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Considering context: Adaptive elements of a simulation program to improve primary care safety during the COVID-19 pandemic in Alberta, Canada

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Background: Globally, primary care (PC) has been central to the COVID-19 response. The pandemic has strained PC systems and introduced novel infection prevention and control (IPC) risks to the provision of safe, accessible in-person care. Specifically, the implementation of IPC guidance developed outside of PC into its operational context has proved challenging.

Methods: Our team of “action researchers” developed an innovative virtual tabletop simulations (TTS) intervention which assisted PC teams as they adapted, implemented, and integrated IPC guidance into their specific clinical contexts. While we have detailed the “technical” elements of the TTS program elsewhere, this paper examines the specific “adaptive” elements that made this intervention successful in the high-income country context of Alberta, Canada.

Results: Multiple factors influenced the uptake of this program in our Albertan setting, including: cultural geography; approach to financing and delivering PC; and policies and cultural norms supporting PC integration, medical education and research, and egalitarian teamwork.

Conclusions: Virtual TTS may provide substantial benefits to IPC and safety improvements in PC settings globally. However, the specific technical and adaptive elements of our Albertan TTS program might, or might not, make these a viable IPC intervention for adapting, spreading, and scaling to other settings.

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Worldwide, primary care (PC) clinicians and the care they deliver have proved to be critical in health system responses to the COVID-19 pandemic.^{1,2} Specifically, PC clinicians have brought their expertise and trusting relationships with patients to the community management of: respiratory diseases³; “long COVID” sequelae⁴; and vaccination counselling and delivery.^{5,6} Global organizations have once again been calling for better integration of PC into health

systems^{7,8} calls that emphasize PC’s role in achieving universal health care and the Sustainable Development Goals.⁸ However, both high-income countries (HICs) and low- and middle-income countries (LMICs) continue to encounter significant challenges in integrating PC delivery into responses to the pandemic.^{9–12} The effective integration of these PC skills, relationships, and capacities with public health and acute care responses has proved elusive. The challenges and

Abbreviations: AHS, Alberta Health Services; FFS, Fee-for-service; HIC, High income country; ILL, Influenza-like illness; IPC, Infection prevention and control; LMIC, Low- and middle-income country; MoH, Ministry of Health; PC, Primary care; PCN, Primary Care Network; PPE, Personal protective equipment; TTS, Tabletop simulations

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disruptions to PC worldwide have been significant during COVID-19, and health system responses have often jeopardized patients' access to in-person PC in their communities.^{12–14}

This paper examines a particular intervention, developed in a HIC setting, for ensuring safe access to in-person PC under pandemic conditions. That intervention, developed in the Canadian province of Alberta, is focused on improving the integration of acute care-developed guidelines into PC practice. Our aim is to engender a conversation about the elements that shaped the intervention's uptake in its home HIC setting. Beyond describing the broader culture and context that facilitated its uptake, we seek to identify the extent to which those elements might, or might not, be replicated in other family practice settings. Our motivating question asks whether the various elements of the intervention might be successfully translated or adapted by PC clinicians working in other settings, including lower resource ones.

INTEGRATING INFECTION PREVENTION AND CONTROL GUIDANCE INTO PRIMARY CARE

Effective infection prevention and control (IPC) measures are central to providing safe, in-person PC.¹⁵ As such, they are also central to ensuring access for a broad range of patients whose screenings, procedures, and chronic disease management have been deprioritized by the pandemic.¹⁶ As the pandemic progressed in Canada generally - and Alberta specifically - PC clinicians seeking to provide in-person care found themselves interpreting and implementing IPC guidance that was being developed in acute care settings.¹⁷ It proved challenging for those clinicians to adapt guidance developed for operational contexts outside of PC to their own realities.¹⁸ In response, our team of "action researchers"^{19,20} created an intervention to support PC teams translating IPC guidance generated in acute care contexts into PC activity.²¹ This intervention adapted simulation methodologies long-used in acute care settings to deliver virtual tabletop simulations (TTS) to teams of PC clinicians.

Pronovost²² describes interventions aimed at improving health care quality and safety as having *technical* and *adaptive* elements. Elsewhere, we have described the *technical* elements of the virtual TTS deployed to support the effective integration of centrally generated IPC guidelines in PC in Alberta.²¹ However, we have not discussed the *adaptive* factors - the broader contextual and cultural elements²³ - that shaped the uptake of virtual TTS as a path to PC resilience. Addressing these "non-technical" factors is important not just to understanding how a particular quality and safety intervention was implemented,²⁴ but also for assessing its potential to be adapted and translated into other family medicine settings.

