AgeTech **D**iscussions:
Exploring **P**erspectives on **T**echnology

Social Robots | Report
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Executive Summary

Canada's population is aging faster than ever before and this has many implications in terms of healthcare, social services, and the economy. In response, AgeTech, or Age Technology, a subset of the health technology industry, has emerged in recent years and uses technology to support healthy aging by enhancing and adapting alternative care approaches. Yet, for many older adults, especially those living in northern and rural communities, there exists a disconnect preventing emerging AgeTech from getting to those that need it the most. The Centre for Technology Adoption for Aging in the North (CTAAN) focuses on bridging that technology adoption gap by testing, piloting, adapting, and implementing new and existing technology solutions tailored to address the challenges experienced by older adults and care partners in northern and rural communities in British Columbia. One of CTAANs' key service is AgeTech Discussions: Exploring Perspectives on Technology, heretofore referred to as ADEPT. The ADEPT workshops focus on emerging AgeTech to describe the applicability, usability, and feasibility of a featured AgeTech from end users' perspectives in northern and rural BC.

This report shares the findings from ADEPT Workshops featuring Social Robots iPal2 Mindy. Data collection occurred over four workshops with a total of 14 participants. Each workshop included pre- and post-surveys, a demonstration of Mindy, question and answer period with Social Robots, and a facilitated discussion period where participants discussed the usability, feasibility, and accessibility of implementing Mindy in long-term care facility settings across northern and rural BC.

Participant findings from the workshops were analysed and five themes arose which are described in this report. These themes include: 1) Still Loading …Suggestions to Ready Mindy for Use, 2) Expanding Mindy's Linguistic Capabilities to Enhance Care, 3) Personalizing Mindy for Meaningful Interaction, 4) Opportunities to Optimize Mindy for Long-Term Care, and 5) Examining Northern and Rural Implementation. Theme 1 discusses Mindy's preparedness for long-term care use and suggestions for developing Mindy into a more realistic companion-like technology. Theme 2 details how expanding Mindy's linguistic capabilities could enhance and support meaningful interactions. Theme 3 describes how integrating the ability to personalize Mindy could complement person-centred care. Theme 4 describes the opportunities to optimize Mindy's functionality, accessibility, and useability for long-term and dementia care settings. Theme 5 explores the implementation process and considerations in northern and rural long-term care facilities.

Primary recommendations include considering the purposeful development of Mindy, underpinned by meaningful collaboration with a diverse range of professionals and end-users to better understand long-term care population needs, to enhance functionality, accessibility, and design inclusivity while creating a more autonomous, companion-like technology.

Taken together, the findings drawn from this report reveal Social Robots iPal2 Mindy to be of interest to older adult health care providers in northern and rural long-term care facilities and communities in BC. That being said, at Mindy's current stage of development, there are many opportunities to improve the technology before considering implementation advancement in

long-term and dementia care settings. By undertaking the development of Mindy into a more autonomous, companion-like technology, through robotic augmentation and realism integration, while also using an ‘accessibility-first’ co-design process, Social Robots technology has the potential to facilitate and support meaningful interactions and engagement in older adult populations and long-term care facilities in northern and rural BC in the future.

Contents

Background

In recent years, innovative solutions and technologies have begun to emerge from the AgeTech sector. AgeTech, or Age Technology, a subset of the health technology industry, uses technology to support healthy aging, and to support care partners and health professionals to improve quality of life for aging adults. By enhancing and adapting alternative care approaches through emerging technologies, it may be possible to enable and extend the ability for older adults to safely age in place within their own homes, improve long-term care facility experiences, and/or decrease long-term care costs/needs.

Although Canadians are living longer, they are also more likely to develop a chronic or life-limiting illness and have complex care needs as they age.[1-2] Consequently, increasing numbers of individuals are entering into long-term care facilities when personal and community supports are no longer able to provide a sufficient level of care.[3] Often, long-term care residents have limited to no access to activities they found meaningful prior to entry and with less than 10% of residents displaying high social engagement in activities, few feel meaningfully engaged.[4] Additionally, one in five long-term care residents experience depression and are at an increased risk of becoming socially isolated and lonely.[4]

In response to these growing concerns, researchers have been exploring robotic innovations to prevent and reduce social isolaton in older adults.[5] As the implementation of robots to enhance wellbeing of older adults in the context of health care continues to develop, social robots, or socially assistive robots, have garned much interest for their potential applications in aging populations, however there exists a significant gap in knowledge and understanding around the impact of social robots on older adults.

Current studies of SARs in long-term care facilities have generally shown positive socio-psychological effects, including improvements in communication, and level of social interaction and engagement in residents.[5] In a study examing ‘Pepper’, a socially assistive robot, in a long-term care facility indicated that activitiy patterns changed among long-term care residents, with increased activity in common areas after the implementation of the socially assistive robot.[6] This improved the level of social interactions, both between residents and between residents and health care staff.[6] Another study with a socially assistive pet robot, ‘Paro’, saw an increase in smiling and laughing in residents and healthcare professionals alike, when interacting with the socially assistive robot in group activities.[7]

The Centre for Technology Adoption for Aging in the North (CTAAN) supports aging in northern* and rural BC communities by making Age Technologies more available to older adults, care partners, and the health care systems that support them. CTAAN’s programs focus on testing, piloting, adapting, and implementing new and existing technology solutions tailored to address the challenges experienced by older adults and care partners in northern and rural communities.

CTAAN is built on a partnership with UNBC, the Northern Health Authority, and AGE-WELL. CTAAN has an extensive network of partners and “Living Lab” sites that allow for evaluation,

testing, and validation in real-world settings. CTAAN leads testing, research projects, and evaluation to validate technology and works collaboratively with our partners to support implementation for at home settings and in care settings across the continuum of care.

This information provides companies with important third-party validation that will not only provide key product insights but will allow the company to achieve a first sale or further reinforce a value proposition that will help the company scale in the region and far beyond. These services are provided by CTAAN staff including researchers, students, older adults, community partners, and healthcare providers.

The first step to introducing AgeTech to the region is one of CTAANs' key services, **A**geTech **D**iscussions: **E**xploring **P**erspectives on **T**echnology, heretofore referred to as **ADEPT**, which focuses on emerging AgeTech in northern and rural BC to describe the applicability, usability, and feasibility of a featured AgeTech from end users' perspectives. Through workshops, end users participate in facilitated discussions and provide important insights and recommendations to inform design and adjustments of featured AgeTech. This process provides technology developers and companies with evidence that helps form the next steps to scale their products and services to northern and rural areas.

