Review Article

The legal and socioeconomic considerations of spine telemedicine in Canada

Youngkyung Jung[1]^, Shawn Baldeo[2], Markian Pahuta[3]^, Sunjay Sharma[4], Daipayan Guha[4]^

[1]Michael G. DeGroote School of Medicine, McMaster University, Hamilton, Canada; [2]Department of Psychiatry, University of Toronto, Toronto, Canada; [3]Department of Orthopedic Surgery, McMaster University, Hamilton, Canada; [4]Department of Neurosurgery, McMaster University, Hamilton, Canada

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Correspondence to: Daipayan Guha, MD, PhD, FRCSC. Department of Neurosurgery, McMaster University, 7th Floor, 237 Barton Street East, McMaster Wing, Hamilton L8L 2X2, Canada. Email: guhad@mcmaster.ca.

Abstract: Telemedicine, or virtual care offers a platform for remote assessments, for either initial consultations or follow-up care. Telemedicine is a broad term and may refer to video conferences/assessments, telephone visits, messages through online platforms, and remote monitoring applications. The restrictions during the coronavirus disease 2019 (COVID-19) crisis had accelerated the use of telemedicine in Canadian healthcare. Several years after the pandemic, after this initial trial of widespread telemedicine, there remains significant uncertainty as to its efficacy and future directions. There are inherent challenges to telemedicine, including questions of clinical reliability and privacy, balanced against the possibility of efficiency and increased access to specialists. The Canadian healthcare system also poses significant challenges in the evaluation and systemic implementation of telemedicine, given the lack of a national legal framework and separate provincial or territorial regulation systems across the country. Telemedicine is of a particular interest to spinal surgeons, given the prevalence, morbidity, and economic costs associated with spinal pathologies. Prior to the COVID-19 pandemic, few spine surgeons offered telemedicine, due to the perceived challenges of remote assessment and diagnosis with spine pathologies. There has been little subsequent data to examine the role and suitability for remote acre in spine surgery. Herein, we review the current landscape of telemedicine in Canadian healthcare, with applications to spine surgery.

Keywords: Telemedicine; socioeconomic; legal implications

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Introduction

Telemedicine has been available and practiced in Canada since the 1970s (1) with a growing interest in its potential to increase access to care and reduce costs from both a societal and payer perspective (2). Although its uptake has lagged behind other developed nations (3), there was a 120% growth between 2010 and 2014 in virtual care sessions, particularly across mental health services, general neurology, rehabilitation, oncology, and general pediatrics (4). There are regional differences, with geographically isolated rural areas relying on telehealth for the full spectrum of health services including emergencies, compared to urban regions that tend to use virtual care for primary care, mental health, and addiction services (5). Specific usage trends are difficult

^ ORCID: Youngkyung Jung, 0000-0002-3902-665X; Markian Pahuta, 0000-0002-4808-5459; Daipayan Guha, 0000-0002-2052-4819.

to follow, as some regions track the number of unique patients served, whilst others record the total number of visits (4).

Regardless, the coronavirus disease 2019 (COVID-19) pandemic catalyzed a rapid transition to virtual care across most medical disciplines; within 1 month, 67% of ambulatory visits were carried out virtually, from a baseline of 2–3% (6). Enabling this was the rapid market expansion of increasingly sophisticated virtual care platforms, allowing encrypted real-time video and audio communication often embedded into electronic medical systems already used for patient encounters. While the pressured timeline of these changes leave much uncertainty regarding the efficacy and optimal delivery of telemedicine, there is growing certainty that it is here to stay (6,7).

