As the Canadian healthcare system faces increasing pressures and demands to meet the needs of an aging, socio-economically variable, and geographically dispersed population, telemedicine is often looked to as a key part of the solution.

The sophistication and reach of telemedicine is evolving. While telecare (telephone-based care) was once at the forefront of telemedicine, technology advancements have paved the way for the introduction of new technology applications in healthcare, including:

- **Videoconferencing** – the use of video to connect people in two different locations typically for the purpose of patient visits, physician-physician consultations, patient-physician-specialist consultations, or educational use.
- **E-consultation** – the use of technology to capture information (data, images, etc.) and forward it to a specialist for review and feedback.
- **Telehome monitoring** – remote monitoring of vital statistics, often supported by telecare for the purpose of periodic follow-up and/or check-in in the event of abnormal results.

From a primary care perspective, these advancements are often viewed with cautious optimism. Telemedicine is seen as having the potential to ease geographic, financial, pain, mobility and other barriers to care. This is commonly seen as an important opportunity to address two dimensions of the Triple Aim, namely improving the patient experience of care and improving the health of populations, particularly for the elderly and rural and remote communities. At the same time, the ability of telemedicine to address the cost component of the Triple Aim is unclear. Further, privacy, confidentiality and safety questions; lack of clarity regarding credentialing, liability and billing; and impacts on patient attachment are often cited as areas of concern with respect to telemedicine.

As the use of telemedicine applications becomes more pervasive, awareness builds in healthcare and patient communities, and pressure to implement interventions that have had seemingly successful results mounts. In this climate, the importance of understanding the current uses, benefits, challenges, barriers, opportunities and risks of telemedicine becomes of key concern to those seeking to access and provide primary healthcare.

### Telemedicine

A variety of definitions and forms of telemedicine exist. In general, telemedicine refers to the provision of medical expertise or services via telecommunication or information technology when the patient and the provider are separated by distance.

### The Triple Aim...

...is a framework developed by the Institute for Healthcare Improvement (IHI) that simultaneously pursues three dimensions:

- improving the patient experience of care (including quality and satisfaction),
- improving the health of populations, and
- reducing the per capita cost of health care.

Each dimension must be fulfilled to achieve the Triple Aim. (1)

For the purpose of this paper, a literature search was conducted to respond to the question, “What is the current state of telemedicine – what studies exist in the area that impact family practice and what conclusions do they draw?” The resulting paper provides insight into the current uses of telemedicine and the state of telemedicine research. Potential benefits, challenges, risks and opportunities of telemedicine are discussed.
A 2014 Price Waterhouse Coopers LLP (PwC) report found that “nearly two-thirds of Canadians would consider using virtual health options in their own care or for someone they care for.” Evolution and ongoing advancements in technology are making this possible and patients have embraced healthcare technologies. According to a June 2014 article in the Vancouver Sun, telemedicine visits covered by the Medical Services Plan have grown 735% in the last year alone.

The 2013 Canadian Telehealth Report: Based on the 2012 Telehealth Survey found that, “Telehealth continues to be an area of rapid expansion both in the volume and types of services provided for healthcare and health education delivery in Canada.” Services most commonly delivered by Canadian telehealth include:

- mental health (psychiatry and psychology) (13 provinces/territories),
- cardiology, endocrinology (diabetes), genetics, oncology (12 provinces/territories), and
- chronic pain, neurology, rehabilitation (occupational therapy), and rehabilitation (physiotherapy) (11 provinces/territories).

Telehome monitoring and videoconferencing were discussed in the report in detail, with interesting results. Five provinces/territories, including BC, reported the use of telehome monitoring. Surprisingly the growth of home telehealth (monitoring) was much less than the overall growth of telehealth. This was not expected given the growth of chronic disease in the Canada.