Feature Technology: Social Robots – iPal2 Mindy

The focus of this report is Social Robots iPal2 Mindy. Social Robots (www.socialrobots.ca) was founded with the goal of providing engagement and entertainment to older adults. Mindy provides an innovative solution that addresses loneliness, boredom, and social isolation for older adults.

Social Robots Mindy can improve older adults' health by increasing perceived social interaction and emotional support through better patient engagement, decreasing loneliness, and helping connect people to one another.

Mindy can be used in a long-term care facilities or by community-dwelling older adults and 'Visits with Mindy' can be a group or 1:1 activity with users. Mindy can support family and care providers through the camera and smart speaker capabilities, and can talk (text to speech), play music, share family photos, play videos, dance/move, play games, and conduct video calls.

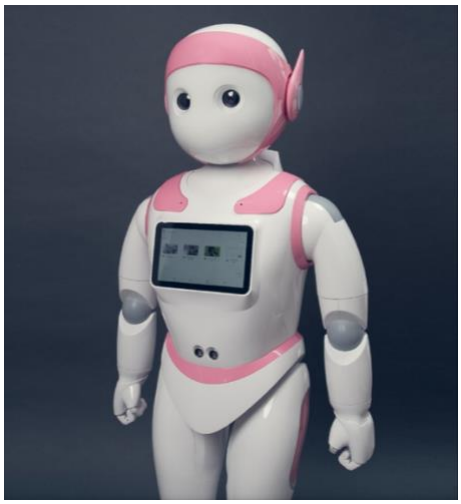


Figure 1. Social Robots iPal2 Mindy

*In Canada, the term 'northern' is commonly used in a provincial context to identify the northern and more sparsely populated (e.g., rural, remote) areas, which may experience arctic/subarctic climates, political marginalisation, economic dependency on natural resource development, and larger proportions of Indigenous populations.[8] There is much diversity across northern and rural communities based on socio-spatial characteristics (e.g., population size, population density), social representation, population demographics and resource availability.

Methods

To explore how CTAAN could collaborate with Social Robots, CTAAN offered one of it's key services: ADEPT, facilitated workshops supported by NRC-IRAP funding through CTAAN, and contributions from the company, Social Robots, to support emerging technology to become more accessible in northern and rural BC communities.

The ADEPT workshop preparation began with an introductory presentation of companion robot iPal2 Mindy by Social Robots to the UNBC research team. Through discussions, Social Robots identified a gap in understanding the diverse and unique contexts of long-term care facilities across northern and rural BC, including decision-making processes, long-term care health professional and resident needs, financial capacity and allocation, economic viability, Wi-Fi capabilities, purchasing, and the implementation feasibility of iPal2 Mindy across these settings. With a key objective of exploring the "Feasibility and Usability of Social Robots iPal2 Mindy in Long-Term Care Facilities in Northern and Rural British Columbia", management and staff from healthcare facilities fitting this description were recruited for these ADEPT Workshops. Additionally, we applied maximum variation sampling techniques to ensure diversity, equity, and inclusion in our recruitment. Data collection occurred in August 2023 over four workshops and the target number of participants was reached. Informed consent was obtained from all participants prior to the workshops.

Each workshop followed the same format:

1) Pre-workshop survey for participants to complete in the first 10 minutes
2) Social Robots presentation with iPal2 Mindy demonstration
3) Question-and-answer session with a Social Robots company representative
4) Facilitated group discussion
5) Post-workshop survey to be completed at the end of the discussion

In the pre-survey, participants provided demographic information and answered questions about their experience with social robots, and attitudes towards social robot technology in their respective health care facilities. In the post-survey, participants shared further insights relating to companion robot iPal2 Mindy and their satisfaction with the presentation/demonstration, general workshop facilitation, and organization.

Social Robots presented iPal2 Mindy, a social robot, and the functions, capabilities, current research, outcomes, and the physical design were detailed. The facilitated group discussions were led by trained CTAAN staff without Social Robots present. A discussion guide was used to direct the conversations and focused on soliciting information around social robots, iPal2 Mindy, northern and rural BC long-term care facility contexts, decision planning, economic viability, staffing efficiency/human resources, implementation considerations, and required supports. Prompts used to elicit participant views and experiences were open-ended opinion and experienced-based questions.

Workshops lasted 2.5 hours each and were digitally recorded. Audio was transcribed verbatim and checked for accuracy. All identifying information was removed to ensure confidentiality. Qualitative data was analyzed using a thematic approach guided by Braun and Clarke (2006).

This involved following the six-phase process outlined using an inductive approach to code and generate themes:

1) Familiarisation with the data: Each transcript was read several times and initial thoughts noted to establish familiarity.
2) Coding: Concise initial descriptive codes were generated in a systematic manner and data relevant to each code was collated.
3) Searching for themes: A coding framework was developed by adding, removing, and organizing the initial codes into potential themes and sub-themes.
4) Reviewing themes: To maximize internal homogeneity and external heterogeneity, each theme was examined and refined in relation to the codes and in relation to the entire data set. A thematic map was used to help ensure the themes fit together meaningfully and the distinctions between them were clear.
5) Defining themes: The ‘‘essence’’ of each theme was identified and described clearly to determine the aspect of the data which each theme captured.
6) Producing the report: Extracts were knit together in an analytical narrative with interview quotes integrated to contextualize the analysis in relation to the objectives of the research and to existing literature.

Quantitative survey data was summarized using descriptive statistics in Excel, while qualitative data was analyzed using NVivo 12. A consensus approach was applied to ensure the findings and illustrative quotes used in this report best represented the prevailing patterns across participants to provide thorough recommendations for Social Robots.

Ethics approval for the ADEPT workshops was provided by the University of Northern British Columbia ethics board (H22-00499), the Northern Health Operations Board (RRC-2022-004) and the National Research Council (2022-56).

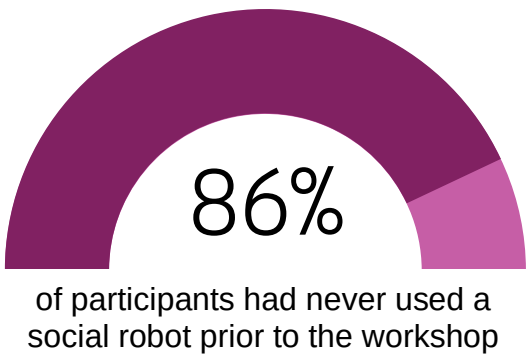
Workshop Findings

PARTICIPANTS & PRE-SURVEY

Fourteen participants took part in four ADEPT workshops held in August 2023. Participants worked in a variety of healthcare settings including: long-term care, older adult care, dementia care, hospice palliative care, primary care, as well as health care administration and support. Participants were employed as nurses, managers, supervisors, policy, educator coordinators, navigators, and allied health professionals.