Degenerative spinal pathologies represent a significant burden of disease with high associated costs, both direct as well as indirect from a societal perspective due to disability and lost work productivity. In Ontario alone, direct costs for non-traumatic spine-related care are estimated to be over $200 million Canadian (CAD) annually (8). This raises an interest in exploring the use of telemedicine to mitigate some of the challenges of delivering timely care in spine surgery. During the initial waves of the pandemic, several centres across North America piloted the development of virtual spine care—in spite of concerns that virtual assessments could not replicate authenticity of in person assessments, both clinicians and patients found they were overall satisfied with the quality of virtual clinics (9). However, the growth of telemedicine in Canada has been geographically uneven owing to a fragmented healthcare system, with significant variations in policy and licensure requirements across provinces and territories. Without a national legal framework, there is considerable heterogeneity regarding liability, equitable access, confidentiality, and the logistics of financial reimbursement. Given the ubiquity of virtual care in the setting of the COVID-19 pandemic, there is a growing need to evaluate the evolving role of telemedicine in Canada's healthcare system. Overall, this article reviews the legal and socioeconomic implications of telemedicine in Canada, with respect to spinal surgery.

Current state of spine telemedicine in Canada

There is no universal definition or singular format of 'telemedicine'. The general categories or uses of telemedicine include telerobotics, telementoring or using online platforms for medical training, teleconsulting between specialists, and the use of virtual care for patients in physically distant or remote locations (10). This paper primarily focuses on the latter, given the medicolegal and socioeconomic considerations involved in its further development. The Canadian healthcare system is a publicly-funded, single-payer, universal system, with a decentralized delivery of service. Rather than a unified national system, there are a fragmented set of rules and governing bodies unique to each province and territory that are subject to national standards, in order to be eligible for federal funding.

Prior to the COVID-19 pandemic, British Columbia and Ontario were the only provinces to allow billing for telecare occurring outside of designated telehealth sites. In the COVID-19 era, all provinces and territories have subsequently adopted new telemedicine-specific billing codes. However, there is significant variation in the care delivery platforms, regulations, and distinction between telephone/video sessions for reimbursement (*Table 1*). Of note, these descriptions in *Table 1* are subject to change over time.

Licensure requirements across Canada also vary significantly, which is considerable when considering the demand for care across provincial and territorial boundaries, particularly in limited-resource areas which are often remote. Only four provinces prior to the pandemic allowed the provision of telehealth services by out-of-province practitioners on a routine basis (11). In the backdrop of the pandemic, some of these restrictions were relaxed, notably in Alberta, which initially limited out of province assessments to five per year (12) but subsequently expanded cross-provincial care, provided the service was not readily available in Alberta (13). While disjointed licensure continues to represent a barrier to widespread adoption of virtual care in rural border locales, care in urban centres is typically provided locally, and therefore standard medical licensure regulations usually apply. Telemedicine has varied applications in spine clinics, ranging from preoperative assessments to postoperative follow-ups, through platforms such as telephone/video visits and mobile applications to track progress, symptom improvement, and patient education. While these interventions have high compliance and satisfaction rates, studies are limited by sample sizes and selection bias. To date, there is no literature on the widespread use of these techniques in a Canadian setting (14).

Table 1 An overview of virtual care delivery platforms and reimbursement practices in Canada

