Jurisdictional Scan, Exploratory Literature Review and Analysis

Hybrid Model of Care Project

May 2024
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Contents

INTRODUCTION

This review consists of a jurisdictional scan, exploratory literature review and analysis. This review will provide an understanding of best practices and potential virtual hybrid care model solution within Canada and internationally. International programs were found to parallel those in Canada in structure and outcomes upon analysis: given the similarities, and the preference for the most contextually relevant examples, international programs were not extensively described in this review. This scan was initially completed in 2024 and has since been updated in April 2025, identifying several new programs within Canada. Many programs are in early stages of implementation, therefore, there is limited evaluation and outcome data.

The review was initially completed in May 2024, and used to inform the development of a virtual hybrid model of care for Cariboo Memorial Hospital in the Interior Health Authority. Initial program information on CMH can be found in the summary of findings section.

METHODS

A jurisdictional scan was conducted to identify care models and example programs in Canada and internationally that use hybrid approaches of virtual providers alongside on-site staff to provide care to patients in hospitals and health centers. The initial research was conducted in April 2024 and has been updated through informational interviews in March and April 2025.

Two international jurisdictional scans recently conducted in BC were identified by the Virtual Hybrid Model Care Project Working Groups and were thoroughly reviewed to identify example programs: 1*) a McMaster Rapid Evidence Review, 'Optimizing the Use of Hybrid-care Models for Delivery of Healthcare Services',* which was commissioned in 2022 by the BC Ministry of Health (Velez et al., 2023), and 2) an exploratory scan, '*Health System Transformation Branch Virtual Care – Service Line Models and Tech'*, by Greg Seib, Senior Policy Analyst, BC Ministry of Health, in November and December 2023 (Seib, 2023). As per Seib (personal communication, February 2023), this exploratory scan was non-exhaustive and included a google keyword search of commonly used virtual health terms on public websites focusing on publicly available virtual care information from relevant health organizations and jurisdictions, providing care to patients remotely and not in their homes, and models supporting practitioners in the delivery of virtual care.

Programs included in these scans were reviewed and hand searched for references to other, similar programs. Searches of Google and Google Scholar were done using key search words including a combination of the following: virtual care, emergency, urgent, admitted, attached, inpatient, acute, most responsible physician or provider, hybrid care, care model, physician, or provider coverage. Interviews were conducted with representatives from programs in Canada deemed relevant. Some interviews led to referrals to other programs.

Interview responses were included in this review. Some programs were accompanied with published literature or reports which were used to add additional information to this review; others were informed

by informational interviews only. Details for each program were summarized into relevant sections when available: background, description of program, technology/tools used, challenges, keys to success, outcomes, and if available, details on quality review process. Findings were also collectively summarized to outline key factors of different applications of this type of hybrid care model. An analysis was done that outlines the advantages and key requirements for each key factor.

An exploratory literature review was done to identify existing guidelines, standards, and best practices in BC and Canada. A comprehensive literature review was not in scope for the purposes of this review, however, foundational resources and existing research from BC, including the two jurisdictional scans described above, were identified by the Virtual Hybrid Care Model Working Groups. Five (5) key documents were summarized and analysed to gain insight into evidence-based best practices for providing high quality virtual or hybrid care within BC and Canada.

JURISDICTIONAL SCAN

Summary of Findings

Ten (10) programs were identified in Canada that use a **hybrid care model that includes a virtual provider responsible for directing the care of patients in a hospital or health center with the support of on-site staff.** Virtual providers in these programs serve as the most responsible provider (MRP) for the patients in their care at the time of their coverage.

The programs that meet the criteria of the hybrid care model described include:

1. British Columbia: Cariboo Memorial, supported by Teladoc
2. British Columbia: Eagle Ridge Hospital Virtual Hospitalist
3. British Columbia: RCCBC VERRa
4. Alberta Health Services: Virtual Emergency Physician (VEP)
5. Central Saskatchewan: Virtual Physician in Emergency Room (VPER)
6. Ontario: PGY5 resident virtual support
7. New Brunswick: Horizon Health Network Teladoc
8. Nova Scotia: VirtualEmergencyNS
9. Prince Edward Island: Health PEI- Western Hospital
10. Newfoundland & Labrador: Virtual ED Provider Programs

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An eleventh (11th) program, the University of Saskatchewan's Virtual Care and Remote Presence Robotics Program, which operates in **nursing outpost stations** was included as a primary example of this review due to its comprehensive care model and plans for expansion to a broader scope which may include larger facilities. While not the focus of this review, additional examples of programs operating at nursing outpost stations or remote community health centres are included in the ***Appendix***.

Several **international** programs were identified that use the hybrid care model of focus. These programs mirror those in Canada in purpose and structure. Examples are included in the ***Appendix***. Given the similarities, and the preference for the most contextually relevant examples, international programs were not extensively described in this review.

There are many examples within Canada and internationally of virtual health programs using ***other*** **types of hybrid care models**. These include:

- **Virtual physician/specialist "peer-to-peer" consultation:** These programs focus on consultation and support to staff as opposed to physician coverage or responsibility of directing care for patients: their purpose is to increase the capacity of a care team and their ability to care for complex patients. These programs often include components of bedside assessments of patients with the virtual provider, often using the same technology as those with virtual providers directing care. These programs have similar operational and technical requirements to those of the hybrid care model of focus; some examples are included in the **Appendix**.

- Virtual triage, consultation, and/or primary care for at-home patients: These programs reduce the number of non-urgent patients and those with general primary care needs arriving in ED, freeing up resources for the care team. This is the model used by Urgent Virtual Care Centre (UVCC) programs.

- Virtual monitoring of at-home 'inpatients': These programs typically include nursing and support staff visiting patients in their homes with the support of a virtual provider for direction of care. The purpose of these types of programs is to reduce the number of low-acuity patients in-hospital thus increasing the capacity of the care team.

Programs using these care models can be considered adjunct to those of the care model of focus as they improve the capacity of on-site providers by reducing the number of patients in inpatient and emergency departments. All models described above are often standalone initiatives, however, are sometimes implemented in conjunction with one another. For example, Health Authorities in Nova Scotia and Saskatchewan have virtual programs for on-site patients in the ED as well as virtual programs for triaging or providing primary care to at-home patients. Both Health Authorities have indicated that the virtual triage/primary care programs have successfully reduced the number of patients arriving in the ED, which has improved the capacity of the on-site and virtual ED staff.

The following table categorizes the main programs identified in this review based on the 3 key decisions and the operational objective (i.e., virtual provider coverage) described above.

	Virtual Provider Staffing				Technology Complexity			Implementation & Support		Virtual Provider Coverage Arrangement		
	Internal		External									
	Local	Health Authority	Provincial	Third-party	Low-Tech	Medium-tech	High-Tech	Internal	With Third-party Company	On-Site Hybrid	On-Call Hybrid	Fully Virtual
British Columbia: *Cariboo Memorial, supported by Teladoc*				X			X		X	X		
British Columbia: *Eagle Ridge Hospital Virtual Evening Hospitalist*	X				X			X		X		
British Columbia: *RCCBC VERRA*			X		X			X			X	
Alberta Health Services: Virtual Emergency Physician		X			X	*Wanting to move in this direction		X				X
Central Saskatchewan: *Virtual Physician in Emergency Room*		X			X			X				X
Northern Saskatchewan: *Virtual Care and Remote Presence Robotics Program*			X (University)				X		X (University)			X
Ontario: *PGY5 Resident virtual support*		X			X					X		
New Brunswick: Horizon Health Network supported by Teladoc health				X			X			X		
Nova Scotia: *VirtualEmergencyNS, supported by Maple*		X				X			X	X		
Prince Edward Island: *Health PEI –Western Hospital supported by Maple*				X		X			X	X		

Newfoundland & Labrador: *Virtual Emergency Room Services*		X					X	X				X
Newfoundland & Labrador: *Virtual ED Physician Coverage, supported by Teladoc Health*				X			X		X			X

Canadian Program Examples

British Columbia: Cariboo Memorial, supported by Teladoc

As of April 2024, Cariboo Memorial Hospital (CMH) in Williams Lake, BC, was facing significant provider shortages, resulting in temporary inpatient diversion and an Emergency Department (ED) closure. This staffing issue affected both the inpatient and ED departments. CMH and Interior Health (IH) partnered with Provincial Health Services Authority (PHSA) Emergency Care BC and Provincial Virtual Health, and the Ministry of Health (MOH) Hospital Services Branch to develop a virtual solution to address limited provider resources and capacity which were leading to closures and diversions.

As a result of this partnership a new virtual physician pilot project was launched Nov 15, 2024 for patients admitted to Cariboo Memorial Hospital. The pilot project utilizes a hybrid model in which a virtual physician splits the work load with an in-person physician; workload division is based on a per patient basis, depending on their needs and capacity of each physician.

Virtual Provider Coverage	On-site hybrid: Virtual physician works alongside an in-person physician. Patient workload is divided each morning based on care needs and capacity of the physicians. All virtual physicians consulting is licensed and registered in British Columbia
Impact to Nursing & Allied Staff	On-site nurses are required to round with the virtual physician and support the virtual consultation/assessment process.
Virtual Provider Staffing	Third Party
Technology	High Tech The program utilizes a device equipped with both a screen and 2 zoom lens cameras. The device is equipped with blue tooth enabled peripherals (e-stethoscope, otoscope, derm-camera, and multi-purpose handheld camera).
Solution Implementation & Support	Third Party Teladoc provided non-clinical support in the form of a flow nursing team who provide on the spot tech support, follow- up on patient orders and results, and ensures proper information transfer between the virtual physician and the site.

Outcomes

The CMH Virtual Support for Hospitals program went live November 15, 2024 and is being evaluated at 1-, 3-, and 6-month intervals. This is a 6-month pilot program supported by Teladoc Canada.

Early metrics in the 1- and 3-month evaluations show no difference in key safety metrics (deaths, readmission rate within 72 hours, and transfers back to the ED) in comparison to the in-person care control group. In addition, there are no statistically significant difference in length of stay between the virtual and in-person care groups.

Patient satisfaction is positive, overall, and while the in-person staff are noticing an increase in workload as a result a lack of a electronic health record, they are noticing a reduction in workload and associated stress, related to not experiencing service interruptions on the unit since the pilot began. Other benefits include improved access to care in the community, improved in-person physician recruitment/retention, and improvements in occupancy despite increased patient volumes at site.

British Columbia: Eagle Ridge Virtual Hospitalist

Eagle Ridge Hospital is a 168 acute-care bed facility with approximately 150 ED visits per day. The hospital services the Tri-Cities area which has a population of over 250,000 (Koczerginski, J. & Sy, C., 2023). As of April 2025, they have also expanded their virtual hospitalist line: there is a now a dedicated 7 day a week virtual line who is MRP for ALC patients.

*Information on this program has been reviewed and updated by relevant contacts as of April 2025.

Virtual Provider Coverage	On-site Hybrid As per the Fraser Health Virtual Health team (C. Dufresne, S. Kapadia, & S. Horton, personal communication, February 2024), the Virtual Evening Hospitalist program at Eagle Ridge Hospital is serviced by a virtual hospitalist who provides evening coverage for existing, stable inpatients who have already been seen by an in-person hospital that day. The virtual hospitalist receives hand-off from the daytime on-site hospitalist and covers all “ward calls" between 5pm and 10pm. An in-person hospitalist remains on site and manages the ED and admissions as well as any inpatients with deteriorating clinical statuses and any discharges.
Impact to Nursing & Allied Staff	Workflow only (not scope) As an on-site physician remains available for higher acuity care, the scope of nurses and allied health staff is not impacted.
Virtual Provider Staffing	Local (Hospital) The program is staffed by existing Eagle Ridge hospitalists. Only physicians working that week in-person are eligible to provide virtual coverage, as a means of preventing local physicians from dropping in-person shifts for virtual ones.
Technology	Low-tech The program uses MS Teams and cellphones for communication. Staff use Meditech Expanse as a clinical information system: virtual physicians have remote access to patients’ complete electronic medical records including their current clinical status (i.e., vital signs), history, labs, treatments, imaging, orders, notes, as well as electronic ordering and documenting.
Solution Implementation & Support	Internal

Challenges

Efficiency in workflow and resourcing, as well as funding, were identified as challenges.

Keys to Success

The following factors were identified as key requirements for the program's success:

- Access to Meditech Expanse including for documenting and ordering, with remote functionality.
- Thorough project planning including design sessions, current and future workflow development, and clear communication pathway between project and clinical leads.
- Physician training materials including videos.
- Communication and collaboration with diverse stakeholders including the clinical team to establish team roles and responsibilities.
- The involvement of physician leads.

Outcomes

The program improved on-site hospitalists' admissions times by 2 to 3 hours and increased the number of patients on-site hospitalists were able to admit. 92% of hospitalists felt that the virtual line greatly or moderately improved efficiency in admitting patients in ED. Nursing workload remained the same.

Virtual Emergency Room Physician

Eagle Ridge Hospital also has a virtual physician ED support program. In this program, the virtual physician acts as an ED physician ***resource*** by; 1) reviewing patient charts on the ED Triage Tracker and writing orders, 2) completing microbiology report call backs, and 3) taking incoming ED physician calls (e.g., UPCC, specialist offices). The virtual ED physicians are not primarily responsible for directing the care of on-site patients (i.e., 'most responsible provider'). Orders placed by the virtual physicians are only actioned once patients arrive in their designated care zones. The virtual ED physicians work from 9am to 3pm. The aim of this project was to address satisfaction rates for ED providers, operational efficiency by providing quicker access to care for eligible patients and decrease wait times for patient diagnostic assessments. This program also uses Meditech Expanse as described above.

The following outcomes were identified:

- Improved overall satisfaction of virtual physician and reduction in job-related stress.
- Time saved for virtual orders vs. on-site physician: Ct scan head (62 mins), pain analgesic (70 mins), nausea/vomiting (78 mins), sepsis (18 mins), and pediatric extremity x-Ray (64mins).
- 60% of nursing found no impact or worsening of work satisfaction: this was expected due to the primary purpose of the program being to support physician capacity.