A majority of participants were motivated to attend the ADEPT workshop featuring Social Robots because they had an interest in emerging technology, wanted to learn how technology can improve the quality of life for older adults and were curious in how a social robot might complement their professional role. Additionally, participants were interested to see if social robots could be suitable for the long-term care setting, and how this type of technology could support healthy aging, reduce social isolation and enhance opportunities for meaningful engagement. Participants were keen to understand what a social robot is, how the technology works, what resources are needed to support the operations, and were curious if this type of technology could make a difference with older adult populations.

A majority of participants had never used social robot technology before, and most were unsure if there was a need for this type of technology in long-term care (see Figure 2.). Prior to the workshop, few participants responded as to what benefits they saw in implementing social robots, but those that did foresaw social robots as supporting older adult independence, reducing social isolation, enhacing social interactions, and improving quality of communication between residents and residents and staff. When asked what features should be prioritized when picturing social robots, those that responded reported the ability to engage autonomously, entertain, the need for minimal external support, is low maintenance, user friendly, multilingual with many communication abilities, and will adhere to infection control policies.



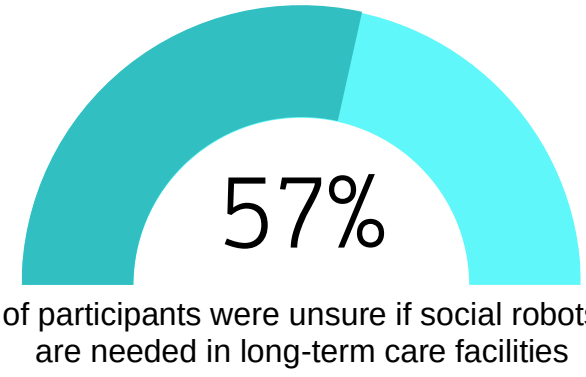


Figure 2. Pre-survey results

FACILITATED DISCUSSION: KEY THEMES

During the facilitated discussion, participants shared their perspective about Social Robots iPal2 Mindy in relation to long-term care facility settings in northern and rural BC communities. Five themes were developed by analysing the workshop discussions and included: 1) Still Loading …Suggestions to Ready Mindy for Use, 2) Expanding Mindy's Linguistic Capabilities to Enhance Care, 3) Personalizing Mindy for Meaningful Interaction, 4) Opportunities to Optimize Mindy for Long-Term Care, and 5) Examining Northern and Rural Implementation.

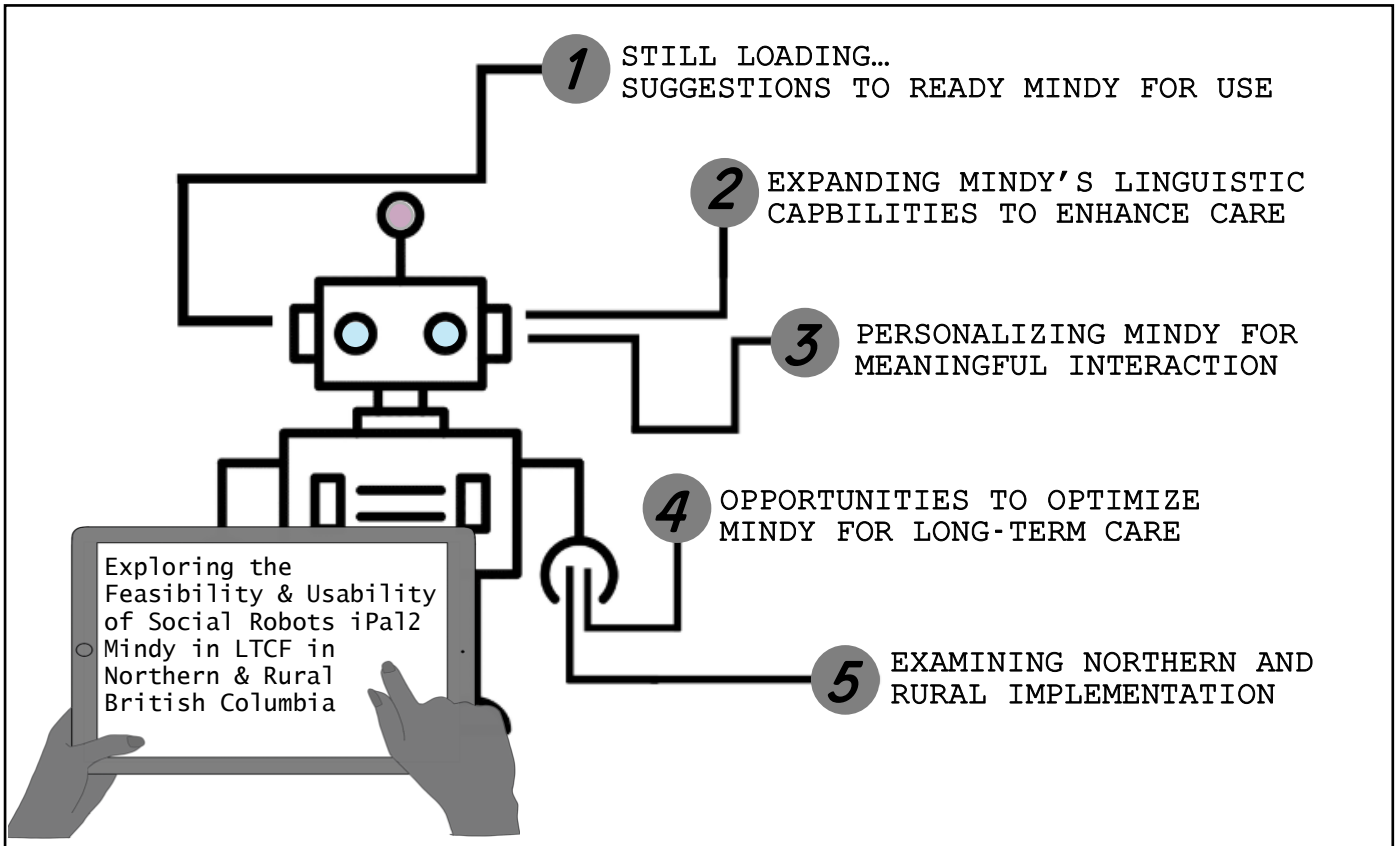


Figure 3. Key themes developed from the ADEPT workshop discussions

THEME 1: STILL LOADING…SUGGESTIONS TO READY MINDY FOR USE

In discussing the concept of social robots, participants were excited for the future of this type of technology, and the range of psychosocial issues that could be addressed within long-term care, assisted living, and aging-in-place/community settings. In acknowledging that social robots are an emerging area of technology, participants envisioned great potential in Mindy, especially in the older adult population.