**BC uses videoconferencing for staff-to-staff interactions, with patients for education, with patients for clinical consultation, and to access meetings.**

Videoconferencing was an area of significant growth in telehealth services, likely due to increasingly affordable technology and integration into everyday communication. BC reported the use of videoconferencing for staff-to-staff interactions, with patients for education, with patients for clinical consultation, and to access meetings. HDX400 and Movi/Jabber were the most popular videoconferencing technologies used in four provinces/territories, including BC.

In addition, BC local news coverage has highlighted the use of such locally developed videoconferencing technologies as Livecare, a system most recently introduced to the rural, remote community of Taylor, BC in June of 2014. At a Livecare visit the doctor is not physically present. A specially trained medical assistant allows the patient to meet with the doctor using a computer (videoconference) and medical peripherals to collect vital signs, heartbeat, lung sounds, and more.

Medeo, another locally developed telemedicine solution, uses a video connection to connect patients to their own GP (if he or she is registered with the system) or another GP (if not), and is available on the Claris Companion (a tablet device) for seniors. This type of virtual visit is similar to one conducted via Skype, which is another method of delivering telemedicine in BC. Skype, like Facetime, is encrypted and is acceptable to use with consent.

Telus Health is another telemedicine solution noted in local literature. Telus Health services are varied and include, among others, videoconferencing and remote patient monitoring.
The State of Telemedicine Research

Reflective of the rapidly changing face of telemedicine, the research demonstrates a movement beyond telephone and email applications to address a wide range of medical needs. A search conducted through the College of Physician & Surgeons of BC Librarian for publications (all types) from the last four years yielded a total of 68 telemedicine sources related to primary care; 64 were provided in full text.\(^{(24)}\)

Videoconferencing was the most dominant telemedicine vehicle addressed in the sources obtained (~31% of sources focused on videoconferencing specifically). This was followed by telehome monitoring and e-consultation (without a video or phone component). Other investigations examined combined or multiple interventions, Web 2.0 portals, etc.

Telemedicine investigation was most commonly applied to mental health, long-term and chronic medical needs such as cardiology, diabetes, nephrology, oncology, chronic pain, neurology, and rehabilitation.

The sources provided by the College focused on a range of themes including: understanding the use, benefits and barriers of telemedicine; effectiveness of telemedicine interventions on patient conditions; impact on healthcare system use; and patient and/or practitioner satisfaction. Noticeably lacking were investigations of cost effectiveness.

Further limitations included small sample sizes (~18% of studies had sample sizes of 20 or less, and ~33% of literature reviews/meta-analysis had 10 or fewer final sources), qualitative and anecdotal sources, and short-term or one-time measurement.

Given the evolving nature of telemedicine and its applications in family practice, these findings may not be surprising. There is a recognized delay between the initiation of a telemedicine program/initiative and the gathering of sufficient data and/or patient and practitioner experience to conduct meaningful research investigations.

At the same time, the sources provided, supplemented with additional resources from a general internet search, can be useful to providing initial thoughts about perceptions, benefits, challenges, risks and opportunities of telemedicine as it becomes a more pervasive part of the Canadian and BC healthcare system.

Virtual Visits

According to Telehealth Benefits & Adoption: Connecting People & Providers Across Canada, Canada is a world leader in the use of telehealth video technology – meaning it is both well developed and well used. The ability to facilitate education, enhance coordination of care, and enable provincial and territorial emergency management responses (e.g., SARS, H1N1) are examples of video technology applications.\(^{(22)}\)

As videoconferencing becomes a more accessible and common part of daily communication, interest in telemedicine applications can be expected to grow.