(C. Dufresne, S. Kapadia, & S. Horton, personal communication, February 2024)

British Columbia: RCCBC VERRa

VERRa (Virtual Emergency Room Rural assistance) is an initiative of RTVS (Real-Time Virtual Support) by Rural Coordination Centre of British Columbia (RCCBC) which also includes the CHARLiE, MaBaL, ROCCi and RUDi programs. As per Dr. John Pawlovich (Personal communication, April 2024), RTVS has provided emergency services support using virtual providers in remote nursing stations in Indigenous communities for over 10 years. VERRa was developed as an evolution of the RUDi (Rural Urgent Doctor in-aid) program

which provides peer-to-peer service for emergency care and expanded to provide MRP (Most Responsible Provider) services as part of a pilot at Dawson Creek and District Hospital. Dawson Creek and District Hospital is a full-service facility with 31 acute-care beds, 15 regional adult psychiatric beds, a 24-hour ED, and ICU for stabilization and transfer. VERRa now provides virtual ED provider coverage across the province to remote nursing stations and some rural hospitals whose patient volume is considered appropriate for the program. The program was designed to provide overnight respite to local physicians who would otherwise be required to work extended hours to keep the ED open.

*Information on this program has been reviewed and updated by relevant contacts as of April 2025.

Virtual Provider Coverage	On-call hybrid: The VERRa program provides overnight MRP support remotely for a broad range of patients. An on-call ED physician remains available in community for in-person high acuity care when required. Programs using VERRa may also access other RTVS services, such as MaBaL or CHARLiE, for virtual specialist support for relevant cases, e.g., deliveries or newborns.
Impact to Nursing & Allied Staff	Possibly scope optimization* As an in community on-site physician remains available for higher acuity care, the scope of nurses and allied health staff could be impacted. On-site nurses (or the virtual physician) can call in the on-call physician whenever they deem it necessary to support in-person care. Given there are times when there is no physician on site, optimization of scope may be required for interim management of high acuity patients before the on-call provider arrives.
Virtual Provider Staffing	Provincial VERRa is staffed by physicians from across the province. VERRa provides overnight support when there are lower patient volumes: the program is currently not an efficient solution for higher volumes.
Technology	'Low-tech' The program utilizes existing RTVS communication infrastructure for care coordination, i.e., Zoom on iPads for nurses on-site and laptops for virtual physicians at home. Virtual physicians have remote access to the site's EMR as well as the provincial EHR, i.e., CareConnect, to review patients' lab results, history, diagnostics, etc. VERRa operates within sites' paper-based clinical information system: the virtual physicians fax all documentation to the site for entry into the patient record.
Solution Implementation & Support	Internal

Keys to Success

As part of its implementation, the VERRa team conducts the following activities:

- Review 6 months of data for a site's overnight volume and acuity levels.
- Meet with local administration to discuss operational processes.

- Meet with local physicians to discuss expectations, i.e., that a local physician remains on-call and available to arrive on-site for cases requiring in-person care.
- Meet with the nursing team to discuss impact to their workflow: nurses are the most impacted by the implementation of this program and thorough engagement is required.

The low-tech, low barrier tools, i.e., iPad and Zoom, were intentionally selected to be user friendly for clinicians without requiring significant IT support.

Challenges

The program does not have the capacity to support the increasing demand for virtual provider services from sites across the province.

Funding is required to advance the scope and depth of the VERRa work.

Outcomes

Up until April 2024, VERRa has provided support to 14 hospitals, successfully completed 344 virtual MRP shifts, and mitigated 3,753 hours of potential closures. As of April 2025, updated data is temporarily on hold as the new director transitions into their role.

Alberta Health Services: Virtual Emergency Physician (VEP)

The Virtual Emergency Physician is a pilot program in Alberta which was created to address physician vacancies and uses virtual ED physicians to cover shifts. This pilot was created in response to a request from the North Zone in Alberta to help with managing emergency service disruptions. The North Zone in Alberta has the highest number of emergency service disruptions with the highest patient volume per capita. The pilot was designed to provide virtual physician coverage to rural sites 24 hours a day. It is a 6-month pilot running from January 2025 to June 2025 pending funding extension, providing support to five (5) rural sites. Sites are separated between 40 and 250 km. The 5 rural sites currently supported are Edson Healthcare Centre, William J. Cadzow - Lac La Biche Healthcare Centre, Hinton Healthcare Center, Beaverlodge Municipal Hospital and Elk Point Healthcare Centre. Each site provides care for approximately 21-34 patients per 24-hour period. The goal is to keep these emergency departments open and supporting patients in their community. The project aims to support lower acuity patients with additional algorithms and decision-making tools when higher acuity patients present during physician vacancies in the ED ("service disruption").

* Information on this program has been reviewed and updated by relevant contacts as of May 2025.

Virtual Provider Coverage	**Fully Virtual:** The VEP program provides 24-hour Virtual Physician support to 5 rural EDs in Alberta. The program is running mostly in evening and nights but has completed one 24 hours shift. Patients who are triaged CTAS 3,4,5 are able to see virtual providers to have their concerns resolved. Generally, patients who are a CTAS 1 or 2 would be initially

	transported to a tertiary site to receive more comprehensive treatment. If they are brought to the site with virtual provider, they would be stabilized and transported via ambulance. Due to EMS not using the same triaging guidelines sometimes patients who are CTAS 2 still arrive at these rural sites. For patients who are CTAS 2, it is up to the discretion between nurse and VEP to decide whether or not to transfer the patient. If patient is deemed not suitable for virtual care, then VEP uses RAPID to link in with a physician to a larger site and have the patient transferred. Pilot sites are 42-97kms from the next emergency department. There is no community back-up physician for this program.
Impact to Nursing & Allied Staff	Scope optimization Emergency departments are staffed with a mixture of RNs and LPNS. RNs are responsible for triaging the patients and then facilitating video call via IPAD to the virtual physician to provide care. LPNs have a more limited scope then the RNs. Nurses rely on Service Disruption procedures for how/when to transfer patients, and Nurse Implemented Protocols and can utilize EMS and ACPs If a patient is requiring additional airway management. An opportunity identified is providing additional advanced training for nurses (e.g. suturing).
Virtual Provider Staffing	Health Authority Alberta has one provincial health authority. The VEP is staffed by 20 Alberta physicians from the North Zone with emergency department experience. These physicians are experienced in addressing issues specific to rural areas. However, they occasionally face challenges when providing care at sites they are less familiar with. When there are gaps in physician coverage, it is the responsibility of the service continuity coordinator to book in physicians. The coordinator leverages locums first and then virtual physicians. If in-person coverage is found, the virtual physician would be cancelled. Virtual physicians are not on shift elsewhere while providing virtual care. Virtual physicians are compensated through fee for service with income guarantee funded as patient volumes vary.
Technology	Low-tech Currently, the program utilizes Zoom on bedside tablets for virtual physician to patient interactions. Virtual physicians have remote access to the provincial EHR, i.e., EPIC and Connect Care to review patients' lab results, history, diagnostics, etc. The project is considering additional digital health tools such as bedside stands and digital stethoscopes

Solution Implementation & Support	Internal

Keys to Success

The following factors were identified as having a positive impact on the launch of the VEP pilot program:

- Alberta has one provincial health authority utilizing the same EMR (EPIC), this allows easy access to patient record for virtual physicians.
- Site engagement and ownership was critical in creating a standardized model.
- Strong partnership with Northern Zone leadership throughout project and continued engagement through weekly design meetings.
- The standard workflow which was designed and implemented, enabled physicians to be contacted via IPAD and allow them to speak directly with the patient.
- Received funding for the VEP providers which was essential to the pilot launching.
- Virtual physicians all have home sites in the Northern Zone (ie. All experienced in Rural ED) which provides them with exposure to the sites they are supporting virtually. This was also done to avoid impact to local recruitment.
- There is a service continuity coordinator position which is responsible for booking virtual physicians if no available in-person coverage.
- The program avoids back-to-back remote shifts in the sites (ie. Virtual physician would not be doing handover to another virtual physician).

Challenges

The following factors were identified as potential issues with the VEP pilot program requiring additional navigation:

- Rural sites joining late to the project will require a different approach to be integrated.
- Staff have a preference for bedside tablets over fixed telehealth equipment which limits quality of video.
- Handover between in-person physician to VEP and then back to local in-person physician can be a challenge but is critical in safe care.
- Identifying which patients are VEP patients through the data is a change for staff and the adoption of this has been a challenge.
- Service disruption scheduling data documentation is not automated.

Outcomes

There have been some challenges with evaluation development and data validation due to short timeline from development to implementation. A comprehensive evidence synthesis prior to implementation was

not possible to inform pilot design. As of March 2025, the evaluation of the initial months of the pilot program is in progress. Results are not yet available.

Looking at qualitative (provider experience through surveys and interviews) and quantitative (coverage for physician) metrics in the evaluation framework.

(J. Taplin, Personal Communication, March 2025) and (S. Webster, Personal Communication, March 2025)

Central Saskatchewan: Virtual Physician in Emergency Room (VPEP)

The VPER program operates at remote health centers with no provider coverage as well as small rural hospitals with up to 10 acute care beds, e.g., Galloway Health Centre. The largest site is Broadview Hospital with 16 acute care inpatient beds (Saskatchewan Health Authority, 2023) (Canadian Institute for Health Information, 2022).

*Information on this program has been reviewed and updated by relevant contacts as of April 2025.

Virtual Provider Coverage Arrangement	**Fully virtual** As per Dr. Puneet Kapur (P. Kapur, personal communication, February 2024), VPER program provides virtual physician coverage for all patients in the ED including those triaged as higher acuity (CTAS 1 and 2). The program has experienced one CTAS 1's and 145 CTAS 2's as of December 2024.
Impact to Nursing & Allied Staff	**Scope optimization** Sites of this program often do not have any on-call physician nearby and as such require on-site nursing and paramedics with additional training in airway management, using supraglottal devices, and other high acuity activities including intraosseous (I.O.) access. Within the province of Saskatchewan, RNs at some sites can call upon paramedics to arrive to ED for support in procedural, airway management or vascular access activities; this is not a component of the VPER program. If higher acuity care is needed, the physician coordinates a transfer to a tertiary centre, accessing the province's 811 Line that acts as a central hub to connect physicians with higher levels of care and coordinates transfer services. RNs are supported by clinical technicians on-site for X-ray and labs; some sites also have LPNs.
Virtual Provider Staffing	**Provincial / Health Authority** The program is staffed from physicians from across the province or those currently living in another province but are licensed in Saskatchewan. There are currently approximately 20 physicians hired by the program. One virtual physician typically covers 2 or 3 EDs at a time. The program offers 24/7 service. The peak hours occur between 10:00 a.m. and 10:00 p.m., with activity beginning to increase around 8:00 a.m. and gradually tapering off around 9:00 p.m.
Technology	**Low-tech**

	The program uses a 'home-grown' videoconferencing solution. On-site nurses connect with virtual physicians via an app on a cellphone. Dr. Kapur highlighted that most of the care provided does not rely on video: the health record and verbal communication over the phone are most important to virtual physicians. The program also uses the province's fully integrated electronic provincial EHR which has all acute care documentation, test results, etc., as well as a provincial e-prescribing system which is connected to all pharmacies in the province.
Solution Implementation & Support	Internal

Operational Details

The VPER program runs in parallel to a second virtual program, VIBEX (described in the ***Appendix***), which is connected to the province's 811 Line and provides virtual primary care services from nurses and physicians to at-home patients. The VIBEX program has answered more than 20,000 calls since its initiation during the Covid-19 pandemic and has resulted in diverting %75 of its patients from going to the ED.

Challenges

- There was initially significant doubt from site nurses for this program and significant engagement with staff and the Nursing Union was required. Identifying defined criteria for nursing activities for the new program, as required by the Nursing Union, was particularly challenging given the context of remote virtual care. The program's framework required flexibility within an ambiguous environment.
- Developing the program with reliance on paramedics was also a challenge given paramedic services are privatized in Saskatchewan and level of training is variable: some have 6 months training while others have 2 years.

Keys to Success

- One key requirement for the program is the reliance on nursing and paramedic skill sets and experience to manage patients' airway, breathing and circulation when possible. This requires additional training and resources to nurses for skills. Paramedics remain available for transport as needed.
- Dr. Kapur highlighted that virtual care does not have 1-to-1 quality of care standard with in-person despite this being a requirement in the College of Physician's standards. The alternative to sites accessing the program is no physician at all and thus an ED closure. Virtual physicians allow EDs to provide most patients with the care they need.

Outcomes

- So far, there have been no significant adverse events or downstream impacts and anecdotally very positive feedback from staff. The program has resulted in avoiding approximately 200 days of closures since starting.

- The program has supported rural retention rates.
- One site, Porcupine Plain Carragana Hospital, graduated from the VPER program after receiving support for some time and no longer requires its services.

Northern Saskatchewan: University of Saskatchewan Virtual Health and Remote Presence Robotics Program

The University of Saskatchewan's Virtual Care and Remote Presence Robotics Program in Northern Saskatchewan currently provides services in small remote facilities: it was included as a primary example of this review due to its comprehensive care model and plans for expansion to a broader scope which may include larger facilities.

The Virtual Health and Remote Presence Robotics Program is an initiative of the University of Saskatchewan and the Saskatchewan Health Authority, led by Dr. Ivar Mendez (I. Mendez, personal communication, February 2024). The program currently services small remote health centers in towns of 2,000 to 3,000 people. As of April 2025, they are designing a standardized virtual care operational model that can be adopted by healthcare systems to integrate virtual care into their existing operations.

* Information on this program has been reviewed and updated by relevant contacts as of April 2025.