> *"I think it's great… it's definitely a work in progress and, of course, it's something new, right? So…good things take time."*

The possibility to improve social engagement was viewed as invaluable to participants who described the various issues associated with social isolation in aging populations in long-term care and community, alike.

> *I love the…I'm surprised about the ability for technology to address social isolation.*

However, after viewing Mindy and its current capabilities, participants largely understood the tablet mounted on Mindy to be the focus of the technology presented by Social Robots, rather than the robotic humanistic elements.

> *I'm just trying to sort in my head what features were unique to Mindy. I feel like the tablet was the majority of the functionality and whatever apps you have available.*

> *Mindy isn't exactly what I thought it was going to be. It was interesting to find out that it was more of an entertainment device than a social engagement device.*

There was a lack of enthusiasm that the focus of this technology was on interaction with the tablet device. Instead, participants preferred the interactive functions Mindy had, although, in its present development stage, contended that the technology was too limited to really set it apart from other similar tablet interventions.

Table 1. Similar to current tablet innovations

Illustrative Quotes
"So, I like the fact that [Mindy] is interactive, and it can be used a multitude of different ways...but I don't think it's where it needs to be at yet, because it's not any better than the [tablet] on the stand."
"I think the positive takeaway is definitely the interactive features of [Mindy] and I do think there will be [the] ability to increase social interaction and connection and communication, but then there is also the other side that I'm like, well, we do that already with tablets and other devices."
"I know that if you touch Mindy, it could giggle and stuff like that, but just being able to, you know, have a conversation… even if it is robotic-like responses - just being able to engage and interact - I think that would really put it one step ahead from where it's at?"

Participants suggested that the robotic aspects of Mindy should be more fully developed to create a realistic companion-like technology and highlighted that for adoption in long-term care, the potential for high quality interaction with the robot itself rather than with a tablet, would be necessary. Developing the technology in this direction left some participants conflicted and questioning the need for a tablet mounted on Mindy.

> *I think the technology, it almost seems like the robot and the tablet should be separate if that makes sense, you know, if there was an app that you could put on your own tablet with your own subscriptions...*

> *You could make it more lifelike and have the tablet not even visible and just have the tablet be kind of like a separate thing that's programmed by a facilitator or handler that meets the needs of an individual person depending on their communication ability, their hearing needs, their interests, their background, their age, there's so many things that you could do to personalize it and not have that artificial looking tablet even visible on [Mindy].”*

> *I'm just kind of like should the tablet be there, should it not…?*

The robotics of Mindy appealed to participants and were viewed as the foundation on which social engagement could be facilitated with residents, clients, and older adults, and some participants viewed the novelty of Mindy as a way to promote and build interest in this innovation.

Table 2. Mindy's robotics to facilitate interactivity

Illustrative Quotes
“Mindy herself being able to move and having LED facial expressions, yeah, it makes it definitely a little bit more engaging than a tablet alone.”
“It's an interesting medium to have the tablet attached to, you know, like a being with a name kind of thing. I think that does add an element that could be useful or at least has some initial luster to people because it's unique.”
“I think it definitely has some attributes that help market itself and just garner interest because it has all these entertaining elements to it and I think [these are] elements that elicit curiosity and that kind of thing.”
“The thing that made me attracted, I would say appealing is, the limbs, the movement, the smoothness of the whole thing.”

The desired interactivity level hinged on the ability to orally communicate with Mindy, with participants emphasizing the need to be able to speak with Mindy autonomously to provide a more realistic companion-like experience for users.

> *I believe that it will [be of] interest, most especially in the aged population, in terms of giving companionship, aside from watching TV, they can, for example, be there and just like open up the topic, “Hey, how are you doing?”, and then [Mindy] responds back to them. I think that would be a good idea.*

> *And like just to be able to [interact] without having to take their eyes away from the eyes of the robot…like make that eye connection, that contact, and have a conversation versus having to look at a tablet.*

Addtionally, participants voiced how unexpected it was that Mindy could not converse orally, particularly with the multitude of conversational Artificial Intelligence driven options available on phones, home speakers, and other technology platforms. With the coming voice activation

upgrades Social Robots demonstrated in a couple of the workshops, participants felt that harnessing that capability would dramatically enhance Mindy.

> *I find that quite surprising for a social robot that it doesn't have those intuitive processes, because when we think about certain technologies like [conversational AI], right, when it's connected to Wi-Fi, you have access to those [interactive voice] capabilities and so I think honestly that would probably be one of my biggest disappointments now that I'm reflecting*

> *I mean, I definitely thought it would be a little bit more intuitive…interactive… in that way and maybe the upgrade that would be coming with the incorporation of like [Artificial Intelligence software] or more of that, AI technology, [would be helpful].*

Relating to the communication functions, participants highlighted facial expressions, and gestures, as crucial cues to create meaningful exchanges between Mindy and the user.

Table 3. Developing Mindys communication abilities

Illustrative Quotes
"That's where we get so much of our information, like communication information, right? Is from facial expressions. And that's how we show that like we're engaged with people…it's how we're responding - with our eyes and our eyebrows and everything."
"Using gestures and facial expressions to express things like delight, empathy, even entertainment, like you know, "listen to me, listen to these cute sounds I make" or whatever … something that's more human right? Because like when you're looking to address social isolation, you know, throwing someone a screen and saying play these games, listen to this music, that's not addressing social isolation. That's just addressing boredom maybe to an extent. If you want to address social isolation, you need to set someone up with something that feels… fulfilling, like from a communication perspective."
"In regards to voice and also some of the other things mentioned earlier about being able to communicate empathy, connection, like maybe having that robot move its head the way that we're all moving our heads."

While participants emphasized the significance of developing and tailoring the interactive robotic side of Mindy to create a more companion-like technology, the hesitancy of incorporating more realistic-like attributes by Social Robots limited pariticpants suggestions.

