



Gerontechnology: The Pros and Cons of Apps, Robots & Other Devices for Connected Aging

Why Gerontechnology?

Older People Outnumber Younger People

Statistics Canada (2019) reported that for the first time in census history, the 5.9 million people over 65 years of age outnumber the 5.8 million children under 14 years of age in Canada. By 2031, the number of older people will reach 23% making Canada look very much like present day Japan –the oldest country in the world. The increase in the share of the oldest Canadians was even larger — up 19.4% for those over 85 and up 41.3% among those over 100. By 2061, there could be 12 million older people to 8 million children. People are living longer while women are having fewer children later in life.

Age Variation across Canada

The age structure varies across Canada (Statistics Canada, 2019).

- **Atlantic Provinces:** Because of low fertility rates, low immigration levels and outward migration to other regions of Canada, almost 1 in 5 people in the Atlantic Provinces was 65 years of age and older—the highest proportion in the country.
- **Quebec:** The proportion of seniors in Quebec (18.3%) was above the national average (16.9%).

- **Ontario:** Because of immigration, the proportions of children (16.4%) and seniors (16.7%) were similar in Ontario.
- **Prairies:** Higher fertility and immigration, and in the case of Alberta, the migration of people from other provinces mean that there are more children than seniors and more millennials (15 to 34) than baby boomers.
- **British Columbia:** The proportion of seniors was 18.3%. In comparison to other provinces in Western Canada, BC had the lowest proportion of children 14 years of age and younger.
- **Territories:** The territories have the youngest populations in Canada. In Nunavut, nearly one-third (32.5%) of the population was 14 years of age and younger and only 3.8% of the population was 65 years of age and older.

Independent Living at Home

What do these demographic shifts mean for older people who wish to live independently at home in their communities, and in particular, in rural communities? Falling birth rates, smaller families, greater mobility, and women's increasing participation in the paid work force mean fewer family members will be available to provide everyday supportive care. In rural and remote areas, the population outflow may be even more dramatic as young adults and potential carers leave to follow education and jobs in cities.

For example, a majority of older people in Toronto, Canada's largest city, judged their general health as good, very good or

excellent. Yet, over a third (39%) reported a physical or mental disability, and just under a third (27%) said that they needed help with one or more daily tasks including preparing meals, doing housework, personal care, going to appointments, running errands and paying bills. Moreover, 20% reported that they had difficulties with mobility, including having trouble walking, needing equipment to walk, needing a wheelchair, and needing help from other people (City of Toronto, 2017).

Research conducted by the Canadian Mortgage and Housing Corporation (2012) concluded that 85% of Canadians over 55 want to age-in-place regardless of changes in their health conditions. According to the 2011 Census of Population, of the nearly 5 million seniors over 65 years in Canada, 92% lived in private households (as part of couples, alone or with others) while 7.9% lived in collective dwellings, such as residences for senior citizens or health care and related facilities (Statistics Canada, 2012). These proportions were relatively unchanged since 2001.

With an aging Canadian population, increasing mobility of young people and smaller families, who can provide supportive care?

The “Pros”: Independent Living with Help from My App and Other Smart Devices

The emerging field of “gerontechnology” may enable older adults to continue to live independently for as long as possible, to empower self-management of their health, and to stay connected to their community while reducing caregiver burden on family and friends.

Some technologies designed to support older people to live independently already exist. We can point to apps for monitoring health conditions and vital signs; devices for detecting falls; systems to dispense the right medication in the correct amounts at the right times; pressure sensors under the bed that can tell if someone is lying down. There are

also numerous ways that houses can be “smart,” including voice controlled lights, doors, television with technology similar to home alarm systems, motion detectors, flood sensors, and fire alarms.

Smart phones, laptops and social media can enable older people who live alone to keep in touch with friends and family. Technology can also connect to an older person’s phone so that the family members can track where their loved one has gone and for how long.

In 2016, Ontario became the first province in Canada to test fully driverless vehicles, part of a 10-year pilot program. Such automated vehicles are capable of detecting the surrounding environment using artificial intelligence, sensors and global positioning system coordinates. Automated and connected vehicle technologies have the potential to enable independent living by facilitating the mobility of older people. On January 2019, Ontario updated its Automated Vehicle Pilot Program to promote new automated and connected vehicle research, development and manufacturing opportunities (Ontario Ministry of Transportation, 2019).

Other technologies such as rehabilitative robotics for post-stroke and cerebral palsy therapy, robots that provide personal care, do household chores and play chess are currently under research and development, with the expectation that they will revolutionize home and community care for older adults.

To what extent can apps and robots relieve some of the caring responsibilities of family and friends or even substitute for the decreasing numbers of family carers?

Personal Assistive Robots

According to a report released by the Standing Senate Committee on Social Affairs, Science and Technology (2017, p.10), robotics is an active area of research in Canada. Committee members heard that personal assistive robots can help individuals with their activities of daily living such as grooming, dressing and preparing meals, and, can be socially interactive for cognitive stimulation and companionship. Such robots could be in the private homes in significant numbers within the next 5 to 10 years, as industry works to bring down the cost to \$5,000 or less.

Meet Pepper



Photography by author (Janet Lum).

Pepper is an emotionally intelligent humanoid developed by Aldebaran for SoftBank, a telecoms and internet giant. Although Pepper was originally designed to serve as an information kiosk at shopping malls and airports, it now has an expanded job at long-term care facilities. For example, at Shintomi nursing home in Tokyo, Pepper leads exercise activities and “sing alongs” for a group of older residents. When Pepper is not running exercise classes, it talks to patients and monitors the corridors at night.