Virtual Provider Coverage Arrangement	Fully virtual The program provinces complete virtual physician coverage to in-person care teams in ED and inpatient departments for all patients including those with high acuity care needs. The program also provides direct virtual support to first responders.
Impact to Nursing & Allied Health	Scope optimization As the program operates in small remote health centers, e.g., 'Nursing out-post stations', the on-site nurses have advanced skill sets. Additional training is required for operating the virtual assessment devices described below. Dr. Mendez highlighted that access to virtual providers increases capacity for all on-site staff; for example, an on-site nursing assistant with access to a virtual provider can perform at a higher clinical level than a nurse practitioner. Without the program, staff in rural areas are compelled to work beyond their scope in many cases and this placed a high burden on them. With these virtual systems, the on-site staff are a part of a team with virtual support and the responsibility is spread to the team. They are collaborating with partner post-secondary institutions to develop applied certificates and micro credentials to train virtual health hub assistants and medical imaging technologists, providing them with the skills and knowledge they need to operate effectively in this evolving technological healthcare landscape. These assistants are part of a hybrid

	healthcare delivery team, working alongside both in-person clinicians and virtual clinicians to deliver care in flexible environments while sharing patient responsibility across the healthcare team.
Virtual Provider Staffing	Provincial / With Third-Party (University) The program is staffed by physicians from the Virtual Health and Remote Presence Robotics Program at the University of Saskatchewan in Saskatoon.
Technology	High-tech The program employs several technologies developed to address specific needs to provide virtual provider support to in-person care teams in small remote healthcare facilities. Technologies are integrated with many different tools, systems, and medical devices, with apps that can be used on iPhones, iPads, and laptops. These include: • State-of-the-art remote clinical assessment devices by Teladoc Health with advanced audio-visual functionality e.g., ultra-high-zoom examination cameras, and mobile capabilities allowing remote-controlled rounding by a virtual physician. • Electronic stethoscopes for virtual auscultations • Portable virtually enabled ECG machines • Portable virtually enabled infrared hematoma detector devices for point of care diagnoses. Portable hematoma detectors replace the need for full-size CT machines or transfers to one, and are particularly useful in communities like Pelican Narrows, SK, which have very high rates of violence. • Portable virtually enabled ultrasound-sonography devices: an on-site assistant maneuvers the frame of the device while a virtual sonographer controls the robotic arm and assessment components. • Portable AI-enabled micro-MRI and X-ray machines: these devices can operate with low field magnets and radiation as they use AI to optimize the resolution of input. • Hand-held portable devices for first responders to receive virtual physician support in the field. Devices have auscultating capabilities for conducting more thorough assessments, e.g., for identifying perforated bowels, etc. • AI-Driven Point of Care portable hand-held devices for diabetic retinopathy screening, virtual oral health screening assessments, • AI-Driven Smart phone enabled Forced Cough Vocalization technologies for screening respiratory infections and diseases including TB • Point of Care Pupil Reactivity cameras for assessing pupil reflex after trauma
Solution Implementation & Support	In partnership with University of Saskatchewan

	Work with government agencies in Saskatchewan and other provinces, private industry, academic institutions, and grant agencies to carry out our various projects and initiatives

Challenges

A change in local systems is required to implement this type of program. This can be challenging in established healthcare systems. There is a need to be able to insert new innovations into established systems as well as fit them into the workflows of individual clinicians.

Keys to Success

The program has also prioritized key considerations required for starting a similar program:

- Highlighting existing awareness of the staffing crises that communities are facing and facilitating their identification of a solution.
- Focusing on providing any required additional training to frontline nurses as a first step.
- Capitalizing on hiring physicians who want to work remotely from home for virtual staffing.
- Capitalizing on local physicians' desire to have reduced workloads and would prefer to be on call for high acuity patients only.
- Seamlessly inserting tools into clinician workflows. Clinicians should be able to see the program as part of their workflows without considering it a burden.
- Regarding programs for both ED and an inpatient department, Dr. Mendez suggested starting in the ED and then transitioning to inpatient.
- For virtual care technologies, prioritizing virtual portable ultrasound machines as these allow for high priority diagnostic assessments, i.e., ECHOs and musculoskeletal assessments.
- Leveraging established standardized approaches to program development and implementation, including prioritizing communities, selecting technologies, and managing change

Outcomes

The primary outcome and justification for funding the program has come from the cost of reducing unnecessary transfers:

- Access to virtual physicians has reduced the need for transfers of a significant number of patients. Staying in their communities is extremely beneficial for patients and families and is also cost effective for the healthcare system. When a patient is transported, they are typically not able to return home immediately even if their care needs have been met. Patients typically must stay in hospital for up to 5 days before transport back is arranged. By keeping the patient in their community, this has avoided costs of transport and hospital bed days.
- In Northern communities in Saskatchewan, when acute care of a newborn is required, without physician support, nurses typically immediately call for a transfer. Connecting nurses in Pelican Narrows, SK, with a virtual pediatric specialist resulted in a significant reduction in newborn transfers: only 37% as opposed to 100% in the control community. The patients in Pelican Narrows were followed for weeks after the virtual provider support and no adverse reactions were found.

- Virtual care can minimize the need for itinerant allied health professionals to travel extended distances to provide diagnostic imaging, physiotherapy, and other services, providing a systemic cost savings effect.
- Virtual care increases the capacity of the local health team by providing supervision, mentorship and guidance, allowing higher levels of care to safely and appropriately be administered in community, reducing the need for travel for both patients and providers.

Outcomes related to the program's portable virtual ultrasound devices were also identified. These devices are being used for 300 ultrasounds per week and the program has found a significant economic benefit using these devices.

Opportunities

The program is currently building a new virtual health hub with the support of the Canadian government. This hub will be a central virtual triage and care center with the ability to monitor 90 sites at a time and virtual physicians and sites will have access to many of the technologies described above. The hub's system is currently being built by Microsoft. The program team recently met with the Privy Council to discuss scaling the virtual health hub to also support other provinces: there is particular interest in Nunavut.

The program also recently received a grant from CIHR to build a mobile imaging diagnostic unit equipped with all the portable diagnostic devices described above. The specialists will be in the virtual health hub and the technologists, i.e., nurses and paramedics, will be on-site in the unit.

Dr. Mendez and his team are currently working with an Indigenous nursing program to develop a micro-curriculum for training on specific devices to be used and new communication methods with virtual physicians in these communities.

This presents a unique opportunity to lead in the rapidly evolving virtual care space by creating a standardized operational framework that sets the benchmark for integration into health systems locally, nationally, and internationally. By establishing best practices now, the program can influence policy, drive innovation, and demonstrate impact through real-world implementation.

Ontario: PGY5 Resident Virtual Support

PGY5 residents may provide clinical coverage at approved sites with the authorization of their Program Director. An approved supervisor must be available to them at all times. In this program, the supervisor may be offsite.

This model was introduced to support communities experiencing staffing challenges and is not intended as a solution to prevent emergency department closures. In this setup, the resident is physically present in the emergency department, while a peer physician on duty provides virtual first-call support. A local physician must be available within the community or from home to attend in person if required. This local physician assumes the second-call role, rather than providing direct in-hospital supervision. Locum physicians are not eligible to serve as supervisors under this model.

The virtual peer physician offers physician-to-physician support only and does not directly assess patients. In practice, the second-call physician was rarely, if ever, called in. These senior residents are close to independent practice and generally found the availability of a peer for consultation sufficient and reassuring. Currently only a few sites are involved in this program, all of which are in small and rural communities.

Residents call a virtual physician for support via phone primarily however there is the ability to connect via video for support reviewing diagnostics such as Xray or EKG. It is rare for the virtual peer support to have direct patient communication.

(Dr Howard Ovens, Ontario Expert Lead for Emergency Medicine, personal communication, April 2025)

Virtual Provider Coverage	PGY5 Resident Virtual Support
Impact to Nursing & Allied Staff	Minimal. This is physician to physician support
Virtual Provider Staffing	Provincial Virtual peer support provided by existing Ontario physicians within their peer-to-peer virtual support pool. One peer is on duty at a time and supports various nuances of services offered.
Technology	Low-tech Residents calls a virtual physician for support via phone primarily.
Solution Implementation & Support	Internal

Ontario: Peer to Peer Virtual Program

This model was introduced to support communities experiencing staffing challenges and is not intended as a solution to prevent emergency department closures. In this setup, a physician has to be present in the emergency department, while a peer physician on duty provides virtual support. This model is used when a local physician is working independently for an extended period and needs to consult with another provider about a case.

The virtual peer to peer physician offers physician-to-physician support or physician-to-nurse practitioner only and does not directly assess patients. Virtual physicians are emergency trained providers.

(K. Booth, personal communication, April 2025)

Virtual Provider Coverage	On-site hybrid
Impact to Nursing & Allied Staff	Minimal. This is physician to physician support
Virtual Provider Staffing	Provincial Health Force Ontario will post unfilled shifts on the closure avoidance shift board, with premiums increasing as the shift time approaches. So far, only small hospitals have been allowed to close due to no in-person provider, with the next nearest hospital generally located about 25 minutes away.
Technology	Low-tech In-person provider calls virtual provider via phone primarily.
Solution Implementation & Support	Internal

Evaluation

- Initial evaluation has been completed but has not yet been published

New Brunswick: Horizon Health Network Teladoc

New Brunswick has a one-year partnership with Teladoc health which started November 2, 2024, to provide virtual physician support in 2 emergency departments (Sussex Health Centre and Charlotte County Hospital) (H. Johnston, personal communication, March 31, 2025). At both sites there is an in-person provider on site as the primary provider and the virtual physician acts as a secondary provider. Have not had the opportunity to try fully virtual physician model in the emergency departments.

Virtual Provider Coverage	On-site Hybrid: The Teladoc program is supporting 2 rural emergency department sites in New Brunswick. Patients who are triaged CTAS 3,4,5 are able to see virtual providers to have their concerns resolved. On-site provider is responsible for patients who are CTAS 1, 2 and some 3s. Virtual providers are able to see up to 3 patients per hour. Virtual physicians are trained like locums. In the future if unable to staff in-person provider, plan would be to alert external partners, ambulance services and patients to divert to nearby acute centres (roughly 40-55minutes away). Walk-in patients who are more acute would be stabilized and transported.

Impact to Nursing & Allied Staff	Scope optimization In the event there was no in-person provider, an RT or ACP would be working to assist in cases requiring airway management. At this time, the model of care is fully hybrid with an on-site physician working with a virtual physician.
Virtual Provider Staffing	Combination Horizon's in-person physician coverage is staffed internally and then access Teladoc health service to staff secondary providers. Due to incentives for in-person coverage, there has been no opportunity to sole virtual physician coverage. Virtual Teladoc providers are licensed through New Brunswick; however, they can be based outside of the province. Currently, the majority of providers are located in Ontario.
Technology	'Low-tech' Virtual Teladoc physicians have remote access to EMRs used in both hospitals (no provincial EMR yet, both hospitals currently use same EMR).
Solution Implementation & Support	Third Party

Keys to Success

The following factors were identified as having a positive impact on the pilot program:

- Two emergency departments which are piloting the program use same EMR (there is a 10-year plan for a provincial EMR)
- Hybrid model, in-person provider is able to see CTAS 1s and 2s.
- Using virtual Teladoc physicians to support known high-volume days in the emergency department.
- The two emergency departments chosen for pilot have lower patient volumes

Challenges

- Virtual physicians can only see up to 3 patients per hour. Teladoc has voiced the ability to be able to see 40-50 patients per day but unsure how this would work if implemented in busier emergency departments.
- No evaluation of the program at this point in time.

Prince Edward Island: Health PEI – Western Hospital supported by Maple

Initially, the Virtual ED Physicians and Telerounding programs in Prince Edward Island (PEI) were launched at Western Hospital, a 25-bed (23 medical, 2 palliative) facility, in Alberton. Both programs were developed collaboratively with Health PEI and Maple. Based on initial results of a 6-month pilot of tele-rounding services, a decision was made to secure ongoing tele-rounding services for an additional 12 to 24 months (Health PEI, 2019). In 2020, after the successful launch of the inpatient tele-rounding program, Western Hospital trialed a virtual ED program for low-acuity patients to be seen by a Maple Nurse Practitioner (NP) on the weekends (S. Edwards-Dick, Personal Communication, May 2025). During the trial, patients consistently preferred to wait to see the in-person provider, so this was abandoned.

The Health PEI project is a virtual Most Responsible Provider (MRP) inpatient care model designed to support unattached patients on a 25-bed inpatient unit. Patients with a family physician are seen by an in-person doctor, while unattached patients are managed by a Maple physician, who serves as the MRP until 5 p.m. Overnight coverage is provided by the on-call emergency department physician. Inclusion and exclusion criteria guide patient eligibility, with higher-acuity cases reviewed on a case-by-case basis and managed collaboratively with on-site physicians. Now in its fourth year, the initiative was launched in response physician recruitment challenges in the province. The Maple contract is held provincially. The ED continues to be staffed by in-person physicians and NP in person Monday to Friday who sees the lower acuity patients which decreases the need for a virtual ED.

* Information on this program has been reviewed and updated by Valerie Arsenault (Nurse Manager) and Shelley Edwards-Dick (Director of Nursing) on May 20, 2025.

Virtual Provider Coverage Arrangement	The Maple physicians covers inpatients from 8:00 AM to 5:00 PM. They are covering unattached patients who are admitted and consent to virtual care. Patients who require in-person care and have a family physician, or present with other complexities will be managed by an on-site physician who collaborates simultaneously with the Maple provider. Patients with altered level of consciousness, unstable vital signs, are palliative care patients or require physical exam are assigned to in-person physicians. Difficult family situations may also warrant in-person care. The Maple physicians are the MRP for their inpatients until 5pm. They are not on-call as there is always a physician in the ED on-call. Physician expectations, including work hours, availability, and specific responsibilities for Maple physicians, are formally documented in writing.
Virtual Provider Staffing	The Maple physicians are primarily from Ontario and are licensed in PEI to be able to deliver remote care. Maple physicians are scheduled for five to seven days of coverage to ensure continuity of care. While Maple manages the scheduling, challenges have occurred due to last-minute physician schedule changes. Coverage expectations have been addressed through their Medical Affairs liaison as part of the contractual agreement (Dr Farion).

	The Maple Team (personal communication, May 2024) shared that their service can be provided with or without physicians; local physicians can serve as the virtual provider using Maple's technologies. Maple physicians receive a daily rate and can bill for specific services such as telephone consults, discharge fees, and hospital day fees.
Impact to Nursing & Allied Health	***Inpatient:*** The nursing team lead on site aided the consultation with the virtual physician by providing a standard assessment from the hospital room. Nurses receive orientation on the Maple device and platform, as well as the workflow for virtual consultations.
Technology	The program operates using a technology platform custom-built by Maple specifically for an in-hospital service (Health PEI, 2019). The patient encounter, using the tele-rounding model, leverages a two-way video conferencing platform at the patient's bedside using a telemedicine cart equipped with a large screen and microphone, a high-resolution camera and a laptop. Virtual physicians had full access to Health PEI's Clinical Information System (CIS) Cerner for all documentation and used e-scription for the dictation of progress notes and discharge summaries. Maple is fully integrated with Cerner. Peripherals like the digital stethoscope were initially available but have not been used in the past two years, as the in-person provider conducts physical assessments alongside Maple. ***Tech support:*** Health PEI's IT department provides initial support, and Maple is contacted for issues related to the device.

Challenges

- Experiencing staffing challenges such as physician availability as well as increased workload for nurses and increased time spent rounding on the patients.
- Another concern is patient acceptance of virtual care specifically the elderly and those with cognitive impairment.

Evaluation

- The Health PEI project does not have formal evaluation reports, but anecdotal feedback indicates a preference for continuity of care with familiar virtual physicians.
- The previous NP trial in the ED was not successful as patients preferred to wait for in-person care rather than see a virtual NP.

Nova Scotia: VirtualEmergencyNS

The VirtualEmergencyNS (VENS) program is currently operating at Yarmouth Regional Hospital, a 124-bed acute care facility, as well as other smaller sites with single or no provider coverage in Nova Scotia (NS). There are plans for future expansion to other sites (J. Sommers, personal communication, February 2024). Dr. Janet Sommers is the Head of the ED at Colchester East Hants Health Centre (CEHHC) where the program was first piloted. The goal of VENS is to provide quality, gold-standard virtual urgent and

emergent care to Nova Scotians in underserved communities allowing patients to receive care close to home, and to support rural teams (physicians and staff) to focus in-person care on those needing it most.