Province	Province-specific delivery platform	Regulations	Reimbursement
Alberta (11)	None	No specific recommended platforms, lists several that are integrated into provincial EHR (Brightsquid, Microquest, Accuro Engage, Telus Health)	No distinction between telephone and video sessions, rates equal to an in-person session
British Columbia (12)	None	No specific recommended platform	Separate telehealth billing codes for telephone and video sessions; can use in-person billing codes if an equivalent telehealth code is unavailable (must include a note stating the visit was done via telehealth)
Manitoba (13)	MBTelehealth, Manitoba, Canada	No specified platforms, given a wide range of approved apps (Zoom, Microsoft Teams, doxy.me, FaceTime, InTouch, Livecare, Medeo, Medex, Novari, OnHealth Call, P2P Doctor, Synaptek, Think Research, Vsee, WebEx, WelTel Health, WhatsApp)	No distinction between telephone and video sessions, telemedicine sessions paid less
New Brunswick (14)	None	None specified	No distinction between telephone and other media session
Newfoundland and Labrador (15)	None	Cisco Jabber and Zoom for Healthcare are approved, but consultants are free to use a platform of their choosing	Separate codes for telephone *vs.* video sessions
Northwest Territories (16)	HealthNet	None specified	Telehealth services specific to videoconferencing
Nova Scotia (17)	No province-specific platforms; provincial partnership with Zoom (Zoom Communications Inc., California, USA), QHR (Loblaws Inc., Ontario, Canada), Medeo (Loblaws Inc.), Telus EMR (Telus Communications Inc., British Columbia, Canada), and Health Myself (Telus Communications Inc.) recommended as well	Physicians advised not to use stand-alone options (e.g., Skype, Facetime)	Separate billing codes for telephone *vs.* telehealth network (specific to hospitals) *vs.* virtual care platform
Nunavut (18)	None	None specified, primarily using Microsoft Teams as a part of Virtual Action Care Plan. Patients can initiate telehealth appointments in Nunavut, NWT, Alberta, Manitoba, and Ontario	n/a
Ontario (19)	OTN	Voice and video on HIPAA-compliant platforms, voice only otherwise	Separate codes for video *vs.* phone; can bill as an in-person consult only if through OTN
Prince Edward Island (20)	None	Healthcare providers required to use either Zoom or previously established pilot software programs (Maple and Telemerge)	No distinction between telephone, secure email/text, and videoconferencing
Saskatchewan (21)	Telehealth Saskatchewan	None specified	No distinction between video or telephone session; telemedicine sessions reimbursed less
Yukon (22)	None	None specified, recommended doxy.me	No distinction between telephone and video sessions; telemedicine sessions reimbursed less

MB, Manitoba; QHR, QHR technologies; EMR, Electronic Medical Record; OTN, Ontario Telehealth Network; EHR, electronic health record; P2P, provider-to-provider; NWT, Northwest Territories; HIPAA, Health Insurance Portability and Accountability Act; n/a, not applicable.

Barriers to telemedicine in Canada

Other legal considerations include the Personal Information Protection and Electronic Documents Act (PIPEDA), which identifies the responsibilities of private companies to protect identifiable individual information across Canada. As a part of PIPEDA, privacy impact assessments (PIAs) are regularly used to identify the risks of a program or service to individual privacy; as a result of the increased use of video teleconferencing platforms during the COVID-19 pandemic, independent companies have also submitted PIAs to ensure future versions and updates to their programs will reasonably protect individual privacy (15). However, each province has its own laws governing the specific oversight of health information, applying to both virtual and in-person care. For example, identifying information such as age, sex, or blood type falls under the purview of PIPEDA, while records of mental/physical health information and treatments rendered are governed by the Personal Health Information Act in Ontario, which is another example of the disparate regulations across Canada.

While the vast majority of the Canadian public is satisfied with telemedicine (16), there are concerns virtual care physicians and health care apps could fragment care and create inefficiencies in the healthcare system—for example, in rural areas, medical tests are performed in local hospitals, where virtual care physicians do not have privileges (17), or patients do not follow up with a specific physician, but rather a rotating roster (18). To ensure continuity of care, the Canadian Medical Association (CMA) recommends virtual care only be undertaken if there is an established physician-patient relationship (19). The CMA also provides key considerations when delivering virtual care. Three key components of this include hardware, software, and scope of practice (20). Hardware may include sufficient screen space, high-definition video and audio, and a secure device to save forms and paperwork. Software includes secure messaging and videoconferencing programs. While healthcare specific platforms may offer greater security features, generic platforms are generally widely available and easily accessible by both providers and patients. Additionally, generic platforms are standardized across a multitude of devices including laptops and mobile devices. Other software considerations include whether the session can be recorded by the patient and ensuring that no other party can enter the virtual meeting space without permission. In a survey of 207 Ontario primary care physicians, 41% reported challenges with integrating virtual care into their existing electronic medical record (EMR) platform (18); this is further complicated by the lack of a centralized EMR in Ontario. While no studies are available, it would be interesting to compare this to the experience in Alberta, where there is a centralized EMR system through Alberta Health Services.