> *But in terms of like the robotic side of it, yeah, I'm not really sure how much that adds to the social engagement right now since the robot itself isn't interacting with the person and also [Social Robots] doesn't want to further develop the realism.*

> *So, yeah, going down a more kind of realistic route like communication wise, if [Social Robots] is able to - you know, get the husband's voice who died 15 years ago and put it into the robot - I don't necessarily see a problem with that.*

> *I had similar experiences in long-term care with advanced stages of dementia…animatronic pet or there's very realistic babies, it gives the residents that sense of purpose of taking care of the cat or cradling the baby and that connection and that nurturing - it felt like [Social Robots] was really trying to avoid having Mindy turn into that replacement - an independent sociable thing and I think that's where I struggle to think of what could you add to Mindy… to improve social engagement without going down that road of it becoming… an artificial friend to address the social needs.*

> *There seems to be a lot of stigma around robotics and a lot of skepticism, even from [Social Robots], right? [Social Robots] saying it's creepy for [Mindy] to be real. It's still so new, there's still a lot questions around ethics and stigma around older people and their ability to interact with and benefit from this technology.*

Moving Mindy towards a more developed companion-like technology that shows responsivity, and responds (via voice activation), was highlighted as essential next steps to move this technology forward and create a more fulsome social robot to address social isolation and improve opportunities to engage.

THEME 2: EXPANDING MINDY'S LINGUISTIC CAPBILITIES TO ENHANCE CARE

Participants spoke positively about Mindy's voice and linguistic capabilities. This was regarded to be particularly useful in long-term care homes where resident populations have a variety of backgrounds and speak multiple languages. The current languages available, number of voice tones, and speed controls were met with enthusiasm, though participants suggested expanding the range of languages, citing the diversity of language and dialects in northern and rural BC.

Table 4. Expanding the range of languages

Illustrative Quotes
"The languages were fantastic although we need more!"
"One thing that I think would be especially [important] for our area… First Nations different dialects, cause there's so many different clans and languages, so I would look into that specifically just for our area."
"For languages I would look at, just area specific and make sure that we have those that are accessible so that we can cater to everybody."
"Multiple languages! Because of a lot a lot of our residents revert back to their mother tongue if English isn't their first language. So, helping us being able to communicate with our residents better that way."

Many participants liked the ability to adjust Mindy's voice tone and talking speed. Taking cues from other technologies, participants described how expanding the range of tones and voices could be useful.

> *[referring to another software]…you can choose from like 200 different voices. There's like a bad guy voice…like you can literally choose anything on those you can change like rate of speech, there's so many other attributes of speech that you can change…if [Social Robots] could harness the use of other software that's already been developed.*

Participants foresaw a multitude of ways Mindy could benefit residents with it's linguistic capabilities, including singing or reading in different languages to improve interactions with residents.

> *To be able to maybe read a book [in their] own native language. That could be something too, cause I know [a resident who] used to love to read and now [is] having trouble with [their] vision and there is a language barrier as well.*

One suggestion that was made by multiple participants was for Mindy to have the ability to translate so staff could better engage and communicate with residents. Participants described a scenario where, for example, a staff member would speak English to Mindy and Mindy would translate to the language that the resident speaks or is most comfortable with.

Overall, participants thought Mindy's language capabilities had the potential to be of value, especially in long-term care homes, and were interested to see how future modifications could further enhance meaningful interaction and engagement with residents.

THEME 3: PERSONALIZING MINDY FOR MEANINGFUL INTERACTION

After picturing Mindy with voice activation and Artificial Intelligence based conversational skills, participants proposed that personalizing Mindy with specific topics, hobbies, or interests for individual long-term care residents would be a way of complementing person-centred care.

Table 5. Personalizing Mindy

Illustrative Quotes
"Yeah, the opportunity to customize here, I think would be like really valuable."
"I think that's kind of where I'd like to see [Mindy] go a little bit to make things more personal, more relevant, more personally engaging content."
"It would be interesting to see [Mindy] programmed with special interests, that are personally relevant to the [resident] so they can, you know, talk about whatever it is, like maybe it's gardening, maybe it's something related to their career and their past…that kind of thing."

For residents or clients that have specific communication and social needs, participants saw Mindy as a useful tool to engage and support interaction in a fun and innovative way.

> *[Mindy could be] another tool that can help clients not only interact with staff but other clients as well - it would be a good conjunctive tool. Like, I could totally use [Mindy] in my morning meetings [with clients] or I could develop some different games [each] day.*

> *We have one person that's like incredibly reserved, so people tend to shy away from [them], whereas [they] could play a game with [Mindy] because [Mindy's] not going to care if [they] keep repeating the same thing over and over again, so, for that social inclusion piece - which is so incredibly important.*

> *For some people here that don't like group settings, [Mindy] would be more of a social aspect for them.*

> *It's a an attention grabber, right? It's kinda kitschy, kinda engaging in that it's something different, something new. I think that that could gain some attention and some traction with some of those residents that don't necessarily engage with other individuals. It's just another outlet or another tool that could bring them into the fold.*

Mindy also presented the opportunity for the staff in long-term care facilities to create more autonomy for the residents, via reminders.

> *To remind them that it's 2 o' clock on Thursday afternoon and it's Bingo today, to allow the residents to have more independence and maybe making them feel like they're a little bit more in control of their life instead of [staff] dictating that kind of stuff to them, you know?*

> *I would see if [Mindy] was beneficial to that person, they're gonna be less isolated, less depressed, maybe more motivated to get out and do things like if they feel like they have that... sense of independence…not actually [the staff] constantly reminding them, [instead] there's...this little gadget they're going, 'Hey, it's Thursday, 2 o'clock Bingo!'… then the [residents] are not constantly feeling like [they're] hounded. There's just that reminder.*

Participants liked the recreation applications that Mindy may offer with future developments, especially in rural or more remote areas, where recreaiton therapists may not be available.

Table 6. Facilitating recreational activities

Illustrative Quotes
"In a larger center, I think it would be a benefit for the fitness classes just to even start them, to give them something to engage…even for the singing event or even doing Bingo on a broader level."
"I love the music therapy part of [Mindy] though. I thought that was a great tool, especially if you can customize it and things like that. I thought those kind of programs would be really interesting and good for the clients."
"And especially when you have health care professionals that aren't comfortable with the singing aspect like the Happy Birthday or the Christmas carols or there's religious issues of why they don't want to do it. That's where [Mindy] could come in."