Virtual Provider Coverage Arrangement	On-site hybrid At Yarmouth Regional Hospital, the VirtualEmergencyNS (VENS) program provides virtual physician coverage in the ED for CTAS 3, 4 and 5 patients with support of an on-site LPN, ACP, RN, or Care Assistant and an on-site physician provides care to patients triaged as CTAS 1 or 2. At non-physician sites, patients with higher acuity needs are transported to another facility when in-person provider care is required.
Impact to Nursing & Allied Staff	Workflow only (not scope) As an on-site physician remains available for higher acuity care, the scope of nurses and allied health staff is not impacted. The program requires dedicated and skilled nursing staff with competency in triage skills and in judging which patients are appropriate for virtual physician care. At pilot site (Colchester Hospital), an RN with advanced skills (casting, suturing, incisions, and drainage) increased opportunities for care that could be provided virtually. Clinical Assistants on-site are responsible for setting up the devices and performing certain aspects of the physical exam.
Virtual Provider Staffing	Provincial / Health Authority The program is staffed from physicians across the province, which has one provincial Health Authority.
Technology	Medium tech At-home physicians use a telecommunication platform from 'Maple', a third-party company, connected to iPads, iPhones, and laptops for viewing and communicating with the patient and staff. iPads are connected to the site's Wi-Fi, however, also have cellular chips in them in case the internet is interrupted. The Maple platform is also used for entering prescriptions, orders, notes, etc. The program operates within the province's paper-based clinical information system: Virtual providers complete all documentation in Maple then fax it to the site for inclusion into the patient record. Virtual providers have access to full suite of investigations and department services: X-ray, CT, lab, ECG, etc. The lower tech tools are user friendly and easily transferrable to different sites across the province. The program also uses some higher-tech peripheral devices, i.e., electronic stethoscopes and otoscopes.

Solution Implementation & Support	In partnership with a private third-party company: Maple

Operational Details

Patients are informed when they've been deemed eligible for virtual care and are assured that they will receive the same diagnostics and care quality utilizing the virtual option. Patients are made aware that the wait time for care is either the same or better than in-person, and they can choose to default back to the in-person stream if desired. Consent is obtained with the support of the registration clerk.

The program runs in parallel to two other virtual programs; 1) Virtual Care Nova Scotia (VCNS), which allows at-home patients in Nova Scotia to receive virtual primary care: prescriptions, labs, referrals, etc. – this program has had an outcome of reduced visits to ED for primary care needs, and 2) Virtual Urgent Nova Scotia (VUNS) which occurs in smaller health centers in the province: this program is staffed by physicians from a third-party company in Ontario and sees low acuity patients.

VENS is currently only available in the day due to staffing.

Keys to Success

The following factors were identified as key requirements for the program's success:

- Dr. Sommers advocated that the best use of virtual physicians is in covering a larger number of lower acuity patients as opposed to a smaller number of higher acuity patients. When covering higher acuity patients, a physician needs more significant involvement in directly monitoring the patient, which is more challenging and less efficient when done virtually.
- Dr. Sommers also advocates for a hybrid model (i.e., alongside an on-site physician) using basic audio-visual communication technology over one that offers advanced technology devices but has only a virtual physician. An on-site physician offers a much broader scope for the ED: the virtual physician supports the capacity of the on-site physician by reducing their workload.
- For VENS, nurse educators developed comprehensive reference guides for both in-person staff, including physicians, and the virtual physicians: this supported program adoption.
- The involvement of a physician champion for initiating the program was necessary.
- Virtual physicians require access to all patient information available to on-site physicians; this requires access to various platforms.
- Dr. Sommers highlighted that recently there has been a shift in physicians' desire for working virtually care and recruitment is becoming easier.
- This type of program requires a significant increase in support staff: clerical, clinical assistants, etc.

Challenges

Dr. Sommers identified the following challenges in implementing and supporting this program:

- Identifying a pool of physicians for staffing the program.
- There is a lack of evidence on virtual care given it's novelty.

- Reinforcing the local context, rural resources, and expectations of the site and staff an ongoing with basis to virtual physicians.
- Reinforcing the need for providers to focus or 'narrow' their clinical assessments: initially physicians were being overly thorough, ordering abundant number of tests, likely due to a decreased sense of security.
- Skepticism from partners of the safety and effectiveness of the care model.
- Neurodivergent patients were found to experience issues with the virtual method of communication.
- Nursing staff are often 'pushing the limit' on what cases they can bring to the virtual physician.
- Specialists and services receiving referrals from VENS physicians may not understand what the program is and that the patient has had an in-person physical exam and investigations done.

Outcomes

The following outcomes were identified:

- The pilot site, Colchester East Hants Health Centre in Truro, concluded receiving services from the VENS program due to success of other staffing interventions including leveraging nurse practitioners and a fast-track program with physicians in the community not working in the ED for lower acuity patients.
- Virtual care has allowed provision of higher quality care at its site given the alternative of no care.
- Many patients have started requesting the service due to it's faster wait-times.
- Virtual care has also provided additional choices to patients; for example, some patients request a provider of the same gender, which is a more feasible request as compared to in-person providers.
- Over 1300 patients have been seen with no adverse event outcomes.

Opportunities

Dr. Sommers identified the following opportunities for virtual hybrid programs:

- Physician resources provided by solution can be great; this solves the problem of developing an additional staffing pool, especially when staffing resources are limited.
- Organizations should select a platform integrated with video and audio, a user-friendly interface (to enhance buy in and acceptance), and easy-to-use login processes.
- Solutions should be able to integrate with the organization's EHR.
- If physicians are not local to the area, they will need education and directives for care. Clinical pathways outlining exactly what tests, services, and resources are available will need to be developed. If covering multiple hospitals, physicians will need to have directives and pathways for each individual site.
- Virtual inpatient physician care is possible and may work better than ED as the patient load is not shifting. Virtual inpatient physician care could allow providers to follow their own patients through their care journey. In-person physicians could provide hand off to a virtual physician when needed. In theory, the on-site physician could be responsible for acute cases only; once a patient is stable (often after first few days), the in-person provider could hand off care to the virtual provider.
- Initiating virtual programs can facilitate identifying areas of practices which need workflow updates and review of practices.
- Differences in time zones across Canada could be leveraged to support virtual providers from other provinces covering limited staffing times, i.e., overnight. For example, a virtual provider in Nova Scotia could wake up at 6am to provide overnight coverage (starting at 2am local time) for a BC site.

- NS has been working on a set of principles to guide virtual care with goals to integrate programs, institute best practices for virtual care, and recruitment.
- NS is using several initiatives with different platforms, however, would prefer to have one platform for the whole province; this is especially true considering proprietary issues with different platforms and integration. Dr. Sommers suggests selecting a vendor that has multiple products and services (i.e., inpatient, outpatient, ED etc.) and is adaptable to the organization's needs (i.e., can incorporate the product with what is currently in use).
- Virtual care allows for coverage of patients in geographical diverse patients including remote areas or multiple locations at once. It may address physician shortages at smaller locations.

Newfoundland & Labrador: Virtual ED Provider Programs

The Newfoundland and Labrador (NL) Health Authority, NL Health, has an 'internal' program implemented independently as well as an adjunct program in partnership with Teladoc Health for additional virtual physician support when internal virtual physicians are not available. (A. Dinn & A. Elliott, personal communication, February 2024) (NL Health Services, 2023) (L. Barrett & C. Fry, personal communication, February 2024).

The program operates in a number of facility types including Category B, A, Health Centre and Urgent Care Centres. 'Category B' Emergency Departments: these are rural hospitals with 10 (e.g., Fogo Island Health Centre) to 20 (e.g., Notre Dame Bay Memorial Health Centre) inpatient beds, with 24-hour emergency care. These sites typically have no intensivists: physicians for both the inpatient department and ED are mostly family physicians from the community.

The Category A Emergency Departments providing virtual fast track or secondary ER physician coverage and has a collaborative relationship with the onsite ER physician. The Health Centres uses regional nurses with advanced skills and a covering virtual physician.

*Information on this program has been reviewed and updated by relevant contacts as of April 2025.

Virtual Provider Coverage	Fully virtual Virtual physicians provide coverage for all patients in the ED, including those triaged as higher acuity (CTAS 1, 2 and 3). The purpose of the program is to treat and stabilize patients who present to the ED and transport any patients to a 'Category A' (tertiary) site when they require more comprehensive treatment. If additional care is required, the virtual physician collaborates with the appropriate physician at the tertiary site to transfer patients. On-site Registered Nurses (RN) and, when available, Advanced Care Paramedics (ACP) and Respiratory Therapists (RT) work to the full scope of their practice including airway management. If staff with airway management experience are not available, the site prioritizes airway protection and transferring as soon as possible. Staff have additional training on suturing, airway protection, back slabs, and other advanced practices.

	In addition to virtual physician coverage, some sites in the province have a NP "Fast Track" program through external company, FoneMed, in which a virtual NP provides care to low acuity patients, i.e., CTAS 4 or 5 (A. Dinn & A. Elliott, personal communication, February 2024) (NL Health Services, 2023).
Impact to Nursing & Allied Staff	Scope optimization RNs, RTs and Advanced Care Paramedics (ACP) work to the full scope of their practice including airway management. Without a provider, ACP and RT airway management is the preferred method for supporting all CTAS levels, however, is not always available: in NL, one zone has a travelling ACP and RT, however, most do not. Sites without airway management support typically prioritize airway 'protection' and transferring if required as soon as possible. Additional work has been undertaken to provide training for registered nurses (RNs) and to purchase equipment such as the more expensive Rescue Pack, i-gels, and back slabs. Following the experience of a virtual Code Blue, debrief sessions have been conducted. Additionally, discussions have been held regarding the necessary steps for a Nurse Practitioner (NP) to effectively lead the emergency room (trauma course, airway course and ensure they have family care designation).
Virtual Provider Staffing	Combination NL Health's internal program is staffed by physicians from across the region. Newfoundland has one provincial health authority. The program operates using its own physicians first, which usually covers 80% of virtual shifts in the Cat B facilities, before accessing the Teladoc Health service. The external support program is staffed by private Teladoc Health physicians. • Teladoc Health physicians are Canadian and are licensed within the province and have credentials and privileges to Health Information Systems. • Teladoc Health physicians currently cover multiple areas across the country at once, operating based on demand from site and on a monthly fee for service model. The Teladoc Health team shared they are open to exploring different models, however, the current model seems to work best for both parties: physicians are not paid based on number of patients they see and in times of surges, costs remain the same. • There is a coordinator who schedules the physicians and the airway management specialists.
Technology	High-tech The program uses mobile carts with high-definition audio-visual functionality and electronic stethoscopes and otoscopes: the internal program sites use Cisco Telemedicine carts and infrastructure and the sites using Teladoc Health services use the Teladoc Litev4 systems. Other tools include electronic stethoscopes and otoscopes and iPads for additional communication, registration, coordination, and

	connection to virtual service. Virtual physicians have remote access to review provincial EHR system, 'HealtheNL', and the different versions of Meditech used across sites. Internet connection is required for virtual assessment machines: for mobile devices, it is best to have strong Wi-Fi, however, connecting with satellite internet is an option. Teladoc Health devices can call in family members, interpreters, other healthcare professionals including specialists, to be on-screen alongside the physician. The programs operate within the province's paper-based clinical information system: the virtual physicians fax all documentation to the site for entry into the patient record. The province's 811 Line is used for coordination of NP FastTrack FoneMed program: patients can call 811 from home, a nursing assessment is started, and the completed assessment form is sent to the ED. 811 will do also follow up calls with patients including those that were not seen while in the ED.
Solution Implementation & Support	**Both internal and in partnership with a private third-party company** The province's primary 'internal' program was implemented and is supported independently by the Health Authority. The additional support program was developed in partnership with a private third-party company Teladoc Health: Teladoc Health provided the technology, implementation support and physician staffing for their service at select sites in the province. 'Teladoc Health', a third-party US company with offices in Canada, provided the technology, implementation support and physician staffing for virtual care at select sites in the province. As per the Teladoc Health team, the implementation of their solution with NL Health included the following processes: • Getting buy-in and an understanding of the community, rural context, nursing staff, and environment and leadership of the ED. • Identifying staff workflows and iteratively restructuring them as needed. Workflow mapping included identifying advanced medical directives of the local site staff to leverage existing autonomy and scope as much as possible. • Thoroughly train staff on the platform during the design phase and on an ongoing basis. • Training and educating Teladoc Health physicians on the context of the community and rural practice in general: Teladoc Health physicians are typically ED physicians from larger centers and not familiar with rural resources and how to manage patients in this context. • The Teladoc Health team was on-site too during the launch of the program to support its implementation. Device monitoring and maintenance is done by Teladoc Health.

Operational Details

All key roles and responsibilities of RNs, LPNs, RTs, and ACPs in this program are outlined in the program's 'Virtual Emergency Room Staffing Models and Workflow' document (NL Health Services, 2023), as shared by NL Health.

For the NP Fast Track program, the NP is assisted by an on-site licensed practical nurse (LPN) or another healthcare team member for assessment and provision of care for discharge. The NP collaborates with the virtual or on-site physician at the site to transfer care of any patients who require a higher level of care. The Fast Track program is connected to **811:** patients can call 811 from home, a nursing assessment is started, and the completed assessment form is sent to the ED. 811 will do also follow up calls with patients including those that were not seen while in the ED. This program is only provided when a virtual or on-site physician is also providing emergency care at the site.

Challenges

NL Health identified the following challenges in implementing and supporting these programs:

- Resourcing for airway management, as described above, is the most significant and sustaining challenge. Without a provider, ACP and RT airway management is the preferred method for supporting all CTAS levels, however, is not always available: in NL, one zone has a travelling ACP and RT, however, most do not. Sites without airway management support typically prioritize airway 'protection' and transferring if required as soon as possible.
- Ongoing assessment of the risks associated with staying open vs. closing is required. Transportation, which is required when an ED closes (i.e., by-passing site and transfers), is one of the highest risks for patients in NL given the significant distances, limited resources in transit, and limited bandwidth in some regions preventing paramedics from accessing physician consultation.
- Ambulance services in the province are also a mix of private and public which has created complications.
- There were initially limitations in physician staffing available for virtual coverage of the program.
- The lack of a provincial EHR: faxing documentation to the site to add to patient record is sufficient but not ideal.
- The Cat A facilities, Urgent Care and Health Centres focus on increasing capacity and decreasing wait times.
- Fax is still being used in the emergency department and currently not being able to use fax feature due to connection issues.