When providing virtual care, it is important for healthcare practitioners to understand that the standard of care remains the same. While documenting the patient encounter is critical for continuity of care, it also serves as evidence should a medico-legal issue arise. While documenting informed consent is critical, it is also important to document whether the treatment plan is impacted by the pandemic or virtual care. If so, providing a justification for delaying or not recommending a physical exam, for example, may help to justify a specific course of action. This may include public health measures or risk of infection.

Medicolegal risks of surgical spine care

Spine surgery carries a high risk of litigation, owing to the nature of the conditions treated, aging population base with increasing medical comorbidities, and potential for complications with life-altering consequences from neural element or vascular injury. While there has been decreasing trend in litigation against spine surgeons in Canada over the past 15 years (21), spinal surgery remains one of the most common neurosurgical subspecialties resulting in medico-legal action in Canada, often in the context of elective procedures and chronic pain (22). Cases brought forth due to delayed time to diagnosis and/or treatment have been associated highly with resulting in settlement or verdict favouring the plaintiff (23). In the United States, multi-level procedures, fusions, laminectomies and discectomies were most frequently associated with medical malpractice suits in the US, however most concerns were around intraoperative errors, and postoperative or hardware-related complications (24,25).

Given 19.3% of surveyed Arbeitsgemeinschaft für Osteosynthesefragen (AO) spine surgeons cited increased risk of medicolegal exposure as a barrier to virtual care (26), the role of telemedicine for conditions prone to misdiagnosis, such as degenerative disc disease (27), osteoporotic vertebral body fractures (28), and cervical myelopathy (29) remains unclear (*Table 2*).

Moreover, particularly in a single-payer publicly-funded health system such as in Canada, there is an emphasis on a more judicious use of spinal imaging (8), frequency of

Table 2 An overview of potentially misdiagnosed spinal conditions

Spine condition	Presenting symptoms	Alternative diagnosis for which this can be mistaken
Degenerative lumbar spinal stenosis (27)	Intermittent claudication of lower extremities (26% of patients will have neurogenic and vascular claudication)	Peripheral vascular disease, musculoskeletal pain, trochanteric bursitis
Osteoporotic vertebral fracture (28)	Generalized back pain, also can be asymptomatic	Musculoskeletal pain. 29.5–45.2% false negative rate and 5% false positive rate with X-rays
Cervical spondylotic myelopathy (29)	Upper limb paresthesia and weakness, gait imbalance, neck pain	Carpal tunnel syndrome (occurred in 43.1% of cases with delay to diagnosis of 2.2±2.3 years)

Table 3 The prevalence of Canadian medical negligence lawsuits in telehealth

Primary search keyword	Number of court cases found			
	Using the primary search keyword	Using 'negligence' as the keyword within	Using 'medical negligence' as the keyword within	Using 'clinical negligence' as the keyword within
Telehealth	147	14	2	0
Tele-health	40	1	0	0
Telemedicine	99	5	0	0
e-health	151	15	1	0
Ehealth	47	5	1	0
Virtual care	7	0	0	0

non-specific and radiologically stable incidental findings and more aggressive interventions with increased rates imaging (30). It is unclear if the reservations many primary care providers have about the medicolegal implications of telemedicine will affect patterns in spine imaging and negate any net economic benefits to be gained from virtual care.

Overall, the benefits of telemedicine, including accessibility and efficiency should be balanced against the potential risks and limitations, including diagnosis without a clinical exam and subsequent concerns of medicolegal risks (31).

