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Building sustainable virtual healthcare delivery in Indigenous communities through capacity building: a case study

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Abstract

Rural and northern Indigenous communities in Saskatchewan continue to face barriers in accessing timely and culturally safe healthcare. To address workforce shortages and digital exclusion, we co-developed a community-based virtual healthcare training initiative focused on building Indigenous-led capacity to support virtual care delivery within home communities. Grounded in Indigenous pedagogy and the Two-Eyed Seeing approach, this descriptive case study reports on the design, implementation, and synthesized experiential insights arising from early program delivery. Delivered in partnership with the Saskatchewan Indian Institute of Technologies (SIIT), the Virtual Health Hub Assistant Certificate Program equips Indigenous learners with both technical skills and cultural competencies to facilitate virtual care in their home communities. Training design was intentionally scaffolded to support digital confidence, relational accountability, and leadership development. Consistent with a community-engaged program evaluation approach, experiential reflections, informal feedback, and operational observations arising during program delivery were collaboratively documented and synthesized by program leads; no formal qualitative and quantitative data were collected, and no human participant data were generated. Graduates are now working or preparing to work within their own remote and rural communities, supporting virtual visits, improving workflow integration, and strengthening trust and patient comfort with digital health systems. Clinicians communicated increased efficiency, while learners expressed a sense of purpose, belonging, and local leadership. This report illustrates how Indigenous-led curriculum, community governance, and localized capacity-building can contribute to the sustainability of virtual care and advance digital health equity, while also identifying areas for future community-defined evaluation. Our experience underscores that ethical virtual care requires educators to centre community values, contextual knowledge, and long-term workforce development.

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Mettre en place une prestation de soins de santé virtuels durable dans les communautés autochtones grâce au renforcement des capacités : une étude de cas

Résumé

Les communautés autochtones rurales et nordiques de la Saskatchewan continuent de se heurter à des obstacles pour accéder à des soins de santé dispensés en temps opportun et respectueux de leur culture. Afin de remédier à la pénurie de main-d'œuvre et à l'exclusion numérique, nous avons co-développé une initiative communautaire de formation aux soins de santé virtuels, axée sur le renforcement des capacités dirigées par les Autochtones pour soutenir la prestation de soins virtuels au sein de leurs communautés d'origine. S'appuyant sur la pédagogie autochtone et l'approche « Two-Eyed Seeing », cette étude de cas descriptive rend compte de la conception, de la mise en œuvre et des enseignements tirés de l'expérience lors des premières phases de la mise en œuvre du programme. Délivré en partenariat avec le Saskatchewan Indian Institute of Technologies (SIIT), le programme de certificat d'assistant du Virtual Health Hub dote les apprenants autochtones à la fois de compétences techniques et de compétences culturelles pour faciliter la prestation de soins virtuels au sein de leurs communautés d'origine. La conception de la formation a été intentionnellement structurée pour favoriser la confiance dans le numérique, la responsabilité relationnelle et le développement du leadership. Conformément à une approche d'évaluation du programme axée sur la communauté, les réflexions expérientielles, les retours informels et les observations opérationnelles survenus pendant la mise en œuvre du programme ont été documentés et synthétisés de manière collaborative par les responsables du programme ; aucune donnée qualitative ou quantitative formelle n'a été collectée, et aucune donnée relative aux participants n'a été générée. Les diplômés travaillent désormais ou se préparent à travailler au sein de leurs propres communautés rurales et isolées, en facilitant les consultations virtuelles, en améliorant l'intégration des flux de travail et en renforçant la confiance et le confort des patients vis-à-vis des systèmes de santé numériques. Les cliniciens ont fait état d'une efficacité accrue, tandis que les apprenants ont exprimé un sentiment d'utilité, d'appartenance et de leadership local. Ce rapport illustre comment un programme d'études dirigé par des Autochtones, une gouvernance communautaire et un renforcement des capacités localisé peuvent contribuer à la pérennité des soins virtuels et faire progresser l'équité en matière de santé numérique, tout en identifiant les domaines à évaluer à l'avenir selon les critères définis par la communauté. Notre expérience souligne que des soins virtuels éthiques exigent des formateurs qu'ils placent au centre les valeurs communautaires, la connaissance du contexte et le développement à long terme de la main-d'œuvre.