Virtual visits between patients and clinicians over videoconference bring to the forefront privacy and security concerns not relevant in traditional face-to-face encounters. These include concerns about network security and involvement of others in the consultation process (e.g., IT support).\(^{(4)}\)

According to a 2013 Canadian telehealth report, nine provinces/territories, including BC, currently have videoconferencing policies and procedures in place. These address topics such as:

- session security from non-authorized viewing,
- ensuring each participant knows their role, and
- correct use and operation of equipment.\(^{(4)}\)
**General Attitudes Toward Telemedicine**

In general, telehealth is seen as a reality of the future. From a practitioner perspective, it is seen as a supplement to traditional care, not a replacement.[15, 16, 17]

Most GPs readily accept a potential role for new technologies in communicating with patients about simple matters (e.g., appointment reminders, routine lab results, ordering repeat medication). While many do not see an immediate necessity to increase non-face-to-face consulting, many predict a future role in easing practice administrative tasks and providing a complementary information service for patients. However, some GPs are reluctant to consider consulting with patients using new technology, and most still feel face-to-face is central to quality care and job satisfaction.[18]

From a patient perspective, satisfaction results tended to be positive and related to the benefits spoken to in much of the research.[19, 20] In a study of the feasibility of nephrology services provided via videoconferencing to remote communities in Ontario, patient responses were overwhelmingly positive; they wanted telemedicine to continue, and some indicated that they would discontinue follow-up care if they had to travel to Ottawa in the future.[20]

Even patients who had not yet accessed telemedicine tended to view it positively and recognized a number of potential benefits.[2, 21]

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**Telemedicine: Perceived Benefits**

The most widely recognized benefit of telemedicine is its ability to improve equity of access to healthcare services. Typically, the literature focuses on applications for rural and remote communities, with First Nations being a key area of study. Financial, geographic and weather barriers, and challenges recruiting and retaining community-based professionals are among the common barriers to rural and remote care that telemedicine is perceived to address.[23, 24]

Pain, mobility limitations and other medical conditions (e.g., mental/psychological conditions) are additional barriers to access that patients and/or practitioners felt could often times be overcome with telemedicine.[12]

By allowing patients to remain in their homes and their communities, telemedicine is seen as facilitating the ability to involve care networks in patient care, keep patients connected to their support network, and to avoid stresses caused by changing environments (e.g., when shifting from a rural to an urban atmosphere).[24, 25, 26]

Consequently, telemedicine also reduces time, costs, and inconveniences related to patient and healthcare provider travel.[15, 24, 25, 27, 28] In many cases of telehome monitoring, the assessments conducted may take minutes to perform, while the time to travel to, and interact with, clinicians is of much greater duration. A pilot project of telecardiology on Vancouver Island avoided over 5,800 km in patient travel and associated costs, and over 1,600 tonnes of carbon emissions in the first six months.[19]

Telemedicine’s ability to facilitate optimal use of healthcare resources is often seen as another benefit. Telemedicine’s ability to reduce wait times is commonly associated with reduced time to access specialist care as a result of telemedicine referral processes such as e-consultations and video consultations.[23, 24, 27, 28, 29]

Telemedicine consultations and telehome monitoring both impact hospital admissions and other healthcare visits. Studies have found that patients with longer wait times tend to visit their GPs more often; telemedicine consultation can assist with this.[26] Telemedicine specialist consults can reduce wait times by 30% to 50%, and studies have found face-to-face visits significantly avoided due to e-consultation and video consultation (at an average of 30% reduction according to one study).[27, 29, 30, 31, 12]
In a study of the management of congenital heart disease in Western Canada, video consultation was found to alleviate the need for pre-procedural consultation. In other cases, telemedicine may highlight the need for in-person consultation. One study of telenephrology (e-consultation) found that a family physician would have treated 79 patients presenting with potential reasons for referral in primary care; the specialist deemed referral necessary for 10 of these patients.

Telehome monitoring also makes an impact on healthcare visitation because it makes patients more aware of their own health status. In the event of abnormal telehome readings, telecare advice is typically available. This can inform the patient of the appropriate course of action, which may be minor changes to care that can be made in the home. Telehome monitoring helps patients gain expertise in their condition, leading them to change behaviours they otherwise would not. Telemedicine's educational benefits can also extend to nurses and physicians. Nurses often see their role in telehome monitoring as a way to increase their ability to communicate with physicians.