Legal framework for spine telemedicine in Canada

The traditional utility of virtual care has been in patient screening particularly in primary care, as not all concerns are amenable to assessment through telemedicine. The CMA recommends telemedicine for visits that primarily rely on history or gross inspection, such as reviewing lab result/imaging results, mental health, minor infections, sexual health care, and travel medicine (20). Virtual care is not recommended for symptoms indicative of an impending emergency, such as chest pain, dyspnea, or loss of neurological function (20). However, these restrictions are to be weighed against the pragmatic limitations of distance, transportation, resource limited settings, and patient mobility. The safety and feasibility of teleconsultation is therefore left largely up to the judgement of individual medical practitioners on a case-by-case basis, with no strict requirements for medico-legal justification.

In 2019, Tong conducted a study to check the prevalence of medical negligence lawsuits in telehealth practice in various countries (32). A similar search was conducted in Lexis Advance Quicklaw with slightly varied terms and the search was specific to Canada (*Table 3*).

While the search did yield voluminous results, these references did not have specific relevance to telemedicine and malpractice cases. For example, in Ontario, there is a phone-based service entitled 'Telehealth Ontario' and commonly referred to as 'telehealth'. This is a free confidential service for users to call and get health advice or information from a registered nurse. Many of the cases found included terms relating to this service. Other cases which have included terms such as "telehealth" and "malpractice" involve cases where malpractice was alleged

but not in relation to telehealth specifically. Rather, there may have been a single telehealth phone call or virtual visit at some point within the medical history of the plaintiff, but the decision surrounding malpractice itself was not related to telehealth. It is also important to note that this search is capturing legal cases which have made it through the court system and excludes cases that have resulted in out-of-court settlements or which have not yet reached the trial stage. Between 2015 and 2019, 45 out of 36,586 cases before the Canadian Medical Protective Association (CMPA) involved the provision of virtual care (33). However, it is yet to be seen how many complaints are submitted in 2020 and beyond when significant changes to virtual care occurred.

Similar to Canada, there were no specific cases in the US related to telehealth and psychiatry. In a study by Fogel & Kvedar [2019] (34), direct-to-consumer (DTC) telemedicine cases were examined over a 1-month period to see if there were any cases of malpractice against a telemedicine service or a healthcare provider in conjunction with a telemedicine service. Based on the terminology used for their methodology, 551 cases were identified, none of which involved claims of medical malpractice against a DTC service or its healthcare providers (34). There are many factors which account for the absence of malpractice suits. Telemedicine may purposefully engage patients whose conditions are amenable to virtual care. Telemedicine providers may also approach or resolve medical issues different from in-person appointments. As an example, medications which can result in severe side effects may only be prescribed after an in-person appointment with specific counselling. Further, disclaimer statements are generally provided asking patients to seek in-person assessments for ongoing concerns (34).

However, there is precedence for instances where inadequacies of telehealth led to poor or improper patient care. Perhaps some of these examples can be used to provide context as to medicolegal issues which may arise in Canada. In the case Moghtader v. Geo Grp. Inc. (GEO Group Inc., Florida, USA) (35), the plaintiff was detained without bond on federal charges in a GEO Group Inc. correctional facility. The plaintiff makes a number of allegations including that he was not initially screened for psychiatric issues, that the complaints made to the psychiatrist about the prison were not relayed to appropriate prison personnel, and that he never consented to distance-based treatment (i.e., telehealth). For this paper, the latter two arguments are of relevance. First, there is a question of whether the physician was responsible for notifying prison personnel of abuse allegations stated by the patient. It was found by the Texas court that there is no duty for physicians to protect adult patients from the harmful acts of others. This case acknowledges that, should a duty exist between a healthcare provider and patient, the same duty would continue to exist despite the interaction being completed via telehealth. Second, there was a question about whether the plaintiff consented to distance-based treatment. Texas law creates a duty to obtain consent to telehealth services. The court stated that, even if we accept the plaintiff's allegation that he did not consent as true, he failed to establish that, had he known about the risks and hazards associated with telehealth, he would not have consented. Thus, it is important for all healthcare providers to specifically document that risks associated with telehealth have been explained to patients and that the patient provided consent to proceed.

