (p1150)

Sheperis, DS; Gomez, R; Wathen, C; Frank, M; Brown, LM. Addressing isolation, loneliness and mental health during COVID: A university training partnership with senior living communities. https://www.doi.org/10.1080/02701960.2022.2096602	Telephone, ICT - Audio/Video Telephony	"a telemental health outreach and psychoeducation program" (p8)	clinical staff consulted during needs assessment.	"university clinical programs in psychology and counseling can address the needs of community older residents by preparing student clinicians to work with the aging population and to engage in telehealth models of outreach and interventions" (p1)"older adults benefitted from the experience of working with college students in counseling and psychology who were gaining clinical experience." (p2)"students engaged in clinical training that could benefit this population of older adults needing services" (p3)Program is an opportunity to identify individuals requiring additional supports that LTC staff can facilitate referrals

Singer, R; Rodriguez, G; Garcia, B; Nutt, A; Merengwa, E. Remote infection control assessments in long-term care facilities during COVID-19 pandemic in Texas, 2020. https://www.doi.org/10.1016/j.ajic.2022.07.007	Telephone, ICT - Audio/Video Telephony	Telephone, Video-conferencing	Infection control assessments using a standardized remote tool		"Texas DSHS was able to reach approximately 4 times as many LTCFs with remote assessments compared to on-site visits in the same time frame… were still able to identify significant gaps in the facilities' IPC practices via tele-ICARs. Tele-ICAR data were successfully used to provide LTCFs with tailored recommendations in real-time to mitigate identified gaps and protect their residents, staff, and communities. ... several benefits...including promoting physical distancing to reduce exposure to COVID-19 to [Healthcare Associated Infections] epidemiologists and [infection preventionist] (and vice versa to LTCFs) and eliminating drive-time to the facilities resulting in reduction of cost and increased productivity of the HAI epidemiologists and IPs. The tele-ICAR tool also proved to be easily adaptable in response to evolving COVID-19 IPC guidance " (p1114)	"Conducting on-site rather than remote assessments is recognized as more beneficial in some instances because in-person assessments are not prone to the same technical limitations that may limit remote ICARs and in-person ICARs typically permit the HAI epidemiologists and IPs to visualize more of the facility's IPC practices." (p1114)
Straker, JK; Choi, MS. Facility and Family Communication during the COVID-19 Visit Restriction: Early Perspectives of Family Members. https://www.doi.org/10.1080/01634372.2021.1969714	ICT - Audio/Video Telephony, Text messaging, Email	"Video calls (FaceTime, Skype, or other); telephone; text message; e-mail; postal mail; window visit; special room or cubicle visit." (p5)	Communication channels	Families of LTC residents	"the total number of available communication channels was associated with peace of mind. That is, respondents who had multiple communication options available were more likely to have peace of mind." (p6)	

Van Orden, KA; Bower, E; Beckler, T; Rowe, J; Gillespie, S. The Use of Robotic Pets with Older Adults during the COVID-19 Pandemic. https://www.doi.org/10.1080/07317115.2021.1954122	Robots	“Companion Pets” manufactured by the company Joy for All, which are commercially available for approximately 100 USD via retailers and the company’s website (joyforall.com). The Robotic Puppies and Cats have built-in sensors and speakers which respond to motion, voice and touch. The pets move, blink, “bark,” “meow” and have a “heart-beat.” Cats also purr and roll onto their backs for tummy scratches.' (p2)	"Technology-mediated interventions for social connection" (p1)"The robotic pet program was initiated during the pandemic to address social connection while visiting restrictions were in place, but the pets were not used only for companionship: nursing staff introduced the pets for comfort during endof-life care or for de-escalation of agitated behavioral symptoms of dementia." (p3)	LTC staff	"reducing anxiety by providing companionship and comfort and encouraging positive social interactions with other residents and staff" (p3)	"One challenge for robotic pet programs is addressing the degree to which older adults believe the pets are real." (p4)

Walters, MS; Prestel, C; Fike, L; Shrivastwa, N; Glowicz, J; Benowitz, I; Bulens, S; Curren, E; Dupont, H; Marcenac, P; Mahon, G; Moorman, A; Ogundimu, A; Weil, LM; Kuhar, D; Cochran, R; Schaefer, M; Slifka, KJ; Kallen, A; Perz, JF. Remote Infection Control Assessments of US Nursing Homes During the COVID-19 Pandemic, April to June 2020. https://www.doi.org/10.1016/j.jamda.2022.03.015	Telephone, ICT - Audio/Video Telephony	Telephone, Video-conferencing	Observation of implementation of IPC requirements	"consultations that included video were superior to those that were phone-based for differentiating facility policy from practice. " (p912)"demonstrated that remote assessments can leverage public health resources to quickly reach large numbers of geographically dispersed facilities" (p913)	"most ICAR elements, both full and partial implementation could be credited as adherent, thus introducing a potential positive bias. Additional positive bias could have arisen from social desirability if respondents gave responses they knew to be correct rather than describe actual practice; the potential for such bias supports the preferential use of video in assessments." (p915)

Appendix E: Questions Related to Technology Use in the Primary Study Questionnaire

How did COVID-19 affect you and your ability to do your job?

a. Did COVID-19 change the way you feel about your job?
b. What role did technology play in your ability to do your job during COVID-19?

Tell me about the supports were in place to help you?

a. Were there any gaps in the support that were made available?
b. Were there any grief supports made available? If so what were they and were they helpful?
c. Can you describe the role of technology in providing supports to you during COVID-19?

How did the way you use technology to communicate with people change during COVID-19?

a. What aspects did you find were positive or negative?
b. How did these changes affect the way you perform your regular role?
c. Many people report the increased use of videoconferencing like Skype, Teams, Zoom, WebEx since the beginning of the COVID-19 pandemic. What was your experience?