Encounters between patients, their GP/nurse practitioner and specialists via videoconference are also recognized for their potential educational role; helping primary healthcare providers to increase their clinical skills and understanding of specialty areas, and specialists to develop a better understanding of front-line practice. E-consultations between physicians have found similar positive effects for professionals.

Additional benefits of telemedicine noted in the literature include increased coordination and communication of care across geographic boundaries, timeliness of care and data (e.g., telehome monitoring provides data over time versus during a single office visit), increased convenience and faster access to healthcare, more candid disclosure of information (e.g., due to a perceived sense of anonymity), and improved recruitment and retention of healthcare professionals in rural and remote communities (e.g., by increasing access to the professional community and other desirable opportunities such as professional development).

Telemedicine: Perceived Costs

There is limited information in the literature related to the cost effectiveness of telemedicine outside of inferences made in terms of cost savings due to avoided travel (particularly related to rural and remote patients/communities), and projected health system cost savings due to decreased physician visits, hospitalizations, etc. Telemedicine visits that also result in in-person visits were not addressed in the literature, nor were the costs of telemedicine implementation versus the time it takes to generate a return on investment. Potential additional costs related to telemedicine (e.g., telehealth coordinators, systems training, etc.) were not typically factored into cost discussions. Despite this, 57% of respondents in PwC’s Making Care Mobile report responded somewhat or very positively when asked how virtual health would impact the ability to reduce costs to the healthcare system.
Telemedicine: Perceived Challenges

Outside of limited information related to the cost effectiveness of telemedicine, there are a number of challenges and barriers to telemedicine practice. In this case, challenges are characterized as those things that can be overcome with limited resources (e.g., creativity, time, money) or by increasing knowledge/awareness.

Challenges include healthcare professionals’ concerns with “too many limitations for identifying and booking appropriate clients.” As one article states, “We would expect that the least complicated patients are handled by e-consultation and the most complex, or those requiring physical interaction, by face-to-face encounters. However there are many dimensions of “complexity” and which elements are most relevant is unclear. Good measures of patient complexity as related to consultation must be developed.” Related to this is the concern that telemedicine could be a potential burden to patients in the early stages of a condition who may be drawn into clinical surveillance too soon (increasing their anxiety), or to patients who are too ill (e.g., don’t have the dexterity to use equipment and/or can’t follow through).

Healthcare professionals are concerned about the challenge of identifying and booking appropriate clients for telemedicine.

There is a concern that various forms of telemedicine could generate large amounts of data (e.g., telehome monitoring) and/or increase access to the clinician that would need to be managed (e.g., telecare, video consultation).

Healthcare providers are also concerned that inserting a layer of technology between the patient and clinician could be too impersonal and may negatively impact the relationship with the patient, attachment and continuity of care.

Additional challenges include lack of knowledge of, or discomfort with, technology leading to resistance to use it, and/or frustration and lack of interest in using telemedicine by healthcare practitioners.

Telemedicine: Perceived Barriers

Barriers are more complex than challenges, requiring the use of substantial resources and/or a variety of stakeholders to influence or change. Perhaps the most pressing barriers to telemedicine are related to credentialing/privileging/licensure, standards, liability and remuneration.

Currently, there is no national licensure system for cross-jurisdictional telemedicine practice making it unclear “where the virtual care episode occurs; at the patient site or provider site”, and licensure requirements vary by province. Furthermore, policies, standards of practice and accountability need to be clearly established within provincial boundaries. While there are general professional standards, the unique experience of telemedicine encounters may result in confusion regarding application. Questions have also been raised about cross-provincial border malpractice liabilities.

Consent, security, privacy and confidentiality are some of the areas where clarity of standards is required. In fact, patients in Canada recognize “security of the healthcare system” and “privacy of my health information” as telemedicine concerns.

Further, as telemedicine practice moves forward fee schedules and policies have lagged at times, creating concerns regarding reimbursement and confusion regarding billing.