Spine consultations can pose a unique challenge, given the importance of the neurological examination and overall functional status for patients with non-traumatic pathologies. While 38.6% of surveyed board-certified spine surgeons had uncertainties about virtual physical assessments, modified exams for the cervical and lumbar spine have been well-documented in wake of the pandemic (26). Although some nuances may be lost with the virtual setting, quite a bit of detail can be gleaned from general inspection, gait, range of motion, and modified strength assessments (*Table 4*).

While some physical examination signs such as Hoffman's, hyperreflexia, and clonus are difficult to adapt to the virtual setting, several other provocative maneuvers, including Spurling's, Lhermitte's, and Lasegue's tests are transferable (38). Of note, there are significant efforts to distinguish sacroiliac joint pain through the virtual assessment (39), given its ubiquity and often confounding clinical presentation in patients with degenerative lumbar disease. To facilitate these virtual assessments, it is recommended patients are sent virtual visit checklists to ensure they are able to optimize their field of view for full body *vs.* focused assessments, have adequate space for gait assessments, and arrange for weighted items to be available beforehand (39,40). There is a lack of standardization across modified virtual assessments, with some providers creating their own scale for strength (38) and others using the established 5-point scale (39). Patient satisfaction rates vary from 35.8% to over 90% with virtual spine assessments (41-43). There is no robust evidence concerning the validity and reliability of remote spinal assessments. In one retrospective review from the US, there was no difference in the treatment plan with virtual and in-person sessions (44).

Table 4 An overview of the spine exam modified for virtual care

Assessment	Maneuver	Positive finding
Gait: 5 to 10 steps are usually enough for assessment (36)	Spastic paretic gait, wide base stance, jerky movement	Myelopathy
	Symptom exacerbation with standing and walking	Neurogenic claudication
	Foot drop/steppage gait	L4/5 nerve root compression, leg-length discrepancy, coronal imbalance
Cervical spine		
Inspection—head, shoulder, neck, and arms should be visible (29)	Check posterior incisions for atrophy	Postoperative paraspinal muscle atrophy (37)
	General inspection	Signs of spinal deformity in adults or adolescents (café au lait spots, truncal asymmetry, limb-length inequality, coronal/sagittal alignment)
Range of motion	Active shoulder ROM (may contribute to cervical pain/symptoms)	Forward flexion, abduction, internal rotation, external rotation; look for positive or restricted ROM
	Cervical flexion, extension, lateral flexion	Note for limitations with pain
Strength	C5–T1 myotomes are tested against gravity, with weights added for resistance	C5: shoulder abduction (deltoid), C6: elbow flexion (bicep); C6/7: elbow extension (tricep), C6: wrist extension; C8: finger flexion*, C8/T1: finger abduction*
Special tests (38,39)	Romberg's test (general proprioceptive disorders and cervical myelopathy)	Patient stands with eyes closed and arms outstretched; positive if they sway or fall
	Finger escape sign (cervical myelopathy)	Patient extends and abducts fingers; positive if 4^{th}/5^{th} digit spontaneously abducts and flexes
	Grip and release (cervical myelopathy)	Patient makes a fist and releases it 20 times in 10 seconds; positive if they cannot do this
	Spurling's maneuver (cervical radiculopathy)	Neck extension with lateral bending; positive if there is pain
Lumbar spine		
Inspection	General visual assessment	Prior incisions, scoliosis, flatback deformity, leg-length discrepancy
Range of motion	Seated range of motion (hip flexion, extension, internal rotation, and external rotation) can be used to evaluate hip osteoarthritis	Limited range of motion or pain with movement
Strength (38,39)	Should be done standing; unlike myelopathy, cannot add weights, distinction made if they can perform this independently	L1/L2/L3: hip flexion (iliopsoas); L2/L3/L4: leg raise (quadriceps); L4: raise onto heels (tibialis anterior)#; S1: raise onto toes (gastrocnemius-soleus)
Localizing sacroiliac joint pain	Fortin's finger test	Patient will localize pain to midline and below lumbar spine
	Sitting position	Patient with SIJ pain will lean on unaffected side when sitting
	FABER	Patient will flex, abduct, and externally rotate their hip while seated; elicits SIJ pain
	Drop test	Patient stands and braces wall; they lift their heel on the affected side then abruptly drop their heel, extending their knee, eliciting SIJ pain

