**The status of telemedicine among Canadian concussion clinics: current use, barriers and future considerations**

*Introduction:*

Over the past decade there has been a significant increase in the number of Canadians seeking medical attention for concussion and mild traumatic brain injury (mTBI) placing an enormous burden on the healthcare system. To meet the needs of this growing patient population, Canada has recently seen an increase in the number of concussion clinics that provide access to physicians and multi-disciplinary professionals with expertise in concussion and TBI. Despite these advances, timely access to primary and specialized concussion care is not universally available to all Canadians, especially for those living in medical underserviced rural and remote northern communities who can face significant geographic, socio-economic and cultural barriers to accessing these services.

To improve access to specialized care among patients with a wide spectrum of medical conditions living in rural and remote regions of Canada, physicians and other healthcare providers have increasingly begun to harness the power of telemedicine to provide care through services such as in-person videoconferencing and eConsultation. Despite widespread use of telemedicine to treat neurological conditions such as stroke, dementia, little is known about the use of telemedicine to assist with care of concussion patients among providers practicing within Canadian concussion clinics and what barriers they face in adding this service to their clinical practice models. Since the onset of the COVID-19 pandemic, there is social media evidence of increased use of telemedicine and virtual care among concussion healthcare providers but there are no studies that have examined the factors influencing these changes in clinical practice.

Therefore, the objective of this research study is to assess the use of telemedicine among Canadian concussion clinics and identify barriers, limitations, and future considerations that must be addressed to optimize its use throughout Canada. We ask that only one representative from each concussion clinic included in this study complete the survey. The results of the survey will be summarized but will not reveal the your identity or indicate which concussion clinic you work at. By completing this survey it is understood that you are providing informed consent to participate in this study.

**Survey:**

**Part 1: Clinic information**

1. Please indicate the name of your clinic (the name of your clinic will not be identified during reporting of the study results)?

2. Please indicate the city/town and province/territory in which your clinic is located?

3. Please indicate your professional designation:

 - physician (M.D)

 - nurse practitioner

 - nurse

 - physiotherapist

 - clinic manager/administrator

 - other

4. Please indicate the patient population that your clinic currently serves (check all that apply):

 - pediatric concussion/mTBI

 - pediatric moderate and severe TBI

 - adult concussion/mTBI

 - adult moderate and severe TBI

5. Is your concussion clinic affiliated with a Canadian university?

 - Yes

 - No

6. Is your concussion clinic associated with a healthcare authority or network?

 - Yes

 - No

7. Does your clinic have access to an on-site physician with expertise in concussion (sports or rehabilitation medicine physician, neurologist, neurosurgeon)?

 - Yes

 - No

8. Does your clinic have access to 2 or more other multi-disciplinary professionals with expertise in concussion/mTBI (e.g. neuropsychology, physiotherapy, occupational therapy, psychiatry)?

 - Yes

 - No

9. Does your clinic follow evidence-based national concussion management guidelines (Ontario Neurotrauma Foundation, Parachute)?

 - Yes

 - No

10. Does your clinic provide care to patients that live in rural or remote communities in Canada?

 - Yes

 - No

11. Does your clinic provide care for patients that live outside the province or territory in which your clinic resides?

 - Yes

 - No

**Part 2: Previous use of telemedicine**

12. Prior to the COVID-19 pandemic, did your clinic use telemedicine to provide patient care?

 - Yes

 - No

*If you answered yes to Question 12, please complete questions 13-25. If you answered No to Question 12 please proceed to question 26.*

13. Prior to the COVID-19 pandemic, had your clinic established a formal telemedicine program or network between your clinic and other pre-selected hospitals or centres that serve as referral sites (e.g a hub-and-spoke model)?

 - Yes

 - No

14. Prior to the COVID-19 pandemic, did your clinic offer telemedicine-based services to patients that lived outside your province or territory?

 - Yes

 - No

15. Prior to the COVID-19 pandemic, what telemedicine-based services did your clinic use to provide patient care?

 - Real-time videoconferencing

 - eConsultation

 - Other (please specify)

16. Prior to the COVID-19 pandemic, were the telemedicine-based services your clinic provided delivered through a provincial or territorial telemedicine network or program (e.g Ontario Telehealth Network)

 - Yes

 - No

17. Prior to the COVID-19 pandemic, please indicate which healthcare providers at your clinic were using telemedicine-based services to provide patient care (check all that apply)?

 - Physician

 - Neuropsychologist

 - Physiotherapist

 - Occupational therapist

 - Psychiatrist

 - Other (please specify)

18. Prior to the COVID-19 pandemic, what aspects of clinical care were your **physicians** using real-time videoconferencing for (check all that apply)?

 - Initial assessment of patients with acute concussion

 - Initial assessment of patients with persistent post-concussion symptoms

 - Follow-up appointments for patients that have undergone in-person initial assessment

 - Other (please specify)

 - Our physician did not use real-time videoconferencing prior to the COVID-19 pandemic

 - Our clinic does not have a physician

19. Prior to the COVID-19 pandemic, what aspects of clinical care were your **neuropsychologists** using real-time videoconferencing for (check all that apply)?