For the Teladoc Health service specifically, the following challenges were added:

- Ongoing reinforcements with Teladoc physicians on the local context, rural resources, and expectations of the site and staff.
- Ongoing reinforcements of the need for providers to focus or 'narrow' their clinical assessments: initially physicians were being overly thorough, ordering abundant number of tests to address chronic care needs. Given the contextual reality, this level of care is not feasible: patients are not attached. Patients can be seen by the same virtual physician overtime but, overall, there is a lack of attachment to primary care team.

Keys to Success

For the Teladoc program; NL Health identified having flexible contracting as a key to success: they developed 2 statements of work with the ability to add sites and other statements of work as needed for scaling the program up or down. Meeting with the vendor once a week to discuss ongoing operational statuses and needs has also been very helpful. The Teladoc Health Team identified that following its thorough implementation process, as described above, and collaborating with NL Health were key to the program's success. Having remote access to the full patient record including labs and diagnostics in real-time using Meditech and HealtheNL was also very important. The Fast Track NP program was dependent on collaboration with the Department of Health to amend existing contracts and information sharing agreements with the province's 811 program as part of the pilot.

Outcomes

The following outcomes were identified:

- Since starting the Virtual Emergency Room Services program, multiple facilities that were previously closed have been re-opened with no closures at any Teladoc supported site.
- For NP Fast Track program, care needs of most CTAS 4 and 5 patients met; all were appropriately discharged after their encounter with the nurse practitioner. The NP Fast Track program has supported the capacity of virtual providers covering more than one site.
- Staff feedback has been positive.
- Program has managed critical transport cases and services were completed the same as if a provider was directly on site.
- Wait times are either the same or better than for typical on-site ED physician.

Opportunities

The Teladoc Health team discussed the following opportunities and options for its service:

- Teladoc Health has not focused on inpatients specifically yet, however, it is a possibility: the workflows could be mapped, and solutions developed.
- Teladoc Health can implement their program in a short time frame of 6 weeks.
- There are flexible options in how the Teladoc systems can be set-up. In NL, Teladoc communication devices are set up to receive the CTAS score of patients as a first prompt and then provide corresponding relevant options for the on-site staff.
- Teladoc Health systems can integrate with hospitals' electronic documentation system if available.
- Implementation of EPIC in Newfoundland is coming in the next year which will assist in streaming access to patient records.

International Program Examples

There are several international programs using a hybrid care model as described in this review. Some examples are described below. The programs were found to mirror those in Canada in purpose, design, learnings, and outcomes.

Australia (Perth): Health in a Virtual Environment (HIVE)

As per the Government of Western Australia East Metropolitan Health Services (2023), the Health in a Virtual Environment (HIVE) program is an inpatient remote monitoring service, operating at Royal Perth, a 450-bed acute care hospital.

The service is enabled by an artificial intelligence platform that detects the earliest signs of clinical deterioration. When an alert is generated, HIVE clinicians use a two-way audio-visual system to collaborate with staff on the ward, offering “a second set of eyes” to deliver care. Once alerted, the Command Centre clinicians provide immediate support to the nursing and medical staff already working on the patient’s ward. Junior physicians and nurses have the option to use the AV to access 24/7 supervision from senior colleagues, who may be elsewhere in the hospital, or off-site. Using the HIVE’s high-definition audio-visual platform, the HIVE clinicians can see both the ward teams and patient to support treatment. Each 'POD' of the Command Centre has 1 doctor and 3 nurses with access to live continuous physiological patient monitoring, live dashboards with predicted deterioration reports, documentation/ordering platform/clinical applications, medical imaging, and a clinical grade audiovisual system (Government of Western Australia East Metropolitan Health Services, 2023).

Australia (Victoria): My Emergency Doctor at MDHS Urgent Care Centre

As per MyEmergencyDoctor (n.d.) and Maryborough District Health Service (n.d.), the Maryborough District Health Service (MDHS) Urgent Care Centre (UCC) is a 24-hour urgent care center supporting a region of approximately 15,000 people. MyEmergencyDoctor provides virtual physician coverage to hospitals and other healthcare centers in Australia.

MyEmergencyDoctor was implemented for overnight emergency telemedicine services in 2019 at MDHS UCC. For this program, a local physician remained on-call to support the UCC for serious cases only. Of the patients seen during a 9-month pilot, 13.5% were admitted for ongoing care and management, 78.4% were discharged home after assessment, and management and 8.2% were transferred to a higher level of care at another health service. No complaints or negative feedback was received. Hospital staff indicated the stress-free and fast accessibility of using the telehealth service made it the ideal solution in ensuring physicians maintain a work life balance. Nurses felt reassured that they were supported by specialist physicians at any given point in time of their shift (MyEmergencyDoctor, n.d.) (Maryborough District Health Service, n.d.).

USA (Boston): Virtual Inpatient Rounding

As per Becker et al. (2021), the Virtual Team Rounding Program (VTRP) was implemented at Brigham and Women's Hospital in Boston during the COVID-19 pandemic. The hospital has more than 800 inpatient beds (Mass General Brigham, n.d.).

The goals of the program include
(i) providing additional clinical support to inpatient teams
(ii) utilizing providers with modified clinical duties
(iii) using virtual methods of communication to preserve PPE (Personal Protective Equipment) and allow in-hospital distancing.

The virtual rounders' primary role was tracking tasks and participating and completing documentation tasks for their teams such as drafting progress notes and discharge summaries. The VTRP leveraged videoconference technology, with a virtual rounder at home using a personal computer and a configured iPad for the inpatient team. The iPad could be stationary during sit-down rounds or secured to a mobile workstation to facilitate walking rounds. The virtual rounder participated in rounds with the team, listening, participating, and accessing the EHR. Two-thirds of on-site physicians reported the program saved them time daily (Becker et al., 2021).

USA (California): Virtual Visit Track

As per Nair et al. (2023), the Virtual Visit Track is a program of Stanford Medicine that was converted from an existing ED Fast Track program, designed to treat patients with less severe health problems as efficiently as possible, to a virtual care program for low acuity patients with a remote emergency physician. Only patients triaged with an Emergency Severity Index (ESI) of 4 and 5 or adult ESI 3 patients who have been determined appropriate by the virtual physician and have consented are eligible for the program. ESI an American triaging index that, like the CTAS, ranges from 1 (highest acuity) to 5 (lowest acuity).

The virtual physician is supported by virtual-enabled hardware and software including Vidyo, a video conferencing platform, which is integrated into the local EMR, and Voalte, a communication software for virtual physicians to on-site assistants. The program includes an on-site 'Resource Physician' that supports tasks that cannot be completed virtually. Implementing the program required workflow development and training for all involved staff. The program saw several positive outcomes including reduced patient length of stay in the ED (47% lower) and a lower patient return rate both within 72 hours and 7 days (Nair et al., 2023).

USA (Minnesota): Virtual Hospitalist Service

As per North Shore Health (2023), the Virtual Hospitalist Service is a program using state of the art technology for virtual physician care in hospitals. The program is staffed by a local state virtual hospitalist provider, Horizon Virtual, and is using Teladoc Health devices. The devices allow physicians to assess patients remotely with the help of the nurse: they are equipped with ultra-high zoom cameras and high-resolution microphones for electronic auscultation.

USA (New York): ED Express Care Virtual Fast Track

As per Hsu et al. (2020), the ED Express Care program was launched in July 2016 in New York. The program uses telemedicine to evaluate patients who are physically in two EDs: an ED at a quaternary care academic medical center with an annual visit volume of 90,000 patients, and a community hospital with an annual visit volume of 45,000 patients. Low-acuity patients, i.e., ESI 4 and 5, are evaluated by an off-site telemedicine physician after an initial nursing triage and medical screening examination if deemed appropriate. Patients must have health concerns that are unlikely to require extensive ED resources. It was found that patients of this program were treated and released from ED quicker than in-person Fast Track patients for similar, low-acuity concerns, and were no more likely to return requiring further evaluation (Hsu et al., 2020).

ADJUNCT MODELS

Virtual physician coverage for remote community health centres

Programs using this model typically operate in nursing stations or centres with one physician or a part-time visiting physician.

Ontario: Sioux Look out Nursing Station MRP model

The Sioux Lookout First Nations Health Authority (SLFNHA) has implemented a most responsible physician (MRP) service to 31 Indigenous Nursing Stations within the Sioux Lookout catchment area to ensure patient care remains the focus. SLFNHA's telemedicine program allows patients and nurses to consult with doctors and specialists remotely. Consults are typically conducted over the phone, as these areas tend to have unreliable internet connectivity which limits the ability to do video calls. The flexible nursing staff are prepared to address urgent needs across 31 communities. These stations, which are staffed by nurses, are not designated emergency departments, but provide emergency care and although they refer to this model as a virtual MRP model, it is similar to other RTVS models in BC where virtual physicians support nurses and patients to consult and therefore is quite different from other hybrid models described. Currently, the virtual providers cover 5pm to 8am as required. There has been some pushback from providers regarding the medicolegal risk, particularly due to inconsistencies in reports communicated over the phone. This program was established to support the SLFNHA while they continue their provider recruitment.

(K. Booth, personal communication, April 2025)

Ontario (Renfrew County): Virtual Triage Assessment Centre (VTAC) Program

As per Fitzsimon (2023), the VTAC program offers a hybrid solution to deliver primary care to all residents across their Renfrew County and reserve ED visits for true emergency care. VTAC physicians provide virtual triage for patients at-home as well as virtual coverage for on-site patients needing in-person assessments. The program is not for patients experiencing life-threatening emergencies.

Patients phone the service to book a telephone or video appointment with a VTAC family physician. The doctor provides consultation to address the patient's health concern. Based on the patient's care needs, the doctor can coordinate the patient being seen on-site at one of the VTAC Clinical Assessment Centres (CACs) located across Renfrew County by community paramedic for a more detailed physical examination. The doctor remains available by video. The virtual physician may refer patients to specialists or other local health resources.

After implementing VTAC, Renfrew County saw reduced ED visits and hospitalisations and slower health-system cost growth compared with neighbouring rural districts. VTAC patients experienced reduced unnecessary ED visits and increased appropriate care (Fitzsimon, 2023).

BC (Robson Valley): Virtual Medicine Pilot

According to Winter et al. (2018), the Virtual Medicine Pilot provided real-time virtual care consultations for 1) family physicians in the Robson Valley and emergency physicians in Prince George, and 2) for consultations from community ED nurses to the local on-call family physicians within the Robson Valley. This was done using videoconferencing as well as secure text messaging. Other technologies such as Google Glass were explored in a limited way in the pilot. The purpose of the pilot was to use virtual care to facilitate timely access to high quality, comprehensive, coordinated team-based care, particularly in emergency care situations.

The following outcomes were identified:

- Rural family physicians began integrating virtual care technologies into their daily practice, in addition to just-in-time consultations. This increased collaboration and coordination of care and contributed to the normalization of virtual care services.
- The visual component and immediacy of the technologies used during the pilot led to improved patient care, better communication during consultations, and stronger relationships among participants at all sites.
- Physician adoption of virtual health was successfully normalized by developing and strengthening relationships across sites and using virtual medicine technologies for purposes beyond patient consultations to develop comfort and familiarity with the equipment.
- Rural family physicians reported an increase in opportunities to build skills and knowledge, in learning from emergency physicians. They also reported reduced stress and increased job satisfaction (Winter et al., 2018).

Australia (New South Wales): Virtual Rural Generalist Service

The Virtual Rural Generalist Service (VRGS) program provides physician staffing both virtually and in person for rural generalist medical coverage for small hospitals and multipurpose services (MPS) (K. Gendron, personal communication, March 2024) (Western NSW Local Health District (2021).
VRGS operates in centers in remote towns, typically of 2000 to 4000 residents, where there are no local physicians available, i.e., run by nurses with advanced triage skills, or when some level of local physician coverage exists but is not comprehensive, i.e., missing coverage for nights, weekends, holidays, etc. VRGS provides virtual care to non-critical ED patients, medical management of acute inpatients, virtual ward rounds for inpatients including admitting and discharging, and clinical support for residential aged care (RAC) residents in rural MPSs (multipurpose services).

VRGS physicians provide some virtual care for higher acuity patients, however, in many cases, a local physician remains on-call for in-person urgent cases that the VRGS cannot support, e.g., intubation. While not always possible, this is the preferred and ideal application of the program. VRGS and site staff also work closely with an adjunct program, ‘vCare’, which provides specialty-level advice and critical care expertise for high acuity patients virtually.

VRGS rosters six virtual physicians per 24-hour period, with shift times aligned and scaled to meet projected demand in EDs and wards. In most cases, VGRS physicians are rural specialists. 25% of all shifts

are done in person within the *district* which VRGS provides support to. VRGS physicians may not work at the same hospital as they are providing care but working in the general district which maintains some level of contextual understanding of the site and can help with rapport with patients and clinicians.

The program uses a number of technologies: Teleconferencing (Cisco Self Care Portal phone diversions); Videoconferencing (Pexip); Fixed ceiling cameras with pan, tilt and zoom; Mobile videoconferencing units (Wallies) with two-way audio and video and pan, tilt and zoom; Lifepak electrocardiograms (ECG) to electronically send ECGs to the doctor; Visionflex Pro-Ex including otoscopes, dermscan and other peripherals; and Clinical applications such as eMR and eMeds.

The following keys to success were identified:

- Nursing is an integral part of service as they are on-site to perform physical assessments and procedures. Nursing receives an enhanced education program targeted at rural nursing assessment skills.
- Operating in parallel to critical care stream, vCare, is crucial: as per Dr. Gendron, "VRGS does not work without vCare".
- A significant amount of process mapping and understanding of service need was undertaken prior to the launch of VRGS in 2020.
- A key enabler for building relationships and engagement with nursing teams and the wider community is on site work that complements virtual activity. 25% of all shifts are completed in person within rural sites in to ensure VRGS physicians understand the communities they are servicing.
- Integrated remote-access universal EMR for ordering (e.g., meds, imaging, and labs) and documenting.

Dr. Gendron identified that, like with any model for virtual care without the presence of an on-site physician, there can be clinical misses.

Initially patients were concerned that the program would be replacing local services, however, it was communicated and eventually understood that this was not the goal.