Overall, with adjustments, participants predicted many uses for Mindy to be a useful tool to enhance meaningful interaction in long-term care facilities.

THEME 4: OPPORTUNITIES TO OPTIMIZE MINDY FOR LONG-TERM CARE

All participants were experienced working with older adults in a varying capacities and settings, including long-term care. Participants stated how the demographic of residents in long-term care has been shifting as the health complexity of residents and prevalence of dementia and other cognitive impairments continue to rise. With the diversity of care needs and communications abilities of long-term care resients, participants saw need for a range of modifications necessary to Mindy to enhance the benefits and feasibility for use when interating with a more multifaceted and evolving population needs.

Table 7. Long-term care resident needs

Illustrative Quotes
"Because long-term care, we are seeing more and more complex people - we're doing a better job of keeping people at home longer… [meaning] that it would only become more challenging [because] people who are using Mindy in long-term care are going to have more disabilities and impairments whether it's physically or cognitively or speech or visually or hearing."
"I look at it from the seniors' perspective and what we're seeing now with the technology we're using right now, anyway, is that it's already kind of confusing for them."
"I think it's great. There's obviously still some work to do that would make it more purposeful for us here at [100+ bed long-term care facility]."

When discussing the logistics of implementing Mindy in a long-term care setting, participants listed design features that could be tailored to better suit resident needs. Most focus was on the tablet mounted on Mindy, with participants suggesting that the screen should be simpler, with few to no apps, bold block lettering, and colour easily distinguished by older adults, such as black and yellow.

Table 8. Considerations for tablet accessibility

Illustrative Quotes
"I also think the screen is not entirely senior friendly either just with the colors and how busy it can be. The fonts, the backgrounds, the number of apps on the screen, all of that….like when we think about many seniors, it's very hard [for them] to differentiate between different tones of colours."
"The amount of apps that are on the screen [mounted on Mindy] kind of concerns me… because I feel like that would be overwhelming…just visually."
"Even with the music, the background, it was pretty and it was nice, but for anyone with any type of visual issues or cognitive deficits a lot of the time it has to be very basic and certain colors."

Further, if using the tablet on Mindy, there was concern with the accessibility and useability for the residents in long-term care.

Table 9. Considerations for accessibility

Illustrative Quotes
"Using touch screens without tremor or with adequate vision to see the screen to interact with the screen…like I think [Mindy's tablet] is really limited to [certain] people, by ability."
"Any kind of physical access issue that you might have using a touch screen, which there's lots of issues with that…access [to the screen] for a person might be challenging if they have a tremor or they have any number of things like [a] visual deficit or they have arthritis or they have limited limb mobility. If [Mindy] can't be mounted within their range of motion and…you're trying to do something on a screen. Like there's some physical requirements that are needed there to be independent with its use for sure…"
"And my concern in terms of like tapping it. Like some people tap very hard indeed. The question now here is how sturdy… that gadget can be pushed, because…it's going to shake or tip off something..."
"I also would be concerned about the positioning of [the mounted tablet], just lighting and that kind of stuff. Is it adjustable within the robot to kind of tip down, tip up, if you're in a wheelchair versus standing, that kind of thing. I didn't get a sense if that is adjustable to kind of be a little bit more visible for them."

While some of these concerns could be avoided with the forthcoming voice activation upgrades, some participants suggested that further adjustments that could be integrated to make Mindy more accessible to those with hearing and visual impairments.

> *Hearing - you can turn up the volume, but maybe there's a way to Bluetooth it with [a residents] hearing aid or something like that?*

> *[For] facilitating the music, like having a screen next to [Mindy] with bigger [lettering]… kind of an alteration that would be helpful…not having a screen [mounted on Mindy] but having a program that works well.*

Participants enjoyed the Social Robots presentation, however participants noted that the capabilites of Mindy that were highlighted did not align well with the distinct needs of persons living with dementia.

> *There's a proportion of people in long-term care with cognitive decline. I think that [this presentation] was an under-representation of how it actually is, I think [the Social Robots presenter] was kind of emphasizing the features of the device that are for people who are cognitively well.*

> *I think… I guess with dementia, I just know that you have to be very responsive in the moment [snaps fingers]. Because I love what she's doing, I think for a certain group of people, like maybe… ones that are cognitively able.*

> *In dementia care - trying to make things as familiar as possible. Having things sort of intuitively look like their purpose. So, perhaps in our rural communities robotics would be quite unfamiliar. Just overcoming that barrier and that introducing it properly or trying to find an interest in in engaging with a robot. I don't know if that would be a problem?"*

> *She did a good presentation. I like what she's doing. But I am just thinking for our particular clients [with dementia]. Yeah, I think it might…. I just have questions.*

Participants spoke of the very specific communication and care needs for those living with dementia. For Mindy to be used in dementia care some participants suggested collaborating with dementiability experts and crafting a deliberate plan for further development.

Table 10. Mindy and dementia-based care

Illustrative Quotes
"I'm thinking early-stage Alzheimer's, early stage dementia, maybe they would be able to follow and on another given day they may not be…would it be more confusing?"
"Any And especially for someone with dementia…having hearing issues or vision problems especially too, that could be super confusing and then my concern for the individual use, as well, if they hit a wrong button and all of a sudden it's an angry face and their arms are waving around and now they're throwing it because they're scared of it."
"AI makes me nervous with [persons living with dementia]…because you don't know what's being said or done with the robot and then you don't know what they're doing and then if they're going through a sundowning episode with that and then they're having visions or anything like that, right?"
"Yes, like are they gonna wanna like smother this robot and then it breaks, or are they going to want to be comforting or are they gonna find it terrifying?"

In this context, participants found that the robot handler could be of benefit to facilitate interaction for the those living with dementia

> *I think it would be a lot more interesting if you weren't having to type out exactly what the robot was saying, but I think for people with dementia, that's a really good way to have some control over the interaction.*

Cultural competency and safety, as well as inclusive design, was highlighted as essential in the next steps of Mindy's development for long-term care, and the broader population of older adults.

Table 11. Culturally safe and inclusive design

Illustrative Quotes
"As an aside, there are culturally safe considerations that would be beneficial to look into when promoting technology that is expected to benefit all clients in care, including our Indigenous population."
"It's such a conscious effort to think about how, even something as simple as the design and, you know, this robot is white, but decolonizing practice takes a lot of effortful thought."
"[in reference to the pink portion of Mindy] I did feel like the paint color was obviously binary in today's context of inclusivity…I think it's unnecessary."