Introduction

Saskatchewan's geography is expansive and stunning, but its vastness has long contributed to inequities in access to care. Rural, remote and Indigenous communities experience consistent gaps due to continued challenges in healthcare access, culturally safe service delivery and digital infrastructure. Despite longstanding provider efforts, these communities encounter challenges in navigating the healthcare system and remain underserved by health systems that are fundamentally designed for urban proximity. This lack of access is reflected in disproportionate levels of preventable illness and mortality, as well as in the staggering financial burden of transporting patients to urban centers for care.[1] For medical education systems and healthcare planners, these disparities underscore a critical workforce development challenge: digital health transformation cannot be sustained without building local, community-governed capacity to deliver and steward virtual care. The COVID-19 pandemic and the concurrent rise of AI-enhanced digital health exposed how innovation without inclusion could reinforce inequity. The concept of "digital determinants of health"[2] helps frame how access to digital tools, literacy, and infrastructure shapes outcomes. However, when Indigenous communities are excluded from the design and governance of virtual health systems, limited uptake is often mischaracterized as hesitancy rather than recognized as a consequence of structural exclusion. These persistent gaps highlight the need for digital health solutions that are not only technically sound but also culturally grounded and community-driven—an approach supported by our own experience with remote presence robotics in a northern Inuit community,[3] culturally safe paediatric care for rural Indigenous populations,[4] and telerobotic ultrasonography initiatives in Northern[5] and Southern Saskatchewan.[6] Together, this body of work emphasizes that virtual care effectiveness depends not only on technology, but also on who is trained, trusted, and empowered to deliver care locally. Recent perspectives highlight that artificial intelligence and digital innovations, when codesigned with Indigenous communities, can expand access and improve culturally grounded care pathways for rural and remote Indigenous populations in Saskatchewan.[7]

Program description and setting

This report describes the development, implementation, and early outcomes of a community-based virtual healthcare training initiative in Saskatchewan, Canada. The Virtual Health Hub Assistant Certificate Program[8] was co-developed and implemented in partnership with the Saskatchewan Indian Institute of Technologies (SIIT),[9] an Indigenous-governed post-secondary institution that served as the delivery partner and institutional home for the training program. The Virtual Health Hub Assistant program is a structured, applied certificate program designed to prepare Indigenous learners to support the day-to-day delivery of virtual healthcare services within their home communities. Training was delivered through a combination of classroom-based instruction, hands-on technical training, and supervised experiential learning connected to real-world virtual care workflows. Learners were trained to support virtual clinical encounters by preparing patients for visits, operating telehealth and telerobotic systems, coordinating digital workflows, and acting as a local point of contact between patients and remote healthcare providers. Program delivery occurred over a defined training period and followed a sequenced structure. Early modules focused on foundational digital literacy and orientation to virtual healthcare platforms, including basic troubleshooting, privacy awareness, and patient-facing communication skills. Subsequent modules emphasized applied competencies, such as setting up and facilitating virtual visits, supporting clinicians during remote consultations, and integrating virtual care processes into existing community health workflows. Throughout the program, learners practiced these skills through guided simulations and supervised engagement with operational virtual health services. The curriculum was intentionally designed to support learners in

remaining within or returning to their home communities to apply these skills in locally meaningful ways. Rather than preparing learners for centralized or urban-based digital health roles, the program emphasized local implementation, relational accountability, and responsiveness to community-specific contexts. Frameworks such as Two-Eyed Seeing approach[10] and Bloom's Taxonomy[12] informed the overall design of the program, but were applied in practical, concrete ways rather than as abstract instructional models. For example, Bloom's Taxonomy informed the progression from introductory knowledge of digital systems to applied problem-solving and leadership in adapting virtual care workflows to local needs. Two-Eyed Seeing guided the parallel emphasis on technical competence and relational practice, ensuring that learners were supported not only to operate digital tools but also to facilitate culturally safe interactions grounded in community knowledge and trust. Rather than relying on abstract concepts such as "braided pedagogy" or "co-guidance," the program operationalized these principles through specific practices, including mentorship by instructors familiar with Indigenous community contexts, opportunities for learners to share local knowledge during training, and flexibility in how virtual care processes were adapted to community realities. This approach ensured that the program remained grounded in lived experience and practical application. We viewed the program as a paradigm shift for medical education: expertise and decision-making are re-centred within Indigenous communities.

Authors' positionality and worldview

We situate this work within our respective roles and relationships to the program described, recognizing positionality as a core component of methodological transparency in community-engaged educational work. We write this work not as detached observers, but as collaborators rooted in distinct disciplines and responsibilities. As a population health physician-scientist (Amal Khan), a vice-president of career and community initiative at the Saskatchewan Indian Institute of Technologies (Lisa Shingoose) and a virtual health care pioneer, innovator and clinician-scientist (Ivar Mendez), we approach this work through a shared commitment to community governance and decolonizing training approaches. Each author was involved in the conceptualization, development, and implementation of the Virtual Health Hub Assistant training program, and our observations arise from sustained engagement in program delivery, partnership-building, and community collaboration. Our ontological grounding lies in recognizing Indigenous sovereignty in health workforce education. The Virtual Health Hub Assistant training program,[8] based on our team's experiential learning of working closely with Indigenous communities in Saskatchewan, is specifically built to reflect Indigenous learners' ways of knowing, being, and doing. Guided by the Two-Eyed Seeing approach,[10] which brings together Indigenous teachings and Western science, we see virtual care as a relational structure shaped by those who use it. Our interpretive lens prioritizes relational accountability, reciprocity, and community-defined value, shaping how experiential observations were reflected upon, discussed and synthesized. What sustains virtual care is beyond infrastructure and connectivity. It is the culturally aligned learning and trust that integrates systems and communities.