By rendering the specific contextual elements that made this intervention successful in our HIC setting, we hope to avoid any normative assumptions about its translatability or appropriateness in other contexts.

We focus on both technical and adaptive factors in order to "decentralize" our intervention, and ensure IPC supports are code-signed with, rather than imposed upon, PC clinicians in lower resource settings.²⁵ As such, our aim is to help PC teams in other HIC and LMIC settings decide *whether* and how to adapt our virtual TTS intervention for improving the integration of acute care IPC guidelines into PC, rather than assume such an innovation developed in our Canadian setting should be used to solve challenges in other family practice contexts.

OVERVIEW OF ALBERTAN VIRTUAL TABLETOP SIMULATIONS AND THEIR CONTEXT

Our development of the virtual TTS was a response to an integration gap we identified in PC clinics' capacity to use personal protective equipment (PPE) and safely implement IPC guidance during the

COVID-19 pandemic. During our research on the pandemic¹⁹ we found that PC clinicians were improvising implementations of policies that had developed for, and in, acute care facilities.¹⁸ In response, our team developed, prototyped, and scaled virtually-delivered TTS to support PC teams as they integrated this guidance into their operations.²¹ TTS have been increasingly used as simulation tools in health care to improve preparedness for and responses to emergencies and disasters.²⁶ Facilitated TTS discussions deploy clinical floorplans or maps which allow providers and staff to use a visualized version of their working environment to: 1) identify hazards and threats; and 2) work together to rehearse and improve processes. Our virtual adaptation of these TTS methods used video conferencing (Zoom©) to connect our facilitators with PC clinical teams, and online collaborative whiteboard software (MURAL©) to display the teams' clinic floorplans, grounding the rehearsals and discussions of patient care scenarios. Facilitators and teams selected and developed care scenarios for a range of clinic functions and procedures which had been impacted by the COVID-19 pandemic. Examples here included: patient screening and intake; interviewing and examining patients with caregivers and/or family members present; and providing care to COVID-19 presumptive patients with influenza-like-illness (ILI) complaints. As delivered, the TTS sessions leveraged the facilitation skills and expertise of both Human Factors and IPC specialists to create a space for PC teams to think aloud, identify hazards in their clinical settings, and experiment with co-designing solutions.²¹ Twenty unique virtual TTS were delivered to PC clinics across Alberta during the period April 2020 to April 2021.

As deployed, the virtual TTS allowed PC clinical teams to: (1) review externally-produced and internally-improvised IPC protocols; (2) rehearse patient care scenarios using a blueprint (i.e., digital map) of their operational space; and (3) co-create, with our team's experts, locally viable solutions to their own IPC challenges. Our TTS sessions led to the: reconfiguration of clinical spaces; simplification and clarification of clinical processes; development and adaptation of PPE protocols; and improvement of team-based communications.²¹ Both formal evaluations and informal feedback from participants suggest the sessions have been helpful not just in the context of the pandemic, but in catalyzing quality improvement and change management activity unrelated to COVID-19 in Alberta's PC clinics.²¹ Participants in the virtual TTS reported that in addition to focusing attention on major IPC gaps and challenges, the simulations helped PC teams: build confidence; share innovative practice adaptations between clinics; develop responsive standard operating procedures; recognize common challenges to service delivery during COVID-19; and anticipate clinical needs.²¹

Rather than assume that these local successes indicate that virtual TTS could or should be exported elsewhere, this paper looks more closely at the contextual factors that shaped the uptake of TTS in Alberta. The following sections describe some of the institutional and cultural structures that made our TTS program possible and successful in its HIC setting. They offer an account of the "soft" adaptive activity, policies, and relationships that surrounded and enabled the "hard" technical work of the virtual TTS.

Our assumption here is that there is more to adapting, scaling, or spreading this intervention than ensuring the technical capacity to host video conferencing and present blueprints of PC operational spaces on whiteboard software. The adaptive elements we describe include Alberta's particular: cultural geography; approach to financing and delivering PC; and policies and cultural norms supporting PC integration, medical education and research, and egalitarian teamwork. We discuss these in turn, first describing each element and then providing a targeted analysis of its effects on the uptake of TTS. We then conclude with reflection on how the virtual TTS' technical and adaptive elements might, or might not, make them a viable candidate for adapting, spreading, and scaling.