Table 4 *(continued)*

Table 4 *(continued)*

Assessment	Maneuver	Positive finding
Special tests (40,41)	10 seconds step test (myelopathy)	Patient marches in spot; positive if <20 steps with 90-degree hip flexion in 10 seconds
	Trendelenburg test (hip abductor)	Patient lifts contralateral leg to test outside hip abductors; positive if hemipelvic dipping
	Straight leg raise (herniated disc and nerve root impingement)	Patient should be supine, positive with inability to flex hip more than 30 degrees (36) Inability to perform this test reflects iliopsoas weakness
	Sit to stand test	Patient asked to stand from seated position ×5; >15 seconds reflects poor lower extremity function
Sensation	Patient asked to point where they are numb, can direct pinprick testing with toothpick or paperclip	None specific

[#], can also use squats, heel-walking, and toe-walking to test quadriceps; *, use contralateral hand for resistance. ROM, range of motion; FABER, flexion, abduction and external rotation; SIJ, sacroiliac joint.

Several studies found the overall management plan did not significantly change with in person vs virtual assessments (45,46).

As outlined above, while some provinces have specific platforms designed for telemedicine, many rely on individual judgement and preferences. While the CMA Virtual Task Care Force outlines hardware recommendations to optimize telemedicine sessions, there are no national guidelines regarding specific software recommendations and regulations (47). In a similar vein, documentation requirements and practices vary between provinces and centres. However, the CMPA and CMA advise clinicians to obtain signed consent for virtual care and also document that the patient has been informed as to the inherent risks of privacy with telecommunication (48).

Socioeconomic impact of telemedicine in Canada

Prolonged wait times in the treatment of non-emergent disease is a significant public health concern in Canada, exacerbated significantly by multiple province-wide shutdowns to preserve critical care capacity in the COVID-19 pandemic. It is estimated that there are 21 million delayed healthcare services across Canada (49) and delayed surgical cases, not always without consequence particularly in the transplant and oncology populations. For example, in Manitoba (50), there are ongoing plans to send around 300 patients who have waited more than 1 year for elective spinal surgery to North Dakota for expedited treatment. Despite initial hopes that telemedicine might expedite access to care, the total number of consultative services provided were lower in 2020 than 2019, after the introduction of unique telemedicine billing codes (51). This may be due in part to fewer patients seeking nonurgent care in the midst of a pandemic, with frequent stay-at-home orders. Regardless, there is significant interest in using telemedicine to address the perennial issue of wait times in Canadian healthcare, with significant theoretical utility in triaging/screening non-urgent referrals while preserving in-person capacity for patients most benefiting from specialist consultation. Notably, in a pilot project in Ontario, a virtual consult system was shown to reduce the wait time for an outpatient nephrology referral from 4 months to 15 hours, by streamlining communication between physicians (52).

Telemedicine is also touted to deliver care to socioeconomically disadvantaged populations. For example, Telestroke has played a significant role in expediting time to treatment in geographically isolated areas of Canada, without compromising patient outcomes (53,54). It has been particularly effective in Ontario, resulting in a 30% thrombolysis rate, compared to the national 8% average, due to strong provincial leadership, well-coordinated infrastructure, and significant funding (55). However, its cost-effectiveness is unclear, as very few studies evaluate the system-level impacts, and rather narrow in on a specific outcome (e.g., reduced number of transfers, days in hospital). However, socioeconomic status can paradoxically limit access to telemedicine, as setting up and maintaining telemedicine equipment and software is also costly—there

are no long-term data comparing the costs of in person care for remotely based patients and the costs of virtual care (56). Low-income households and individuals may not be able to afford the equipment required for virtual care, including the hardware and reliable internet access. The latter disproportionately affects First Nation reserves, Maritime provinces, and territories (57). In Canada, a lack of digital health literacy is associated with age, lack of university education, low household income, under/unemployment, and absence of private insurance (58). On a global scale, low-income countries may have more limited access to proprietary software for digital care (56).