Other telemedicine barriers are related to organizational readiness, infrastructure and the reliability of technology. Lack of time to change current clinical process, lack of preparation to meet technology requirements, or failure to mentally prepare to embrace new technology are all potential barriers to successful telemedicine implementations. Further, the literature recognizes that smaller hospitals may not have the clinical information...
Telemedicine: Perceived Risks

In addition to challenges and barriers to telemedicine, there are risks – those things that will exist, even if a telemedicine system is operating optimally. Key risks outlined in the literature include:

- **Safety Concerns** – Safety concerns arise from the removal of the in-person clinical examination which may remove certain nuances from the physician-patient interaction.\(^ {26, 37}\) This is exacerbated by the current lack of evidence-based research to support appropriate patient selection and telemedicine application. In the case of telemental health, potential crisis situations speak to the need to have additional supports available in the patient’s community to ensure the ability to act quickly when required.\(^ {21, 44}\) If the clinician is not aware of community-based resources, this risk is heightened.

- **Technology Dependence** – At a community level, there is concern that a reliance on telemedicine may limit community-based capacity building.\(^ {45}\) At an individual level, there is concern that patients may become dependent on technology to tell them if they are well. They may listen to their devices as opposed to their bodies, and not seek medical help when it is needed.\(^ {15}\)

- **Ethical Issues** – Concerns have been raised about the intentions of telemedicine developers and where their interests lie, with the patient or with the practitioner (e.g., is focusing on user-friendliness for clinicians rather than patients appropriate?).\(^ {24}\) Other questions of motives are related to potential investments in telemedicine being driven by economics or vested interests in technology.\(^ {15}\)
Telemedicine: Perceived Opportunities

There are opportunities to improve telemedicine and enhance its perceived benefits by addressing or mitigating the challenges, barriers and risks outlined. In addition, the literature identifies opportunities to build a new kind of patient-practitioner relationship through telemedicine. One that is more aligned to the methods of communication used in daily life and more appealing to many generations of technology savvy individuals.\(^{(18, 25)}\)

With the introduction of new “prescription Apps” (e.g., FDA approved apps prescribed to patients) and the pervasiveness of social media, the creation of new, user-friendly telemedicine designs to meet the needs of various populations (e.g., youth, the elderly) is also seen as an opportunity.\(^{(25)}\)

Other opportunities include, maximizing current investments in telemedicine by optimizing or re-purposing technologies. The use of videoconferencing equipment for educational and internal meeting purposes demonstrates how this has successfully occurred in various practices. Creativity may lead to other opportunities to optimize the return on telemedicine investments. For example, in Conversations on Telemental Health: Listening to Remote and Rural First Nations Communities, a community member suggested using videoconferencing to facilitate more culturally appropriate and collaborative care by building connections with out-of-town traditional healers and family members.\(^{(21)}\)

Telemedicine & The Triple Aim

Given the rapid advancements and growing interest in telemedicine in Canada, there is mounting pressure to better understand the ways that telemedicine should and should not be used, and how it ultimately aligns to the Triple Aim. Due to growing concerns about costs and what is often referred to in the literature as “patient attachment”, in June 2014, the BC Minister of Health, Terry Lake, ordered a review of telemedicine in BC saying, “he’s concerned videoconference visits between patients in one location and doctors in another could become “virtual walk-in clinics” with unsustainable costs on the health care system.”\(^{(3)}\) The review is expected to be completed in the fall. According to the article, “Lake said he’s not sure what the review will conclude but one of the issues is that doctors can get higher fees for seeing patients online rather than in their offices. That may be too much of an incentive for doctors to provide online care and could deplete the already fragile supply of family doctors providing cradle to grave, comprehensive medical care, an effect similar to that created by walk-in clinics.”