Together, in discussing the accessibility, inclusivity, and useability of Mindy in long-term care facilities especially among populations requiring specialized dementia and memory care, participants suggestied a variety of considerations and alterations that could enhance Mindy to better meet the needs of these residents.

THEME 5: EXPLORING NORTHERN & RURAL IMPLEMENTATION

When discussing the implementation process for new innovative technologies in long-term care facility settings, participants described a variety of barriers impacting the capacity and ability to adopt new technology. These concerns included staffing concerns, budgetary considerations, infection control policies, and privacy comprehension relating to technology. These concerns were identified as the main priorities to be addressed when any new technology is being considered for adoption.

Participants saw Mindy as requiring a lot of facilitation, and when considering the multiple staffing challenges currently faced by long-term care facilities in northern and rural BC, including low staffing levels, high turnover rates, and heavy workloads, the need for a robot handler was perceived as restrictive and a significant barrier to adoption.

> *"I was hoping for it to be a little bit more autonomy, not necessarily that you could send it down to a room, but even if we have a staff bring it down to a room and kind of get somebody started with the robot, but I feel that the staff is stuck with the robot, so if the staff is stuck with the robot, the staff could engage the residents without the robot, I guess is what I'm trying to say."*

> *"For complex care, my idea would be that the robot would make lighter work. So, basically we could program the robot to you know, go remind people at 1 o'clock that Bingo's at 2:00. And then, you know, but you have to have somebody with you. So, what's the point of having this reminder and then you're still having to have this person operate the reminder."*

With Mindy necessitating a robot handler, the ability for a facility as a whole to sustainably implement this technology would be dependent on staffing and workload levels.

> *I know in our long-term care sites are extremely short staffed. I am not a 100% sure how helpful it will be to us even if a robot were given to us tomorrow. I don't know how much it would really benefit us because from what I understand it still would take staff time to implement the robot. So, I'm not sold that it's going to be a win-win for us at this point.*

> *You're adding an extra job on to someone who's already busy because they had to take [Mindy] around. That, to me, is an extra job for someone.*

Building on these concerns, participants also highlighted how staffing levels and infrastructure may affect the opportunity for residents to access Mindy when a handler is needed.

Table 12. Staffing challenges impacting tech implementation

Illustrative Quotes
"I know that a lot of times this type of thing does get unofficially added to an occupational therapist or rec [therapists' role], but then equitably speaking, is that really fair because a lot of sites don't have occupational therapy or recreation therapy or an activity worker, then there's just never the opportunity to have something like this."
"The other thing that I would add on to that too, [the need for a handler] kind of pigeon holes [accessing Mindy] between Monday to Friday, 8 to 4, kind of thing and then weekends or even when staff aren't around, it's not available or accessible to them."
"It's also, you know, ease of use and its ability to more seamlessly integrate into a facility, especially like others have mentioned in those sites where there's not as much staff where there isn't going to be somebody who can really champion it or follow up."

While many participants suggested having a champion to support the implementation of Mindy, others concluded that the high staff turnover would limit consistent and sustainable use.

> *It takes time out of a day that is not available and then also it can't be champion specific because of churn and turnover in the organization.*

> *You get a champion on it, which is great, but we've had such high turnover that you get a real keen person who's really pushing it and that person takes another job and then you know the robot sits in the corner.*

Foreseeing the emergence of numerous new AgeTech products such as Mindy, in the coming years facing similar obstacles, participants pictured need for a dedicated facility staff member designated to support the implementation in long-term care facilities.

> *So, you need a role that has that responsibility and scope to oversee that kind of thing and I mean, maybe that would be a really cool job for some people, but I feel like it needs to be attached to a role. It can't just be an adjunct, add on to people that are already working to their full scope.*

> *I think personally to do it in a sustainable way in a health authority setting is like it needs to have its own staff, like you know how there's rec therapy and OT, like you need technology therapists or something and I'm curious if that's going to be kind of a future role in health care because setting those personalized programs and limitations and stuff.*

In reflecting on the costs associated with Mindy, participants clarified that the overarching constraint to implementing and sustainably operating this technology would be the subscription costs.

Table 13. Subscription-based services cost prohibitive

Illustrative Quotes
"And so there was a number of super interesting, really cool, different technologies that we could implement into practice and the difficulty that I ran into and in speaking with upper-level management is that it's not just the initial cost, it's that it also requires budgetary allowances for continued access to service to the subscriptions."
"And the other thing that stuck out to me was the price point and the fees per year. In particular, as a non-profit, getting funding for [amount of $] might not seem a lot in a year but if we are doing it every single year, it's a lot of work on our part, and it's so hard to get that and it's not always guaranteed so it would be really horrible to purchase a robot or get funding for the robot and then not be able to fund the apps on it…"
"It's less than some other technology that people have suggested, but that's always an issue that I point out because I have to obtain the funding and I can find it from somewhere but it's not always guaranteed and that's terrible to take on something that costs so much money and then maybe not be able continue due to subscription [costs]."

Further, participants were divided on the operating system of the tablet as many of the long-term care facilities currently have a specific type of system, and costs to switch over would hinder useability and acceptability. Making Mindy seamlessly available on both operating systems would expand useability in long-term care facilities across northern and rural BC.

In outlining the logistics of using this technology in long-term care homes, participants focussed in on infection control guidelines. Participants questioned if Mindy would meet the current infection control policies and noted that a strategy would need to be put in place.

> *Infection control has been quite stringent and protecting our care homes and has limited a lot of things in the past for that reason. I know she said you'd wipe it down with a disinfectant wipe, but…*

> *I think it's against infection control because you can't sanitize it properly. Lots of little bit pieces, there's lots of creases and creases within the robot, itself.*

> *Obviously the infection control…it's something to consider as well or whether or not that tablet could pop out for cleaning, being a case, that kind of thing.*

> *And then I think probably one of its biggest issues is that it doesn't currently meet infection control and it would take some time in order to come up with a plan where it would.*

> *You would need a UV light disinfectant machine, [but] they're not cheap.*

Further, some participants voiced concern over the robustness of the material the technology was made from.

> *I was just wondering if she's really tested it with our Virex® wipes, they're quite strong and can really deteriorate a lot of materials when used over and over again even a lot of our medical equipment… we shortened their life using those wipes over and over again.*

Participants highlighted ongoing trepidation when introducing technology to older adults. Concerns around cameras, being connected to WiFi, and specifically robots were discussed.