ADAPTIVE ELEMENTS SURROUNDING OUR VIRTUAL TABLETOP SIMULATIONS PROGRAM

Cultural geography

Alberta is a landlocked province of more than 640,000km² in western Canada. As part of British Imperial expansion in the 19th century, eleven treaties between the Crown and sovereign First Nations were signed. Present-day Alberta includes lands covered by Treaties 6 (1876), 7 (1877), and 8 (1899) and has been separated into Regions that acknowledge these agreements with Plains and Woodland First Nations, and others with Métis peoples.²⁷ Many First Nations live on reservations although there are also significant urban populations.²⁸ The settler society that has grown since Alberta joined Canadian confederation in 1905 has concentrated into 2 large cities: Edmonton, the provincial capital with 1.468 million residents, and Calgary with 1.543 million residents.²⁹ The balance of the province’s 3.011 million total residents live in rural or semirural environments. Where these settlers were originally predominantly European, recent waves of immigration have seen communities of African and Asian descent arrive primarily in the urban centres.³⁰

Context analysis

Alberta’s mix of concentrated urban and diffuse rural populations, and the heterogeneous cultural backgrounds of its First Nations, European, African, and Asian settlers shaped PC clinicians’ amenability to, and perceived need for, the virtual TTS as an intervention. As launched, the TTS assisted PC clinics in urban, semiurban, and rural areas, as well as those specifically serving immigrant and refugee populations. Because many clinics that participated in the virtual TTS were situated in semiurban or rural settings, there was a strong need to adapt highly centralized IPC guidance emanating from the cities to serve smaller, more localized PC clinical environments.

PC financing and delivery

The financing and delivery of PC in this large, sparsely populated territory with its range of cultures is shaped by a variety of policies and organizational structures (Fig. 1). In Canada, health care is a

provincial responsibility, with the exception of First Nations peoples whose health care is a federal responsibility. Alberta has the largest centralized health care system in Canada, with over 650 facilities across the province managed by a single health authority – Alberta Health Services (AHS). AHS delivers care in 5 geographically-based “health zones.” Facilities in these zones deliver public health, acute, long term, and some urgent care and –in some limited circumstances –PC. The province’s more than 1180 PC clinics are owned and operated by family doctors operating outside AHS control.³¹ With some exceptions, the vast majority of these small, independent PC businesses bill the government (either provincial or federal) on a fee-for-service (FFS) basis. Fee guides are established in negotiations between the provincial ministry of health and the provincial medical association. AHS’ annual budget in 2021 was \$16 billion CAD, and an additional \$5.4 billion CAD has been budgeted for PC physician compensation by the provincial Ministry of Health, predominantly through the FFS billing structure.^{32,33}

Context analysis

Alberta’s overlapping federal and provincial jurisdictions for health care mean that, to achieve uptake in PC clinics serving all of the province’s residents, interventions like the TTS need to enter the PC system at multiple points. As launched, our virtual TTS program entered the provincial PC system and so only provided IPC support and better integration to non-First Nations PC clinics. The highly independent and entrepreneurial nature of FFS PC in Alberta means that there is significant variation in amenability to, or perceived need for, an intervention like TTS amongst PC teams. Individual clinics, and clinical networks, could independently decide whether to participate in the virtual TTS as a service. As such, uptake of the TTS relied heavily on local relationships in which physician leads could exercise their considerable autonomy. Alberta’s health care budget, and the size and capacity of its PC teams confirm that it is a HIC jurisdiction. Beyond the health system’s significant resources, the province’s technical infrastructure is of a high quality. The broadband connections and computer hardware and software necessary for the TTS to be conducted virtually were readily and reliably available in all rural and urban clinics that participated.