Key Questions Going Forward

| What is the best way to address legal, jurisdictional, licensure and credentialing issues within and between provinces? |
| Who should be accountable for determining if a telemedicine technology is appropriate/aligned to requirements set out by governing bodies? |
| What are the actual costs (direct and indirect) of various telemedicine interventions? |
| How should fee schedules be determined? |
| In what situation is a particular telemedicine approach appropriate and in what situation is it not? |
| How should patients be selected for a particular telemedicine approach? |
| What is the formula for the successful implementation of telemedicine applications? |
The Health Ministry’s concerns are connected to two dimensions of the Triple Aim, specifically, reducing the per capita cost of healthcare and improving the patient experience of care. The connection to cost is clear; the connection to patient experience is grounded in attachment and continuity of care. Strong doctor-patient relationships have been linked to better health outcomes (e.g., medication management, preventative care, communication and coordination of care in the event of referrals, etc.) and greater satisfaction for doctors and patients.46

That being said, there is evidence suggesting that telemedicine can improve the patient experience of care by increasing access, maintaining proximity to the patient’s social network, reducing travel time and costs, increasing timeliness of care, increasing communication and coordination of care, and educating both patients and care providers.

Further, by providing increased access, education and increased ability to recruit and retain healthcare workers in diverse settings (including rural and remote communities), telemedicine has the potential to positively impact the third dimension of the Triple Aim, improving the health of populations. In contrast, some may argue that telemedicine is a deterrent to capacity building in communities, fostering reliance on technology rather than building or recruiting and retaining community-based resources.

When considering this information it must be remembered that the dimensions of the Triple Aim are interconnected and intended to be pursued simultaneously; therefore, if one is not met, the Triple Aim is not achieved.

In Conclusion

What is clear is that there are many unknowns when it comes to telemedicine. Research is in its infancy and is not yet robust enough for long-term conclusions to be drawn. At the same time the demand for telemedicine continues to grow, and telemedicine continues to advance without a full understanding of its impact or potential unintended consequences.

Positive and even neutral research results gathered to date should be considered with caution. While a telemedicine intervention may demonstrate relatively equal results to traditional interventions, the implied benefits of telemedicine may cause people to encourage implementation despite the fact that research limitations and limited knowledge of short- and long-term cost effectiveness exist.

At this stage, evidence-based research and examples of best practice are needed to inform decisions related to the practice of telemedicine. Until such research is gained, the ability of telemedicine to help achieve the Triple Aim should be viewed with caution.
REFERENCES


Additional reference resources prepared with this paper are available upon request from the VDoFP.
APPENDIX A: Literature Search

The College of Physicians & Surgeons of BC Librarian was used to conduct a literature search. The question presented was "What is the current state of telemedicine – what studies exist in the area that impact family practice and what conclusions do they draw?".

Publications from the last four years for all publication types were requested (e.g., clinical trial, editorial, letter, meta-analysis, practice guideline, randomized control trial, and review). The database searched was Medline, through the PubMed interface.

Thirty sources were requested from the College. The College provided a bibliography of 68 sources. All were requested in full text in order to provide a more complete review of the state of telemedicine/telemedicine research. Four of these sources were not available.

Of the 64 sources obtained, the majority were from Canada (22 sources), the USA (15), and Australia and the UK (each with 6).

Sources included eight articles and editorials, seven pilot project/program reviews of various levels of rigor, nine literature reviews and meta-analysis, and 12 randomized control trials. Two sources completed secondary analysis of data from a cluster-randomized trial and a randomized controlled study. Other sources were comprised of qualitative studies/reviews; exploratory studies; prospective studies; a descriptive study of repeated measures; an open, multi-centre control, non-random intervention study; among others.

In addition to the publications obtained through the College, publications available to and influencing the general public and practice (e.g., news publications, government papers, etc) were gathered through an internet search and reviewed for additional commentary which has been incorporated into the white paper as appropriate.

The following annexes have been prepared:

- Telemedicine White Paper Annex 1: College of Physicians & Surgeons Annotated Bibliography – This document includes the complete annotated bibliography as provided by the College of Physicians & Surgeons of BC.
- Telemedicine White Paper Annex 2: Additional Resources – This document includes additional resources collected and reviewed as part of the telemedicine white paper process.
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