 - Initial assessment and neuropsychological testing

 - Follow-up appointments for patients that have undergone in-person assessment and/or neuropsychological testing (including appointments for cognitive behavioral therapy)

 - Other (please specify)

 - Our neuropsychologist did not use real-time videoconferencing prior to the COVID-19 pandemic

 - Our clinic does not have a neuropsychologist

20. Prior to the COVID-19 pandemic, what aspects of clinical care were your **physiotherapists** using real-time videoconferencing for (check all that apply)?

 - Initial assessment of patients with persistent post-concussion symptoms

 - Follow-up appointments for patients that have undergone in-person assessment (e.g to advance home exercise progression)

 - Other (please specify)

 - Our physiotherapist did not use real-time videoconferencing prior to the COVID-19 pandemic

 - Our clinic does not have a physiotherapist

21. Prior to the COVID-19 pandemic, what aspects of clinical care were your **occupational therapists** using real-time videoconferencing for (check all that apply)?

 - Initial assessment and neuropsychological testing

 - Follow-up appointments for patients that have undergone in-person assessment (including appointments for therapy)

 - Other (please specify)

 - Our occupational therapist did not use real-time videoconferencing prior to the COVID-19 pandemic

 - Our clinic does not have an occupational therapist

22. Prior to the COVID-19 pandemic, what were the motivating factors for using telemedicine to deliver patient care at your clinic (check all that apply)?

 - Decreasing travel time for patients

 - Improve access to care for patients living in remote or underserved communities

 - Improving clinical outcomes

 - Reduce healthcare costs

 - Reduced missed appointments or patients lost to follow-up

 - Improve research study recruitment

 - Improve patient satisfaction

 - Ensure greater clinical coverage for clinic catchment area

- Enhance clinic revenue

 - Other (please specify)

23. Does your clinic have access to a central Picture Archiving and Communications System (PACS) that allows your physician to review diagnostic imaging studies that have been performed on patients evaluated through real-time videoconferencing?

 - Yes

 - No

24. Prior to the COVID-19 pandemic, and apart from patient care, what other purposes did your clinic use telemedicine for?

 - Education

 - Research

 - Administrative purposes (e.g team meetings)

 - Other (please specify)

*The following questions are for clinics that currently do not use telemedicine to provide care to concussion patients*

25. Do you believe that your patients could benefit from telemedicine-based services being offered at your clinic?

 - Yes

 - No

 - Not sure

26. With appropriate training, equipment, financial support and supportive evidence would you and your clinic be open to using telemedicine to assist with the care of select concussion patients in the future?

 - Yes

 - No

 - Not sure

**Part 3: Future considerations, limitations and barriers**

Please answer the following questions whether your clinic does or does not currently use telemedicine to provide care to concussion patients.

27. Do you believe the development of dedicated telemedicine-based concussion networks could improve access to primary and specialized concussion care in Canada?

 - Yes

 - No

 - Not sure

28. Please identify the potential barriers that would need to be overcome to facilitate use or greater use of telemedicine-based services among healthcare providers at your clinic (check all the apply):

 - Lack of start-up and maintenance funding

 - Lack of clinician training

 - Inability to conduct a complete physical examination

 - Lack of appropriate reimbursement

 - Buy-in from clinicians at your clinic

 - Buy-in from referring sites

 - Language barriers

 - Medico-legal risk

 - Lack of evidence to support benefit

 - Licensing/credentialing challenges

 - Lack of administrative support

 - Privacy and confidentiality concerns

 - Lack of efficiency or impact on clinic workflow

 - Patient-physician relationship

 - Other (please specify)

29. Do you believe that concussion patients and healthcare providers in Canada would benefit from the development of a national working group or task force focusing on the use of telemedicine in concussion care?

 - Yes

 - No

**Part 4: COVID-19 pandemic specific questions**

30. Has your clinic’s use of telemedicine changed since the onset of the COVID-19 pandemic?

 - Yes

 - No

31. What telemedicine services did your clinic begin using during the COVID-19 pandemic that you were not using prior to the COVID-19 pandemic?

 - In-person videoconferencing

 - eConsultation

 - Telephone call appointments

 - Other (please specify)

32. Do you believe that telemedicine has helped provide care to your patients during the COVID-19 pandemic?

 -Yes

 -No

 -Not Sure

33. During the COVID-19 pandemic, were new billing codes or tariffs introduced in your province/territory to allow your clinic’s healthcare providers to bill for telemedicine services that were previously unavailable prior to the COVID-19 pandemic?

 - Yes

 - No

 - Other (please specify)

34. Please indicate which healthcare providers at your clinic used or are using telemedicine-based services to provide patient care during the COVID-19 crisis (check all that apply)?

 - Physician

 - Neuropsychologist

 - Physiotherapist

 - Occupational therapist

 - Psychiatrist

 - Other (please specify)

35. During the COVIID-19 pandemic, were/are the telemedicine-based services your clinic provides delivered through a provincial or territorial telemedicine network or program (e.g Ontario Telehealth Network)

 - Yes

 - No

36. Once the COVID-19 pandemic crisis is over, will your clinic consider using telemedicine to provide care to your concussion patients?

 - Yes

 - No