Pepper is able to sense happiness, joy, sadness, and anger and respond accordingly. It rolls up to you, raises its hands in greeting

when you introduce yourself, and turns its head toward you when you move or talk. A robot that has a human shape and can respond to human cues as well as providing care and reminders can potentially improve the quality of life and extend the independence of older people.

Meet Romeo

Aldebaran’s next generation of humanoid robots is Romeo who stands at 4.5 feet and weighs 88 pounds. His job is to ensure that the people it interacts with stay safe.



[Photograph by Softbank Robotics Europe](#), distributed under a CC BY-SA 4.0 license.

Romeo is to be the “perfect companion robot”, particularly for older people or people with disabilities. He is able to open doors, climb stairs, retrieve a book or a cup of tea from the table, walk with clients while protecting them from falls, remind them to take their medicine, and generally assist in the tasks of daily living. Romeo can also recognise faces and facilitate social interaction.

Paro



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There is also the fully rechargeable Paro, an advanced interactive therapeutic robot modelled on a baby seal developed by the Intelligent System Research Institute of Japan's National Institute of Advanced Industrial Science and Technology (AIST).

Why design Paro after a baby seal? A baby seal would not likely elicit any sad emotions associated with negative memories. Paro is soft and fluffy with sensors across its body so that it can respond to touch and sound. Paro can turn to clients who talk to it, flash its long eyelashes over big black eyes, and nuzzle in the arms of older people who stroke its soft, fluffy body while making baby harp seal sounds.

Paro is credited with improving mood, relieving stress, helping those with dementia feel more socially engaged and potentially replacing anti-anxiety medication (Kunkle, 2008). Unlike real animals, Paro will not trigger allergies, be unpredictable or require feeding and cleaning (Kovacs, 2014). Paro has now made its way to the Centre for Addiction and Mental Health (CAMH, 2014) to help care for people with dementia and depression.

The “Cons”: Issues and Concerns

Can Pepper or Romeo offer the same level of emotional connection as family and friends?

Beyond the practical instrumental tasks, family and friends who provide care can do much to enhance the quality of life of care recipients. The cup of tea, spontaneous songs, game of cards or informal conversations that invariably accompany mundane tasks can offer vital emotional support and companionship. Such interpersonal contact and social connectedness can help relieve social isolation among older people, while promoting their psychological as well as physical wellbeing.

Countries around the world are increasingly identifying social isolation and loneliness as a public health concern leading to adverse mental and physical health effects. A national survey conducted by researchers for the AARP Foundation found that 35% of Americans age 45 and older experience loneliness. As health declines, the rate of loneliness among midlife and older adults increases: 51% of midlife and older adults who consider their health to be fair or poor are lonely in contrast to 27% who believe their health to be excellent or very good (Anderson & Thayer, 2018).

Recently, the UK government launched its first “loneliness strategy” with the appointment of the world's first Minister for Loneliness in January 2018, largely in response to reports that more than 9 million people in the UK experience loneliness to the detriment of their health (Jo Cox Commission on Loneliness, 2018; John, 2018). Doctors in the UK will also be encouraged to write “social prescriptions” for friendship that will refer patients to activities that can help tackle feelings of emotional isolation (Harris, 2018). The rationale is that prescribing patients to take up baking, dancing, creative painting, tai chi or any new activity to meet other people will do more than antidepressants to enhance health and wellbeing. The idea of “social

prescriptions” for friendship highlights the critical importance of the spontaneous social interactions that invariably occur during the course of informal caring.

No matter how “humanoid”, the concern is that Pepper and Romeo may not be able to fulfil the social needs of older people for an active social life and in fact, increase social isolation.

“Eyes Wide Open”: Privacy and Ethical Concerns

The Standing Senate Committee on Social Affairs, Science and Technology (2017, p.21) cautioned Canadians not to sleepwalk into a new world of smart devices without attention to ethical and privacy concerns. Will people’s privacy be protected?

Assistive robots programmed with artificial intelligence software (AI) working in homes or long-term care facilities will be constantly monitoring the individuals they have been programmed to help. Doing so relies on the client’s existing health data while collecting and aggregating considerably more data. What data will be collected? Will the data collected be encrypted and properly anonymized? Who will grant permission to use the client’s data and under what conditions? How long will that data be kept? How can we protect robots from being hacked?

There is the added concern that robots may remove decision-making authority from clients. What is the balance between a person’s autonomy and safety? For example, if Romeo’s client refuses to take her medication at the prescribed time, what are the options? A personal support worker may respect a client’s autonomy, wait and try again later depending on the time sensitivity of the medication.

Carebots can potentially make decisions that may be ethically unacceptable. Current debates wrestle with ethical decisions regarding driverless cars. For example, should the car hit a group of children who have distractedly run onto the road in front of the car to protect the one passenger in the car? To give another example, what are the ethics behind autonomous weapons that save the lives of a country’s citizens but may kill civilians on the ground? Can carebots be “taught” ethics? Is it possible to “program” all ethical contingencies (Sharkey & Sharkey, 2010; Torresen, 2018).

With the increasing numbers of apps, personal assistive robots and other technological devices for providing care, coupled with the decline in carers, we need more research, evidence and discussions around how to optimize the use of gerontechnology to enhance independent living while promoting the social and physical wellbeing of older people in a safe and ethical way.

Cite as:

Lum, J.M. & Koch-Fitsialos, A.R. With assistance from Alvin Ying (March, 2019). Toronto: ON, Canadian Research Network for Care in the Community. www.crnc.ca

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