The following outcomes were identified:

- VRGS has high satisfaction rates and positive experience feedback among nursing and medical staff. Local Visiting Medical Officers spoke highly of the support the model provides them. Currently 14 sites refuse to operate without VRGS coverage.
- The WNSWLHD Clinical governance unit found a reduction in serious incidents across rural sites following the introduction of VRGS.
- From April to June 2020, 97% of patients at four rural facilities regularly supported by VRGS (Narromine, Nyngan, Dunedoo and Gulgong) rated their care as Excellent or Good. This was an increase on the same period the year prior.
- The program has been found to be 1.7 times more cost effective than the model of an on-call physician travelling to a nearby site.

VRGS is monitored and evaluated against six domains. These include:

- *Appropriateness*: Ensuring the service is appropriate for rural health service contexts. Patients seen by VRGS are monitored to ensure they are appropriate for the service.
- *Utilisation*: Monitoring and managing demand for the service across rural sites to retain safe rostering practices and understanding the factors influencing demand.
- *Safety and quality:* Measuring and understanding health-related key performance indicators (e.g., unplanned hospital readmissions, potentially preventable hospitalisations and hospital acquired complications), high quality clinical care including clinical variation, health outcomes for patients, and patient reported experience measures.
- *Organisational context*: Considering the local medical workforce recruitment and retention issues and how VRGS helps to address this.
- *Technology performance*: Ensuring the technology solutions are meeting clinician and patient needs.
- *Cost effectiveness*: Evaluated by comparing the cost of short-term locums and historical virtual support services with the cost of running the service (virtually and face-to-face).

(K. Gendron, personal communication, March 2024) (Western NSW Local Health District (2021).

Virtual physician/specialist consultation programs

BC: RTVS Programs (RUDi, MaBAL, CHARiE)

As per Lauscher et al. (2023), the Real-Time Virtual Support (RTVS) program encompasses RUDi, MaBAL and CHARLIE. RTVS has two main types of service: (1) peer-to-peer support for urgent and nonurgent situations, including case consultations, second opinions, ongoing patient management, transport coordination, point-of-care ultrasound, and simulation-based training and (2) direct-to-patient care that offers citizens and Indigenous community members direct remote access to health professionals in British Columbia.

Alberta: TRACK (Telehealth Rounding and Consultation for Kids)

As shared by Dr. Michelle Bailey, Medical Director of Virtual Health, Alberta Health Services, the TRACKS program is a virtual tertiary-to-regional collaborative care service for clinicians caring for pediatric inpatients in a small number of rural communities (M. Bailey, personal communication, February 2024). The project aims to reduce unnecessary transfers and keep patients closer to home in areas that don't have access to specialists and address the lack of connectivity and understanding of what regional sites are capable of.

The TRACK program uses a mobile cart equipped with an audiovisual platform to connect clinicians in rural sites with pediatricians and multidisciplinary clinicians from tertiary centers. Children and families participate in some sessions at the bedside as well. The cart is equipped with devices with high quality audio and visual functionality. Initially, communication was only between carts, however, Zoom was later installed to allow the tertiary site staff to phone-in from anywhere and include other experts in the call.

TRACK also allows for collaboration with the province's RAPID team for facilitating transfers. This allows better identification from both sites for if and why a transfer is required.

The following challenges were identified:

- Wi-Fi connectivity was initially a barrier but was addressed pre-go-live.
- Lack of shared EMR across sites.
- Concerns about increased workload and burden. The number of consultations can fluctuate greatly in a week: a specialty may see three consultants in a week or three over a month.

The following factors were identified as key requirements for the program's success:

- Nursing coordinators at both sites coordinated patient loads and exacerbations. Coordinators participated in rounds to identify needs and coordinate accordingly.
- An understanding from tertiary sites of the capacity and knowledge of providers at regional centers. Tertiary centers were educated on the regional site's level and quality of care.

Families highly appraised the program and indicated it led to increased trust, whether they stayed at their regional center or were transferred to the tertiary site: families felt once arriving at the tertiary site, the providers already understood their care needs (M. Bailey, personal communication, February 2024).

Ontario: Virtual Critical Care (VCC)

According to Dr. Scott Millington, a staff intensivist at Ottawa Hospital and a spokesperson for its Virtual Critical Care (VCC) program, the VCC program provides virtual ICU staff consultation to hospital staff with limited critical care experience caring for critically ill patients (S. Millington, personal communication, February 2024).

The main goal of the program is avoiding unnecessary transfers. If a site is without an intensivist, they would otherwise immediately transfer high acuity patients arriving to the ED: the VCC program allows sites to keep some patients on-site safely. The program provides 24/7 access to ICU physicians and ICU nurses based on Ottawa Hospital. It is currently live at the 60 hospitals that typically refer patients to Ottawa. The program is a consultation service only: the physicians have no privileges at local hospitals; all direction of care is done through proxies. Some VCC calls involve guiding the local physician in procedures (i.e., intubating, central line, etc.). Some have been able to diagnose palliative care needs, thus allowing patients to die close to home instead of being transferred to receive this diagnosis. The program is also helpful for surgical consults: typically, many non-operational surgical patients, i.e., neuro or intracranial hemorrhage, are unnecessarily sent to the Neurosurgery Department at Ottawa Hospital. VCC is now trying to reduce the number of these transfers, keeping patients at their home site with additional supports. The consulted VCC team follow patients longitudinally.

The program uses the 'EPIC' EMR for most of its work and half of the rural hospitals are also on EPIC. A shared EMR has been a major enabler for the program.

For communication, the program uses Zoom with phones or iPads: there is no advanced technology for examining the patient. The VCC team may request to have a video visit so that they are able to see the environment, patient, and their family.

The program is in the process of gathering user satisfaction and data on other outcomes. Anecdotally, Dr. Millington says the program has been very well received. Hospitals are promoting VCC as part of their recruitment strategy and letting new staff know that they have this additional support when working. This can be particularly important for new physicians.

The program exists in parallel to a similar program in Ontario called 'Criticall'. With Criticall, physicians can call a hot line to discuss critical care concerns, however, it is primarily intended for transfers so that physicians have direct access to a higher level of care.

(S. Millington, personal communication, February 2024)

Manitoba: Manitoba Telestroke Program

According to Heart & Stroke (2020), Telestroke enables local emergency physicians in rural EDs to work remotely with stroke neurologists and radiologists in Winnipeg or Brandon 24 hours a day to provide advanced emergency stroke services to patients exhibiting stroke symptoms. Consultation is done through videoconferencing and shared digital CT images. For rural communities, access to a stroke neurologist is simply not available outside of our larger city centres. The stroke specialists work together

with the local team to determine if a patient can be treated with a clot-bursting drug which can help patients make a partial or complete recovery if given within 4.5 hours after the first symptoms of stroke appear (Heart & Stroke, 2020).

EXPLORATORY LITERATURE REVIEW

An exploratory literature review was done to identify existing guidelines, standards, and best practices in BC and Canada. Foundational documents from both BC and Canada were identified, as described in the ***Methods*** section, that highlight evidence-based best practices for providing high quality care within a virtual hybrid model.

Summary of Foundational Reports

1. Virtual Clinical Care Reference Group (VCCRG) Final Report

As per the Virtual Care Clinical Reference Group (2023), the Virtual Clinical Care Reference Group (VCCRG) is an ad hoc working group emerging from the *MOA - Collaboration on Virtual Care Fees*; *Ministry of Health, Doctors of BC, and Medical Services Commission, 2022*. In response to the MOA, the VCCRG developed a Final Report, published in February 2023, to provide guidance to the Ministry of Health and the Doctors of BC Tarriff Committee on the topic of hybrid care, i.e., virtual care together with in-person care. The VCCRG had representation from the College of Physicians and Surgeons of BC, Rural Collaboration Centre for BC (RCCBC), and BC Patient Safety & Quality Council.

The group's mandate was to develop detailed guidance on clinical practice to support the provision of high-quality hybrid care, focusing on two main areas for direction: 1) identify, create, and/or recommend consolidated guidance to support hybrid case in primary care and specialty care, and 2) consider the need to develop a framework measuring safety and quality of virtually provided care with a practical implementation strategy.

To inform their report, the VCCRG pursued the following activities:

1. Identified and reviewed key research/resources as a group.
2. Contributed individual perspectives and professional experiences with respect to the delivery of virtual and hybrid care.
3. Consulted the Sections & Societies of Doctors of BC (i.e., leads from each specialty) on their perspectives.
4. Reviewed and considered findings from the rapid evidence synthesis commissioned in 2022 by BC's Ministry of Health to McMaster University on the successful features of hybrid models, the impacts of these models, and associated the frameworks.

As a result of their research and collaboration, the VCCRG identified 8 key principles for considering when choosing the delivery of an encounter through in-person or virtual means*: Safety, Effectiveness, Accessibility, Equity, Person-centeredness and Respect, Cultural Safety and Humility, Build Relationships,* and *Efficiency.*

The group also identified seven (7) structural barriers and enablers of hybrid care: *Digital Interoperability and Architecture, Data Access for System Improvement, Governance and Policy, Privacy & Other Legal Considerations, Licensure, Clinical Education,* and *Payment Models*

Collectively, the VCCRG developed a **principle-based framework** for hybrid care, highlighting that it is too early to recommend a specific framework based on evidence.

The group identified **3 foundational concepts** of their framework and developed **5 recommendations,** based on their research and collaboration:

Foundational concepts

1. Virtual care is most appropriately incorporated into a comprehensive, longitudinal hybrid approach.
2. The appropriate application of a hybrid care model supports the Quadruple Aim (better outcomes, improved clinician experience, improved patient experience, and lower costs).
3. A variety of considerations must be taken into account when choosing the appropriate care delivery modality; clinical, provider, and patient considerations.

Recommendations

1. Apply principle-based hybrid care guidance to ensure high-quality, consistent, and dependable implementation of services.
2. Collect evidence over the coming months and years to continuously and iteratively inform how funding models could evolve to best support principle-based and cost-effective hybrid care.
3. Create a BC Hybrid Care Working Groups (HCWG) and apply the Learning Health Systems (LHS)/Partnership Pentagram Plus Model.
    - LHS approach: A continuous adaptive cycle that consists of taking an evidence/knowledge-informed action, collecting data about the outcomes of that action, and using that data to generate and apply new knowledge.
    - PP+ Model: Identify and bring together key stakeholders together to co-design the LHS processes, inform actions, and work together to adopt lessons through collaboration, self-organization, and mutual interdependency.
4. Partner with First Nations Health Authority, Indigenous and other community members.
5. Partner with similar hybrid care working groups and other teams across the country to share knowledge.

(Virtual Care Clinical Reference Group, 2023)

2. McMaster Rapid Synthesis: Optimizing the Use of Hybrid-care Models for Delivery of Healthcare Services

As per Velez et al. (2023) and Virtual Care Clinical Reference Group (2023), the McMaster Rapid Synthesis was commissioned by the BC's Ministry of Health and was reviewed by the VCCRG to inform their Final Report (described above). The synthesis identifies, selects, appraises, and synthesizes relevant research evidence in both Canada and internationally about 3 key questions:

1. What are the features of hybrid-care models (i.e., those that combine virtual and in-person care)?
2. What are the impacts of hybrid-care models according to the quadruple aim for health systems of enhancing patient experience, improving population health, reducing costs, and improving the work life of health care providers?

3. What frameworks can be used to support monitoring and evaluation of quality of care delivered using hybrid-care models?

The findings include two overviews of systematic reviews, 24 systematic reviews (eight included a meta-analysis), one scoping review, and one rapid review from a targeted search for relevant literature.

The key findings are described below:

- Availability of evidence: Most countries' efforts to establish hybrid models are in early stages. Information currently available is insufficient to recommend virtual care or hybrid models over exclusive in-person healthcare.
- Eligibility for virtual approaches: The choice of whether to use in-person services is generally centered around feasibility and clinical appropriateness. In the U.S., the Centers for Medicare and Medicaid has provided guidance on situations in which virtual care is more likely to be appropriate, such as for wellness visits, managing chronic conditions, discussing test results, counseling about diagnostic and therapeutic options, dermatology, prescriptions for medicine, nutrition counseling, and mental health counseling.
- Risks/Challenges: Some challenges have been identified from the perspective of healthcare providers, which included issues with technology use proficiency, lack of confidence in the quality/reliability of the technology, connectivity issues, and concerns around legal matters, increased administrative burden and/or fear of inability to conduct thorough examinations with reliance on subjective descriptions.
- Lessons Learned: Many countries have identified lessons learned from a rapid shift to virtual care brought on by COVID-19. Many of the hybrid models identified involve sharing medical information across providers as a key consideration. Integrating virtual care models with broader electronic health record systems has been highlighted as an important consideration.
- Outcomes: Research shows that patients from different age groups and health conditions benefit from virtual healthcare services and hybrid models at a population level, and that virtual care can reduce care-related costs for patients, produce high levels of satisfaction among patients and caregivers and varied levels of satisfaction among providers.

(Velez et al., 2023)

3. College of Physicians and Surgeons of BC: Practice Standard for Virtual Care

In June 2023 the College of Physicians and Surgeons of British Columbia (CPSBC) published a revised practice standard for the provision of virtual care in BC. A practice standard reflects the minimum standard of professional behaviour and ethical conduct on a specific topic or issue expected by the College of its registrants (all physicians and surgeons who practise medicine in British Columbia) (CPSBC, 2023). As per the College, virtual care is a core component of medical care. Registrants who provide virtual care are held to the same ethical and professional standards, and legal obligations related to in person care.

Key requirements relevant for this review include:

- Ensuring patients referred to specialists are adequately investigated before referral; if a primary care assessment of the patient presentation would normally include a physical examination before referral, the referring registrant must ensure that one is done; it is unacceptable to defer a physical examination because the virtual care medium does not allow for one.
- Considering whether the virtual care medium affords adequate assessment of the presenting problem, and if it does not, arranging for a timely in-person assessment done by themselves, or another registrant or nurse practitioner with whom the registrant has a pre-established agreement.
- Communicating with referring and other treating physicians and providing follow-up and after-hours care as medically appropriate, including informing the patient of appropriate follow-up in accordance with the Referral-Consultation Process professional guideline and Care Coverage Outside Regular Office Hours practice standard.
- Considering specific guidelines regarding prescribing of medications, including opioids and psychotropic drugs.
- Considering compliance with licensing requirements in both British Columbia and the jurisdiction where the patient is located, as well as ensuring appropriate liability protection for cross-border care.

(CPSBC, 2023)

4. Canadian Association of Emergency Physicians: Optimizing the role of virtual care in emergency medicine

In March 2025, The Canadian Association of Emergency Physicians (CAEP) published a manuscript addressing virtual care in Emergency Medicine. The manuscript acknowledges the rapid expansion of virtual care during the COVID-19 pandemic and emphasizes the need for thoughtful implementation to ensure safety, equity, and sustainability. There are nine key recommendations which focuses on system design, accessibility, quality, education, financial models, and sustainability. CAEP advocates for a hybrid care model that combines virtual and in-person services, ensuring best practice patient care while maintaining high clinical standards. Maintaining clear definitions and roles within the healthcare system is important to prevent the dilution of emergency care standards.