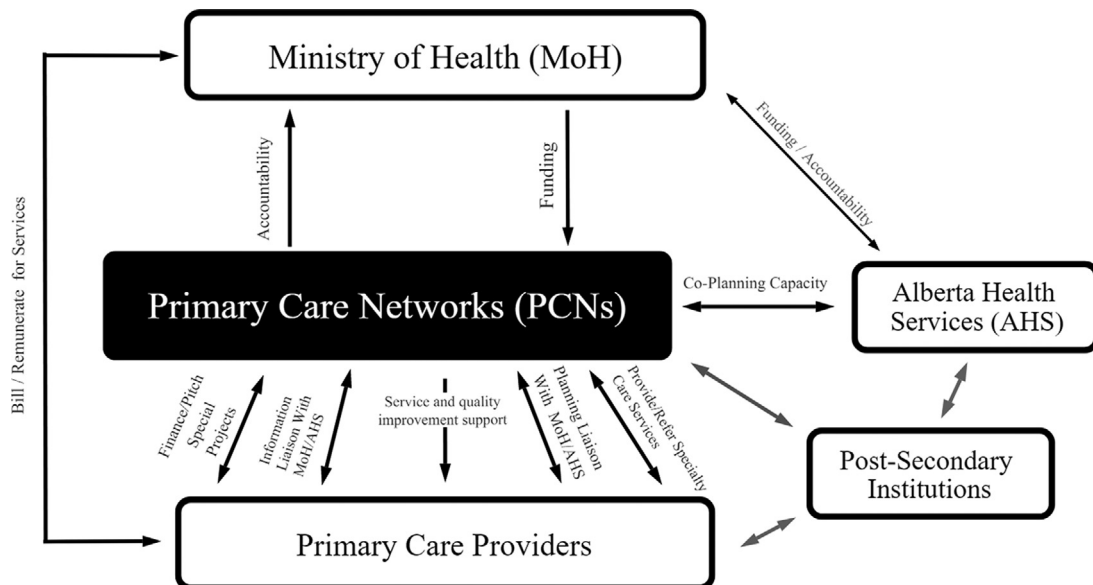


Fig 1. A simplified overview of the primary care service delivery infrastructure in the Canadian province of Alberta.

Integration, education, and egalitarian teamwork policies

Although PC financing and delivery are highly independent and autonomous, there are also significant links between PC and the centralized body of AHS. Provincial policy specifically seeks greater integration and linkages between the independent and central elements of the health system. A particularly noteworthy linkage between independent family doctors and the central health authority is the Primary Care Network (PCN) program. Many, but not all, PC physicians opt to affiliate themselves with a PCN. The PCNs are financed through grants from the provincial Ministry of Health and are based on the size of their members' patient panels. They provide PC services and quality improvement supports that would be beyond the capacity of individual clinics, and, in their system integration role, co-plan care delivery priorities with AHS public health and acute care facilities at the health-zone level.³⁴ In this sense, the PCNs are key touch-points between independent PCs and the centralized health system.

Provincially-funded postsecondary education institutions also have close linkages with PC in Alberta. The universities in both Edmonton (University of Alberta) and Calgary (University of Calgary) include medical schools with family medicine programs. As a result, there are well-established relationships between academic researchers, family medicine residents, and clinical teaching faculty at these institutions, which extend to AHS, the PCNs, and to a lesser extent, PC clinics directly.

Finally, a key element of provincial PC policy -and thus a performance marker for the PCNs -is the delivery of the Patient's Medical Home.³¹ Among other elements in this PC delivery model, team-based care is a particular policy priority.³⁵ This means there has been a focus in PCNs, and their individual PC clinics, on the collaborative interaction of medical, allied health, and lay members of PC teams. While there is not always perfect fidelity between policy intentions and operational actions in the realm of PC teamwork,²¹ Alberta's PC staff are familiar with its rhetoric, and to some extent, its values, practices, and cultural underpinnings.

Context analysis

Alberta's policy commitment to integrating PC into the broader health system has led to the creation of the PCNs. In the case of our virtual TTS program, the PCNs acted as bridges between the well-resourced education institution, where we were based as researchers, and independent PC clinics. The PCNs were single contact points for reaching large numbers of autonomous entrepreneurial physicians and their teams. Our team leveraged connections forged during our research and teaching activities with the PCNs of the Calgary health zone to begin delivering the TTS. Specifically, our status as researchers in a university with regular points of contact between academic departments of family medicine, the PCNs, and individual PC clinics, as afforded us the position of "consultative outsiders" who could be trusted, and were readily accepted by PC clinicians and site leadership. From initial relationships, uptake of the TTS quickly scaled to areas outside of Calgary by word-of-mouth, mainly through inter-PCN connections.