> *I am also worried for the elderly that have the paranoia, and mental health concerns, with [Mindy], I have worries and serious concerns some of the older adults have with being 'spied on', or followed.*

However, participants contended that with accessible information and understanding for residents and staff alike, privacy concerns could be addressed and potentially minimized.

> *I think better understanding about who has access to, where that information is stored, and who can access the network…I think there are a lot of safeguards that are probably are in place. And that there is some degree of protection but having better understanding of that.*

> *And socializing those issues with staff in a in a comprehensible way. Like, I kind of feel the privacy language is not very accessible, so, there's a lot of just trust. We know what we're doing kind of thing, but I think a little bit more ….. meeting people where they're at with privacy concerns and having that open dialogue would improve our knowledge and then comfort with what's possible instead of kind of exploring what ifs and what could be. So I think some like deliberate dialogue about those issues to improve understanding and then maybe identify gaps, right?*

As well, participants put forward that a technology like Mindy could help older adults become more familiar and comfortable with technology in general.

> *[Robots, like Mindy] are a good gateway to technology, especially for people who don't even use a cell phone, because they're afraid of technology. This could be a way to [introduce them], if it's simple to use.*

> *Yeah, for me [robots, like Mindy] brings [older adults] closer to technology. So, it's part of their, I would say, engagement when it comes to complex things like, voice activation, it will be something new, a new learning experience for them to learn to adapt when it comes to [technology].*

Overall, participants discussed a variety of considerations to be made when implementing a new technology, like Mindy, and agreed that a trial or pilot would be the best route to understand these potential barriers and plan around them.

> *I think if there's a free trial for [Mindy], for example, for a week or 2 weeks and if it's showing a lot of…usability in the care setting…you'll see results…and I believe that getting firsthand experience with Mindy…, I think it will be a good learning [for the] the company as well as the organization handling [Mindy].*

> *There's some unknowns with [Mindy], right? I think the demonstration probably doesn't do it justice. I think it would be one of those things that you would want to get into the facility and try.*

POST-SURVEY

Overall, participants really enjoyed learning about Mindy in the presentation by Social Robots. Participants described the format of the workshop as interactive, well facilitated and paced, and they appreciated the opportunity to ask questions, and the open forum discussion without Social Robots present.

> "I really enjoyed the presentation and think the robot can be developed further to be more successful in long-term care. I also think in a few years from now, we will have more residents who are more tech savy and would be more receptive to this."

While some participants were unsure who Mindy could benefit at the present, most participants indicated that older adults, and those experiencing social isolation, may benefit from Mindy. A majority of participants could not see using this type of technology in their professional role.

Many participants indicated that in its current state, Mindy is not functionally ready to fit the needs of older adults or persons living with dementia in long-term care facilities or in community. Participants reported that with modifications, specifically developing the robotic/interactive aspects, there was potential that Mindy could be beneficial in the future.

> "This is an interesting frontier in technology and health care. I am looking forward to following how the functionality of social robots Mindy evolves and its impact on health care experiences and outcomes."

Summary & Recommendations

This report presented the perspectives of northern and rural healthcare professionals who participated in ADEPT Workshops featuring iPal2 Mindy by Social Robots. Through qualitative analysis of the facilitated workshop discussions, five themes were developed and included: 1) Still Loading …Suggestions to Ready Mindy for Use, 2) Expanding Mindy's Linguistic Capabilities to Enhance Care, 3) Personalizing Mindy for Meaningful Interaction, 4) Opportunities to Optimize Mindy for Long-Term Care, and 5) Examining Northern and Rural Implementation.

The following are a list of recommendations based on the findings of this report for northern, rural, and long-term care facilities:

- Consider the purposeful development of Mindy into a more companion-like technology by augmenting the robotic aspects of the technology
    - Need to clarify technology identity: is Mindy to be a companion-like technology or an entertainment device?
- Integrate more autonomous features – voice activation and conversational Artificial Intelligence informed capabilities to create a more fulsome companion-like technology
- Expand functionality of Mindy to include more personalized realism
    - Consider expanding the emotional, communicative, and physical abilities, along with facial expressions/gestures
- Enhance opportunities to connect with a diverse range of end-users by incorporating more language options
    - Inclusion of Indigenous languages was noted as important to augment accessibility in northern and rural BC
- Increase linguistic capabilities (i.e., translational abilities) to better support communication between Mindy and non-english speaking end-users
- Expand range of voice tones and settings to better customize to each end-user
- Develop customizable settings which can be adapted to context (i.e., incorporate personalized 'profiles' for each end-user or setting)
- Partner with diverse stakeholders, using an 'accessibility-first' process, to tailor design aesthics to be more inclusive, relating to gender, ethnicity, age, and ability
- Ensure that all developers are well versed in the needs and abilities of persons who live in long-term care (i.e., require developers to take a dementiability course to understand how best to tailor functionality of Mindy)
- Integrate dementia and older adult friendly characteristics into the functionality of Mindy (i.e., for tablet component: update colours for those that are living with dementia, less apps, simpler screen, integrate voice command capabiltiies)
- Collaborate with older adult health and hearing care professionals to integrate more accessibility with Mindy (i.e., Blue tooth to hearing aids)
- Consider option to have a remove tablet mounted on Mindy, or make it removeable for accessibility and adherence to infection control policies
- Develop a comprehensive guide with strategies for introducing Mindy to residents with different abilities

- Collaborate with long-term care policy stakeholder to better understand infection prevention and control requirements (i.e., something that can be easily cleaned and disinfected)
- Create a catalogue of activities/functions that Mindy can support
    - Include specific catalogue for how to use Mindy to support persons living with dementia

Taken together, the findings drawn from this report reveal Social Robots iPal2 Mindy to be of interest to older adult health care providers in northern and rural long-term care facilities and communities in BC. That being said, at Mindy's current stage of development, there are many opportunities to improve the technologies functionality, useability, accessibility and design inclusivity before considering implementation advancement in long-term and dementia care settings. By undertaking the purposeful development of Mindy into a more autonomous, companion-like technology, through robotic augmentation and realism integration, while also using an 'accessibility-first' co-design process, Social Robots technology has the potential to facilitate and support meaningful interactions and engagement in older adult populations and long-term care facilities in northern and rural BC in the future.

NEXT STEPS

- Report findings will inform the development and implementation direction for Social Robots
- Considering further trials to evaluate both staff acceptance and workload impact, as well as resident use, in northern and/or long-term care facilties would be necessary to provide an evidence-base implementation plan with adequate organizational support for sustainability

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