Table 1. Summary of Recommendations

Recommendation:	Actionable Steps:
Virtual care should be purposefully integrated into a hybrid patient care system	• Develop provincial/territorial plans for integration of virtual care. • Define clear referral pathways for in person and specialist assessment. • Align virtual care integration with workforce planning.
The role of emergency virtual care within an integrated emergency care system should be clearly defined	• Define minimum clinical, technological, and staffing requirements. • Ensure compliance with emergency medicine standards. • Establish clear nomenclature and public communication guidelines.

Engage emergency care providers and emergency medicine system experts in the design, implementation, and evaluation of virtual care services	• Promote collaboration and structured partnerships between virtual and in-person care providers. • Mandate shared health information systems.
Engage patients from diverse backgrounds in the design, implementation, and evaluation of virtual care services	• Expand broadband infrastructure in rural and remote areas. • Implement digital literacy initiatives. • Design virtual care services to be accessible to all patients.
Standardize virtual care data reporting across Canada	• Standardize data collection across virtual emergency care programs. • Develop a centralized data-sharing system between private virtual care providers and public health authorities. • Evaluate virtual emergency services using the Quintuple Aim framework.
Standardize and regularly update virtual care guidelines based on emerging evidence	• Require ongoing policy updates based on emerging evidence. • Define patient conditions and clinical care contexts that are best suited for virtual emergency consultations. • Implement a framework for scaling effective models of virtual emergency care.
Align virtual care funding models with system sustainability	• Ensure virtual emergency care funding strengthens long-term system capacity. • Create transparent, accountable funding agreements for virtual emergency services. • Align reimbursement structures for virtual emergency care with health system outcomes and cost-efficiency metrics. • Share effective funding models for virtual emergency care across Canada

(CAEP, 2025)

5. Canada Health Infoway: Clinician Change Virtual Care Toolkit

The Clinician Change Virtual Care (CCVC) Toolkit developed by Canada Health Infoway Inc. includes evidence-based information on virtual care to support clinicians with the tools they need to provide safe, high quality virtual care, focused on three priority areas identified by stakeholders: 1) appropriateness, 2) use and optimization of virtual care services, and 3) quality and safe virtual care interactions. It also includes resources to inform plans and approaches for evaluating virtual care services and identifying areas for improvement.

As per Canada Health Infoway Inc. (2022), this Toolkit was created and published in 2022 after conducting the following activities the year prior (i.e., 2021):

- A scoping review and an extensive environmental scan of existing virtual care tools and resources, including review of approximately 150 national and international resources related to virtual care implementation and adoption.

- A qualitative survey of over 200 clinicians and support staff across the country to validate identified priority areas qualitative survey of over 200 clinicians and support staff across the country to validate identified priority areas.
- Convening a committee of clinicians and virtual care experts to select and review evidence from key, trustworthy resources,
- A needs assessment and gap analysis which included interviews and focus groups with stakeholders including patients, caregivers, primary health care clinicians and support staff.

The three (3) priorities identified for providing safe, high quality virtual care are described below:

1. Appropriateness: There are several factors to consider when determining whether to use virtual care, and with which modality (i.e., phone, video, secure messaging, etc.). These decisions depend on the clinical situation, capabilities of clinicians and support staff, capabilities and preferences of patients and caregivers, and the guidance from local regulatory authorities. The CCVC Toolkit includes key considerations for each of these factors.

2. Use and optimization of virtual care services: The CCVC Toolkit outlines 3 key logistical considerations to consider when implementing virtual care services:
    - Technical: Canada Health Infoway has developed a separate *Digital Health Solutions Procurement* Toolkit that provides consolidated requirements that can be used for the procurement of virtual visit and remote patient monitoring solutions. The tools and solutions to select depend on the program's workflow and patient population.
    - Privacy: The Toolkit provides recommendations on 1) informing patients, 2) patient consent, 3) protecting patient privacy, and 4) secure methods of communication.
    - Workflow design: The Toolkit provides guidance to consider when assessing and/or incorporating virtual care into a program's practice, with a focus on 1) team engagement, 2) processes and policies, and 3) onboarding patients.

3. Quality and safe virtual care interactions: The Toolkit provides key considerations for promoting the right environment for virtual care, with a focus on 4 areas:
    1. Guidelines for conducting virtual visits.
    2. Virtual care physical examination.
    3. Safe medication management in virtual care.
    4. Health and digital health equity.

(Canada Health Infoway Inc., 2022)

6. Colleges of Physicians in Canada, Canadian Medical Association Royal College of Physicians and Surgeons of Canada: Virtual Care in Canada: Report of the Virtual Care Task Force.

As per CPC et al. (2022), the Virtual Care Task Force (VCTF) is made up of representatives from the Colleges of Physicians in Canada, the Canadian Medical Association and the Royal College of Physicians and Surgeons of Canada. The Task Force had the mandate of developing principles and recommendations

for promoting a pan-Canadian approach to the delivery of publicly insured medical services by Canadian physicians through virtual means.

Based on the Task Force's research and collaborative work, it provided four (4) recommendations:

1. Ensure that appropriate virtual care services are funded as part of the publicly funded health care system.
2. Make equity a fundamental principle underpinning the delivery of virtual care in Canada.
3. Promote guidance for providers and patients on the appropriate use of virtual care.
4. Urge governments and provincial/territorial medical associations to work to incorporate the following aspects of virtual care in their negotiated agreements:
    - Provide a permanent basis for virtual care fee codes within fee schedules.
    - Provide for remunerating physicians at the same rate whether care is provided virtually or in person.
    - Provide support for an appropriate balance of both in-person and virtual care that does not include arbitrary caps on the volume of virtual care services.
    - Provide for payment for virtual care services that can be delegated appropriately and within scope to other staff within the medical practice.
    - Provide for payment for virtual care services provided asynchronously via secure email/text messaging.
    - Provide for payment for managing portals that patients can access and into which they can input personal health information.

The Task Force supports a hybrid care model in which both virtual and in-person care is offered by a practitioner depending on the nature of the medical condition, the needs of the patient, and the physician's best judgment. The Task Force also emphasizes that virtual care should be provided in the context of an ongoing relationship with a family physician or specialist and their care team.

(Colleges of Physicians in Canada, the Canadian Medical Association and the Royal College of Physicians and Surgeons of Canada, 2022)

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APPENDIX A: Universal Key Components of Hybrid Care Models

Key components that are universal across all hybrid care models were identified:

1. Three (3) key decisions for which different options exist and vary across programs:
   - Virtual Provider Staffing
   - Technology Complexity
   - Solution Implementation and Support

2. Three (3) requirements, i.e., factors that all programs must consider:
   - Clinical and Operational Workflow Changes
   - System for Coordination and Connection
   - System for Clinical Information Sharing

3. One (1) operational outcome which is dependent on operational capacity and addressing key decisions and universal requirements:
   - Virtual Provider Coverage

Decision #1: Virtual Provider Staffing: A source of staffing, i.e., a staffing 'pool', of virtual providers to cover a hybrid care programs' shifts needs to be identified and developed. Staffing options include:

A. Internal

Local: Local providers from the existing hospital or community provider pool. This option may not be feasible for all sites with provider shortages, however, may be an option in some areas if scheduling adjustments can be made. For example, local providers may be willing to work additional hours or reduce risk of burnout if working some shifts virtually: the option of working from home has been shown to be a strong incentive for providers in other regions.

Health Authority: Staffing from a region's Health Authority (HA). Accessing providers from across a Health Authority may be more feasible than from a local pool, however, may still be challenging if there is a regional shortage: see Provincial option.

B. External

Provincial: Staffing from across the province. This is an option for provinces with multiple regional HAs, such as British Columbias: for provinces with one HA, this option is synonymous with "Health Authority" providers, described above.

Third-party company: Staffing by a third-party company as part of the outsourcing of their services. **Note**: It is unclear if any external companies currently provide physician staffing

independent of the procurement of their technology: in other words, selecting this option may require an organization to also select option B, i.e., technology implementation and support in partnership with a third-party company, for Decision #3.

Overlapping requirements and advantages exist for the different virtual provider staffing options, as outlined below:

Advantages:

	Local: Community/ Hospital	Regional / Provincial	External (Third-party company)
May increase trust and buy-in from supporting on-site staff as compared to outsourced physicians.	X	*Depending on make-up of provider pool*	
May be more accepted by patients due to security of continuity of care.	X	X	X
Given broader resourcing; • Program can be developed to support multiple sites. • Improved possibilities for scaling regionally or provincially.		X	X
Other	If scheduling adjustments are feasible, the offer of work-from-home shifts for physicians can be a strong incentive.		• If site has the external party's technological infrastructure, there are flexible contracting options for accessing external staffing as needed. • Can be used as a short-term staffing solution while a more comprehensive solution is developed.

Requirements:

	Local: Community/ Hospital	Regional / Provincial	External (Third-party company)
Changes to scheduling system or coverage responsibilities or recruitment (assuming physician shortage).	X	*Depending on make-up of provider pool*	
Requires access & provisioning to local clinical systems.		*Depending on make-up of provider pool*	X
Education and training as well as ongoing reinforcement (often by nursing) to physicians of local context and rural resources.		*Depending on make-up of provider pool*	X
Development of an internal payment model that complements that of in-person providers.	X	X	

Other			• Identification of appropriate vendor that has cohesion with local system and culture. • External technology solution: no known options for outsourced virtual physicians using internal technology.

Decision #2: Technology Complexity: Programs differ in the degree of complexity of the technology used for virtual care.

- Low-tech: Using basic videoconferencing, such as Zoom, and instant messaging solutions for communication between virtual providers and on-site staff and patients.

  Advantages of this option include:
  - As per Dr. Kapur of Central Saskatchewan's VPER program (P. Kapur, personal communication, February 2024), thorough nursing assessments and communication with patients and nursing and access to the complete health record can be more informative than high-tech video assessments; these are considered the most important aspects to virtual physicians in his program. The VPER program provides fully virtual provider coverage including for high acuity patients using a low-tech solution only.
  - As per Dr. Sommers of Nova Scotia's VirtualEmergencyNS program (J. Sommers, personal communication, February 2024), a hybrid model in which a virtual provider using basic audio-visual communication technology working alongside an on-site provider allows for better care than one that has advanced technology devices but only a virtual physician.
  - Low-tech solutions require less training than high-tech ones and may be easier to implement and support with less time and money.

- Medium-tech: Use of low-tech tools for overall virtual assessments and care, however, with the addition of select peripheral devices such as electronic stethoscopes and otoscopes. Cariboo Memorial Hospital within Interior Health of British Columbia utilized a medium tech device with zoom capabilities and electronic peripherals for first person assessment data capabilities of the virtual physician.

- High-tech: Use of high-tech devices for more advanced remote patient assessments. High-tech devices are used in addition to the lower-tech tools for communication. High-tech devices include those with advanced audio-visual functionality, e.g., ultra-high-zoom examination cameras, as well as advanced point of care diagnostic capabilities such as those being used in Northern Saskatchewan by the University of Saskatchewan, i.e., virtually enabled ECGs and ultrasounds and portable AI-enabled micro-MRI and X-ray machines, which operate with low field magnets and radiation by using AI to optimize the resolution of input. Some devices require an on-site staff member for maneuvering; others can be maneuvered remotely by the physician.

  Advantages of medium to high-tech options include:
  - Allows for superior first-person assessment by a virtual provider as opposed to via a proxy (i.e., nurse communicating findings).

- Added tool for more comprehensive clinical diagnosis which may increase providers' comfortability in directing the care of their patients and confidence in their diagnoses.

Requirements of this option include:

- External implementation and support in partnership with private third-party company; this requires identifying an appropriate vendor and selecting appropriate devices.
- More significant training on devices.
- May be more expensive.

Decision #3: Solution Implementation and Support: Programs differ in how they adopt a technology solution. Implementation and support of a technology solution includes the provision or procurement of technology as well as workflow mapping, system training, program launch, IT support, etc.

A. **Internal**: A technology solution can be internally developed, such as Central Saskatchewan's home-grown videoconferencing program, or an existing technology such as Zoom leveraged. Some existing technologies may be expanded by increasing infrastructure and licensing. Technology solutions most likely require significant IT support; to internally implement a technological solution, an organization's IT department must have capacity to provide this support.

   Note: It is unclear if any external companies currently provide physician staffing independent of the procurement of their technology: in other words, selecting this option may require an organization also selects option A, i.e., internal virtual provider staffing, for Decision #1.

B. **In partnership with a third-party company**: The technology solution can be implemented by outsourcing to a third-party company who supplies and maintains the technology. In Canada, four provinces have used this approach to support their virtual ED/Inpatient programs: 1) Nova Scotia has contracted Maple, a Canadian telemedicine company, 2) Newfoundland & Labrador has contracted Teladoc Canada, 3) New Brunswick has contracted Teladoc Canada, and 4) BC has contracted Teladoc Canada. Besides the technology devices and systems, these companies provide implementation planning including clinical and technical requirements gathering and workflow mapping.

   Organizations can outsource the implementation of a technology solution to a third-party while maintaining internal physician staffing, i.e., internal physicians using an external technology solution.

   It is important to note that even when outsourcing the technology solution to a third-party, some degree of internal planning and implementation support is still required by an organization when initiating a hybrid care model.

   Advantages of this option include:

   - Quicker implementation: packaged ready-to-go solutions.
   - Vendors may have more experience and expertise implementing the type of initiative.
   - Vendors often leverage the latest technology in healthcare as it becomes available.

   Requirements of this option include:

   - Identification of an appropriate vendor that has cohesion with local system and culture.

Universal Requirement #1: Clinical and Operational Workflow Changes: Hybrid care models require a change to the workflow for all staff involved in the care of patients at the site, including nursing, allied staff, administration, and other providers if any. This impact presumably requires increased resources including staffing for most sites. As previously mentioned, whenever possible, organizations should prioritize on-site or on-call providers to support an ED. In these cases, nurses and allied staff can work within their current scope and experience.