Another limiting factor for telemedicine is the lack of end-user support in navigating various telemedicine platforms. This is significant, as poor digital health literacy may result in poorer satisfaction and lack of engagement with telemedicine (36). In the realm of spinal surgery, patients with degenerative spinal pathologies are typically older and with limited digital literacy, presenting a significant barrier to access. Despite these barriers and the regulatory challenges of implementing telemedicine in Canada, investing in virtual care could have positive socioeconomic impacts. RAND Europe predicts current levels of virtual care, compared to pre-pandemic levels, could result in a net $5 billion CAD savings per year, owed to a faster access to care with resultant reduced societal costs from fewer lost working days, as well as, reduced emergency room visits (3). In brief, telemedicine has potential to streamline the care of spine surgery patients, however there is significant buy-in required from patients, clinicians and administrators to ensure this care is delivered in adherence to existing legal and regulatory requirements (59).

Future directions

There may be a further role for telemedicine for postoperative follow-ups, especially with decreased postoperative patient mobility. While individual virtual postoperative follow-up visits may be more cost-effective with improved clinical efficiency, travel expenses, and missed time missed from work (60,61), it is important to establish their efficacy, as there are considerable economic costs with 30-day readmissions. According to the Canadian Institute for Health Information, in 2022, 9.1% of patients are readmitted to hospital within 30 days of discharge—readmissions cost the health care system $2.5 billion/year in Canada (62). Approximately 10% of postoperative readmissions are due to infection (63).

As such, there are growing interests in establishing telemedicine as a way to monitor postoperative wound complications (37,64). More generally, in the PVC-RAM-1 trial, a multi-centre randomized controlled trial (RCT) in Canada, 905 adult patients discharged within 24 hours after non-elective surgery were followed with virtual care and remote automated monitoring (e.g., vitals, weight, images of wounds) or standard care, with no difference in days at home alive at 31 days (64). PVC-RAM-2 is scheduled to start in 2022, with a focus on hospital readmission and emergency department visits within 30 days (65). Enrollment is also underway in 2022 for PVC-RAM-3, which aims to analyze the utility of perioperative virtual care with remote automated monitoring of vitals and weight change in safely reducing length of stay for patients undergoing elective non-cardiac surgeries (66); this is of particular interest as increased index length of stay is associated with readmission within 30 days for spine patients (67,68). These trials signal a growing demand and interest in establishing telemedicine in Canadian healthcare. However, for its successful integration into spine surgery, there need to be clearly defined guidelines to inform practitioners as to the logistics of weaving this new technology into their practices. These guidelines should offer insights as to billing, whether physicians are mandated to offer virtual care or if it is optional, eligible software platforms and facilitating cross-provincial/territorial appointments.

Conclusions

The role of telemedicine in Canada continues to evolve with the dynamic aftermath of the COVID-19 pandemic. Its ability to expedite access to medical care makes it a valuable resource, particularly given the health disparities across geographically isolated regions in Canada. However, there are significant challenges navigating the widespread upstart of telemedicine, given the lack of a national legal framework and the inherent difficulties of navigating individual provincial systems. Without a unifying policy, there is uncertainty regarding best practice policies, along with unclear legal implications of confidentiality and privacy, which may serve as a barrier for clinicians to integrate telehealth into their practice. A nationwide policy outlining the regulations behind the uses of telemedicine and telehealth will help clinicians clarify their responsibilities in terms of ensuring confidentiality/privacy and overall help reduce the legal barriers to implementing telehealth across provinces and territories.

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