Working with PCNs also helped improve continuity and the appropriateness of our co-designed solutions in the simulations. Sessions with different clinics from the same PCN meant our advice was shared across clinics. Our facilitation team received direct feedback about recommendations accepted or rejected by staff at these clinics, which allowed us to adapt them accordingly for future simulations. The ability of the PCNs to help promote the virtual TTS program and disseminate our safety findings highlights their importance as critical infrastructural supports for PC in Alberta, emphasized even further during the COVID-19 pandemic.^{12,34,36}

Finally, the virtual TTS sessions assumed that participating PC clinicians were competent in, and comfortable with, the values of egalitarian teamwork that underpin the Patient Medical Home model. The virtual TTS sessions prompted participants to experiment with different roles and voices, as well as to discuss challenges and propose solutions openly, honestly, respectfully and in good faith with one another. Our approach to facilitation was "consultative," in that the solutions that we co-designed with teams were always presented in a non-prescriptive manner, as recommendations rather than mandates. We aimed to streamline and simplify existing practices rather than educate participants on new, externally developed policies or procedures. Indeed, this assumption about the value of egalitarian teamwork, acceptance of consultative advice, and experimentalism as methods for quality improvement were foundational to our co-design, "alongsider" approach.^{19,37}

The assumed norms of egalitarian teamwork and collaborative, nonjudgmental experimentation were understood and embraced by the majority of participants in the TTS sessions. In this sense, our approach successfully enforced the levelling of social status as PC physicians, nurses, clinic support staff, allied health, and our expert facilitators worked as an egalitarian team to address IPC challenges. Our virtual TTS sessions thus acted as a catalyst for clinics that were already interested, eager, and willing to use novel team-building activities to help their staff adapt to the changes imposed by the pandemic.

THE BENEFITS OF VIRTUAL TABLETOP SIMULATIONS

While our focus in this paper is on the TTS' adaptive elements, it is important not to overlook the opportunities afforded by the virtual delivery of tabletop simulations for PC. Although this virtual TTS format was uniquely fitted for our specific conditions and context - namely, a pandemic response in a well-funded, autonomous primary health care environment - our team recognized that the method might be useful and successful in many other settings, for many other purposes. We discovered a range of significant benefits to virtual delivery of simulations, including: cost and time savings; scheduling flexibility with participants and facilitators; built-in physical distancing; digital interactivity and chatting options; and easy recording and exporting of simulation sessions from the MURAL© interface. The low-cost TTS program offered PC clinicians from across a large, diffusely populated province a low barrier to entry and a range of time and resource savings as they sought to integrate IPC guidance into PC practice. Virtual TTS, in other words, have the potential to function as a powerful tool for multidisciplinary teams to collectively build safety improvements into their workspaces.²¹

CONCLUSION

While offering significant benefits, we still wonder whether, and to what extent, this intervention is generalizable. Would it be possible, appropriate, or acceptable in other HIC or LMIC contexts? If access to adequate broadband, hardware, and software is a "hard" technical requirement for virtual TTS viability, this paper has highlighted a range of "soft" adaptive elements that present significantly more complex, and less easy-to-answer questions about whether this IPC intervention could or should be adapted, scaled and spread.

As launched, the TTS relied heavily on local, institutionally supported, contacts; the bridging capacity of the PCNs; and the independent entrepreneurial nature of PC in Alberta. How might local social networks and organizations with an interest in quality improvement and connections to PC be leveraged in other, lower-resource contexts? Are PC clinicians in various LMIC settings similarly able, and interested, in acting as independently as those in our HIC setting did?

And do those LMIC clinicians bring an entrepreneurial, egalitarian mindset to seeking IPC solutions for in-person care? Have there been other similar virtual TTS programs and innovations originating in LMIC settings that we can learn from?

The TTS were created and released in a well-resourced environment in which PC integration challenges - like how to implement IPC guidelines developed outside of PC operations - were considered valid objects of attention. Policy and culture also combined to allow us as researchers and TTS facilitators to assume that egalitarian teamwork and collaborative experimentalism were broadly accepted as valid methods for achieving quality improvement. The virtual TTS program seems well suited to scale and be adapted to other family medicine practices, as it is low-cost and has demonstrated impact.²¹ Here, we have provided an account of some of the adaptive elements that led to the uptake of our virtual TTS program in Alberta's PC setting during the COVID-19 pandemic. We leave open the question of whether this kind of innovation would be acceptable, appropriate, or useful in other settings with other populations. Our hope is to begin a dialogue between researchers, IPC professionals, and local family medicine communities, aimed at understanding whether and how the technical and adaptive elements of our original intervention might be successfully translated or scaled.

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