Optimization of scope

When an on-site or on-call provider is not feasible, to provide care to higher acuity patients the scope of nurses and allied staff may need to be optimized, meaning they provide care at the highest possible level of their professional scope within the province, as set by the Health Professions Act. Optimizing the scope of a site's nurses and allied staff likely requires additional training as well as additional resources, including increased staffing. In Central Saskatchewan, nurses and paramedics are uptrained in airway management using supraglottal devices for and intraosseous (I.O.) vascular access. If higher acuity care is needed, patients are transferred to the nearest tertiary center. In Newfoundland & Labrador, Respiratory Technologists (RTs) and Advanced Care Paramedics (ACPs) are leveraged to manage airways when no on-site provider is available. If staff with airway management experience are not available, the site prioritizes airway protection and transferring as soon as possible. Transportation is one of the highest risks for patients in NL given the significant distances, limited resources in transit, and limited bandwidth in some regions preventing paramedics from accessing physician consultation: sites must consistently assess the risks associated with staying open with limited advanced skills available vs. closing.

Expansion of scope

In some cases, the level of care needed by some patients may require the provincial scope of nurses and allied health to be expanded. Determining the possibility of expanding the scope of a nurses and allied health in the province would require significant collaboration with the Nurses' Union, the College of Nurses, and the Ministry of Health, as well as significant additional training.

Universal Requirement #2: System for Coordination and Connection: A system or process for care coordination is required for connecting virtual providers to on-site staff members. As most programs have virtual providers covering multiple EDs at once, it is ideal for sites to connect to a central hub that can queue calls based on priority. Some programs across Canada have leveraged their provincial 811 system to serve as a central hub for coordinating care. In some programs, nurses originate the calls directly with providers themselves, however, setting up calls and equipment and waiting to connect with the provider can be time-consuming. A coordination system or process will require increased administrative staffing resources; appropriate tasks should be delegated to non-nursing staff whenever possible.

Universal Requirement #3: System for Clinical Information Sharing: An EHR system or process must be in place for sharing clinical information and documentation. Access to these systems must also be provisioned to virtual providers, which requires provincial licensing and regional credentialing. Virtual providers require complete access to all systems, including ordering capabilities, that on-site providers have for directing patient care. For sites without digital clinical information systems, i.e., paper-based sites, the clinical information sharing process includes faxing documents to sites for entry into the patient record. Of note, workload on in-person and virtual staff increases significantly without the use of an integrated EHR.

Operational Outcome: Virtual Provider Coverage

The universal operational outcome across all programs with hybrid care models is virtual provider coverage. Across all programs, in-person provider coverage is prioritized, however, when this is not possible, alternative arrangements can be leveraged that include virtual provider coverage. An organization's arrangement of virtual provider coverage is dependent on their operational capacity and may vary across sites. Organizations can identify arrangements that are appropriate for their sites once key decisions and universal requirements, as described above, have been addressed. Sites may alternate between the different arrangements based on changing resources and operational needs.

The 3 virtual provider coverage arrangements are outlined below:

A. **Hybrid**: At least 1 physician is available for on-site care.

Advantages of this option (as compared to fully virtual) include:

- Reduced impact on nursing and allied staff: there is a limited need for optimizing or expanding scope.
- Increased likelihood of on-site nursing and allied health staff accepting the model due to comfort with on-site provider.
- Increased likelihood of acceptance by patients due to their understanding of on-site physician skill set.

On-site hybrid: An on-site physician remains responsible for all high acuity patients. A virtual physician or other provider is responsible for patients with lower acuity levels.

On-call hybrid: An on-call physician is available for on-site care of patients requiring in-person physician care while a virtual physician or other provider is responsible for all other patients.

Requirements of this option include:

- This type of model may require **optimization of scope** for nursing and allied staff, as described in *Universal Requirement #1: Clinical and Operational Workflow Changes,* for interim management of high acuity patients before the on-call provider arrives.

The term 'physician' is used when describing a provider (i.e., healthcare provider) that is responsible for high acuity patients, as other types of providers, e.g., nurse practitioners (NPs),

are not licensed to provide this level of care. Organizations may leverage NPs or other types of providers, virtually or on-site, to care for lower acuity patients.

When hybrid provider coverage is possible, organizations typically prioritize in-person providers caring for patients with higher acuity needs. Patients are typically initially assigned a provider based on their level of acuity as indicated by their CTAS (Canadian Triage and Acuity Scale Level) Score. Patients triaged as CTAS 1 have the highest acuity and are at immediate risk for loss of life or limb: examples include patients experiencing cardiac arrest, respiratory arrest, major trauma, or unconsciousness. Patients triaged as CTAS 2 are also considered high acuity and have conditions that are a potential threat to life, limb, or function, including moderate respiratory distress and chest pain. Patients triaged as CTAS 3 have conditions that could potentially progress to a serious problem, including mild respiratory distress and severe hypertension. CTAS 4 is considered less urgent and CTAS 5 is considered non-urgent (Canadian Association of Emergency Physicians, 2007).

Patients may also be assigned or re-assigned based on the appropriateness of their condition and care requirements for an in-person vs. virtual provider. Findings from the exploratory literature include some guidance on what conditions may or may not be appropriate for a virtual provider.

B. Fully virtual*:* No local physician is available for on-site care. A virtual physician provides care to all patients including those of high acuity. If a higher level of care is needed than can be provided by the on-site staff and virtual provider, patients are transferred to another site.

Advantages of this option include:

- Fully virtual provider coverage is considered better than no provider support at all by programs implementing this model.
- No local in-person physicians required.

Requirements of this option include:

- For most of these programs, a nurse with advanced skills and an advanced care paramedics and/or respiratory therapist are available for high acuity interventions including airway management. In some cases, sites implementing this care model do not have these resources available and instead prioritize airway *protection* and transferring as soon as possible.
- Virtual physicians must be confident in providing high acuity care remotely.
- This type of model likely requires optimization or expansion of scope, as described in *Universal Requirement #1: Clinical and Operational Workflow Changes.*

APPENDIX B: Exploratory guidelines and standards review

Introduction

An exploratory literature review was done to identify **guidelines and standards of global in-hospital virtual health models**. Review provides a summary of literature, considerations when implementing a virtual health model, challenges identified and evidence gaps. Searches on Google Scholar and PubMed were conducted using key search words including a combination of the following: virtual care, emergency, urgent, admitted, attached, inpatient, acute, most responsible physician or provider, hybrid care, care model and physician. While a comprehensive review was not within scope, key articles on virtual and hybrid care models were analyzed to highlight evidence-based best practices. Scientific articles published between January 2020 and March 2025 from Canada, United States, and Australia were included in the review. Articles looking at virtual care provided outside the hospital setting or looking at hospital at home programs were excluded from this review. Given the emerging nature of virtual health in hospital settings, there is a limited body of literature available, which will be discussed further in the evidence gap section of this review.

Summary of Literature

The literature summary is organized into two sections: one covering virtual health programs implemented in emergency departments and the other focusing on virtual health support programs in acute inpatient units. It is important to note that all research found demonstrated virtual models in rural and remote hospital settings.

1. Virtual Physicians or Telehealth in Emergency departments

The majority of literature found discussed programs with virtual physicians providing coverage in rural emergency departments (ED). There are two different scenarios. The first scenario is a virtual provider working alongside an in-person provider (or on-call provider). The second scenario is the virtual physician providing sole coverage for difficult to fill shifts. Virtual physicians can provide care safely for lower acuity concerns such s CTAS 3-5, however, for CTAS 1 and 2 an in-person provider is necessary (Thompson et al., 2024). In the event that there is no in-person provider for more acute concerns, patient will be stabilized and transferred to a different centre to receive care. Having access to virtual physicians provides a "safety net" for rural hospitals and helps determine new ways of interprofessional collaboration (Novak et al., 2023).

The benefits noted by these programs are maintaining access to care and minimizing unnecessary patient transfers for patients in rural and remote areas (Thompson et al., 2024). Minimizing unnecessary patient transfers allows for cost savings, keeping patients local and saves resources such as ambulances for those who are more critical condition. Another benefit is the significantly reduced trauma patient care-related costs, emergency department length of stay, and rates of patients leaving the ED without being seen (Alter et al., 2023). The literature outlined the necessity of having access to well-trained nurses to assist

virtual physicians in doing thorough physical assessments (Thompson et al., 2024). Many of the programs utilized low technology to connect provider with patient, generally an IPAD brought to the patient or a screen on wheels. Majority of patient feedback was positive, and they reported virtual care as an acceptable alternative in the event that an in-person provider was not available (Thompson et al., 2024). In qualitative interviews, patients and caregivers stated that the virtual health met their needs and provided high quality medical care in most cases (Thompson et al., 2024). The literature highlights concern about the privacy aspects of virtual care in the ED, particularly with telehealth cart volume settings often being too high, as well as the loss of the in-person care component (Thompson et al., 2024).

2. Virtual Physicians on Acute inpatient Units

The Virtual Rural Generalist Service (VRGS) in Australia and Virtual Intensive Care Unit (VICU) program in the United States provide virtual physician support to inpatient units in rural hospitals. The focus of these programs is ensuring continued access to care for patients, with virtual physicians able to remotely access patient charts and promptly order additional tests as needed (Reid and Church, 2025). Virtual providers either speak directly to patient at the bedside through a monitor or participate in rounds with local in-person providers. Although patients would prefer in-person care, they appreciated having no disruption to care. This model does not take any additional nursing resources. If it is determined that patients require specialized interventions, they could be transferred to sites which have available specialists. The literature found that having access to virtual specialists is a good alternative while still trying to recruit for in-person specialists to these remote areas. In the Virtual Rural Generalist Service (VRGS), electronic medication charting is facilitated through the medication record, allowing doctors to seamlessly order medication or intravenous fluids and undertake medication reconciliation (Nott et al., 2024). Two-way audiovisual mobile telehealth carts with high-definition digital otoscopes, and wound assessment cameras to support diagnosis are utilized in Australia to support virtual physicians in providing care on inpatient units (Nott et al., 2024).

Benefits of this model are that increases accessibility of care, reduces need to travel for specialized care, thorough consultations, collaboration with local team, provides a second opinion for local staff, timely care with shorter wait times (for some patients).

Themes and Considerations

The following themes emerged from the literature on implementing a virtual care model in a hospital setting:

1.1 Improving access to care

- Virtual health can ensure ongoing access to care for patients in rural or remote communities, a virtual provider is considered better than no doctor from a patient perspective (Thompson et al., 2024).
- Access to virtual specialist physicians can enhance ability of hospital to continue to care for a patient in their community versus transferring them to another center just to get assessed by a specialist (Dudas et al., 2023).

- Providing virtual health in hospitals supports patients with limited technology access and lower digital health literacy in using and accessing virtual care as they will have in-person assistance using the technology (Thompson et al., 2024).
- Virtual physician in hospitals have been implemented as an interim solution to maintain access to care while trying to recruit more in-person providers.

1.2 Resource allocation

- Virtual care in hospital setting often is reliant on collaboration with on-site nursing staff and requires them to work to full scope (Thompson et al., 2024). The full scope of nursing practice refers to the ability for nurses to practice to the full extent of their education, skills, and competence, as outlined by authorized by the registered nursing body, aligned with the standards, competencies, and regulations set forth by the licensing authority.
- Remote access to patients' medical records and ability to order medications, tests, etc., is key in success of virtual health programs.
- Virtual providers should familiarize themselves with the hospital site to enhance collaboration with on-site staff and better understand available resources (Nott et al., 2024)
- Utilizing simple technology with secure video platforms along with in-person support may be adequate (Dudas et al., 2023).
- Virtual health has the potential to improve triaging efforts in emergency departments and resource allocation.
- Virtual programs require extensive IT support throughout (Novak et al., 2023).

1.3 Safety of Virtual Care

- Virtual care can be safely delivered for appropriate patients, more acute patients require in-person provider or to be transferred for more specialized care.
- Early consideration of nursing professional practice and care models is essential when developing virtual care models, as the safety of care may be impacted by nurse's ability to conduct physical assessments of patients (Reid et al., 2024).
- Virtual urgent care services should ensure adequate availability and be staffed by providers skilled in managing the expected patient presentations.

1.4 Cost Effectiveness

- Remuneration and financial models should incentivize providers to see patients using the most appropriate modality.
- Virtual physicians are able to provide timely care to lower CTAS 3-5 patients, enabling in-person providers to focus on CTAS 1 and 2 patients.
- Literature shows that utilizing virtual physicians reduces the number of patients leaving the emergency department without being seen.

1.5 Evaluation and Improvement

- It is important to define common quality indicators to allow benchmarking and continuous improvement of virtual programs.
- Recommendation to do monthly team meetings to streamline communication, discuss risks, and address clinical or logistical concerns, and bi-annual in-person meetings focused on training, incident management, and team building (Nott et al., 2024).
- The key enablers to acceptance of the telemedicine service were being able to understand the doctor, ask questions, be listened to, and feeling comfortable, along with, having trust in the doctor and the technology (Reid and Church, 2025)

Challenges

The following challenges are highlighted in the literature regarding the limitations of virtual care:

1. Concerns about the limitations of a virtual examination and depending on nursing availability and assessment skills. There is variability and comfort in nursing competency in clinical exams for virtual physicians (Nott et al., 2024)
2. There is a desire to maintain the "human touch" in medical care.
3. Potential reduction continuity of care by having physicians who may not be familiar with the patients.
4. Concern about patient privacy when virtual consultations are done in a busy emergency department.
5. There is a reluctance of some patients to engage with virtual providers.
6. There are limitations for virtual physicians to provide care for more acutely ill patients or those requiring in-person interventions.
7. A factor that limited the acceptability of care to patients was the unpredictable wait time for a virtual consultation. Unable to quote wait times with virtual physicians (Thompson et al., 2024).

Evidence Gaps

As previously mentioned, virtual care within a hospital is a new approach to delivering care, and the following gaps in evidence have been identified:

1. No studies analyzing the impact of virtual health practice on emergency department crowding.
2. The literature relied on small sample sizes, limiting the ability to generalize findings to larger patient populations.
3. There is a lack of best practice guidelines of virtual physicians in the emergency department.
4. All literature focused on English speaking patients and no mention of any use of language services.
5. Throughout the literature there were different definitions of safe care. Reid and Church (2025) describe safe care as the patient being able to understand the virtual doctor, be listened to, and ask questions. Other articles looked at safe care as no adverse outcome to the patient.
6. There is no long-term evidence of the impact of implementing this care model.
7. There is no literature which identified programs outside of rural and remote hospitals.

Conclusion

In conclusion, while virtual care in the hospital setting holds potential, the current body of research remains limited, primarily due to the relatively new nature of this approach. Early pilot studies have demonstrated promising results, indicating that virtual services can effectively mitigate interruptions in hospital services and increase access to care in rural communities. Virtual providers are able to address lower acuity patient concerns safely and reduce unnecessary patient transfers. These findings suggest that virtual interventions may play a crucial role in maintaining continuity of care during times of service

disruption, particularly with the current HHR challenges. As the field continues to evolve, further research will be crucial to fully assess the effectiveness and impact of virtual care models in hospital settings.