Methods

Evaluation approach

As this report focuses on describing experiential learning that reflects the developmental and implementation processes, we did not conduct formal quantitative or qualitative data collection or participant recruitment. This work is presented as a descriptive case study grounded in program implementation rather than as an evaluative research study. Observations were documented based on program operations and reports, informal participant feedback during program delivery, and reflections from program developers, instructors, and community partners, consistent with a community-engaged evaluation approach.[13] Experiential observations emerged organically during the design, delivery, and refinement of the Virtual Health Hub Assistant program and were generated through

sustained engagement in teaching, mentorship, operational coordination, and community partnership activities. Informal feedback was shared voluntarily by learners, instructors, clinicians, and partners during routine interactions, debriefs, and community conversations associated with program delivery. No structured interviews, surveys, recordings, or transcripts were produced, and no formal qualitative or quantitative instruments were employed. Documentation of observations occurred through contemporaneous reflective notes, operational records, and facilitated team discussions among program leads and instructors. These records were maintained as part of routine program delivery and quality reflection rather than for research extraction. To support rigour and transparency, program leads engaged in iterative reflexive sessions to collectively reflect on recurring patterns, challenges, and strengths observed during implementation. Synthesis of experiential insights was conducted collaboratively through consensus-building discussions among the authors and core program team members. During these sessions, observations were compared across contexts and roles to identify recurrent themes and key program-level insights related to learner engagement, cultural safety, relational accountability, leadership development, and system-level relevance. No formal coding framework or analytic software was used; instead, themes were "lifted" through repeated collective reflection, comparison of experiences, and agreement on shared interpretations grounded in program delivery. The experiential insights presented reflect program-level learning rather than individual participant data, and interpretations were shaped by relational accountability and ongoing dialogue with community and institutional partners.

Ethical considerations

This program constituted a workforce development initiative and community-directed program evaluation Utilizing OCAP®[14] principles, CARE framework[15] and Two-Eyed Seeing[10] approach, oversight and decision-making were guided by SIIT and community leadership, experiential insights remained program- and community-held, no individual-level data were extracted, and interpretation and reporting occurred through Indigenous-governed institutional structures. Knowledge arising from this work sits with the program and partner communities and is shared here for educational purposes. This work was reviewed by the University of Saskatchewan Human Research Ethics Office and deemed exempt from requiring research ethics approval.

Findings

Synthesized insights drawn from program delivery are organized below as key themes reflecting collective experiential learning across the first cohort of the Virtual Health Hub Assistant program. These themes represent program-level observations arising from implementation and collaborative reflection.

Theme 1: Development of Indigenous-Led virtual care capacity within home communities

Graduates from the first cohort are now ready to work within their own remote and rural communities, with some already established in La Loche, Fond du Lac, Stanley Mission, Stony Rapids, Pelican Narrows, Whitecap and Gravelbourg. Across program delivery, a consistent pattern emerged in which learners expressed a strong preference for remaining in or returning to their home communities to support local virtual care delivery. This reflects the emergence of an Indigenous-led virtual care workforce that can potentially sustain health services locally. Their roles include working collaboratively with the Virtual Health Hub to facilitate virtual visits in their communities, troubleshooting digital tools, and serving as relational bridges between patients and remote providers. Program leads observed that learners' familiarity with local contexts and relationships supported smoother integration of virtual care workflows and strengthened trust between patients and clinicians.

Theme 2: Relational accountability and cultural safety as enablers of virtual care

Clinicians from these communities report increased efficiency, smooth workflow integration and cultural safety.[6] Patients expressed a greater sense of satisfaction, comfort, trust, and willingness to engage with virtual platforms and access healthcare through telerobotic technology.[6] These observations were repeatedly noted during program reflection sessions and were interpreted as relational outcomes arising from culturally aligned facilitation rather than from technological optimization alone. Learners' ability to act as trusted intermediaries—grounded in shared language, culture, and community knowledge—was consistently identified as central to patient comfort and sustained engagement with virtual care. These relational dimensions were viewed by program partners as foundational to ethical and effective virtual healthcare delivery in Indigenous contexts.

Theme 3: Identity, leadership, and retention through community-governed training

Many learners expressed a renewed sense of purpose and pride, choosing to remain in their communities rather than leave in search of opportunity. Through iterative reflection, program leads identified a recurring connection between culturally grounded training, learner identity, and leadership development. Learner's engagement reflected not only intellectual growth but an upward movement through Maslow's Hierarchy of Needs[16]—from basic security and belonging, to self-esteem, and finally to self-actualization through serving their communities in meaningful, culturally grounded roles. This theme highlighted how community-governed training environments can support retention of Indigenous health workers and foster leadership aligned with local values and priorities. These insights highlight the direct connection between training, identity, and self-determined health futures.

Theme 4: System-level relevance and emerging policy implications

System-wide, the program has prompted policy conversations across health regions and post-secondary partners. Across synthesis discussions, program leads noted that what began as a localized training initiative was increasingly understood by partners as a scalable framework for advancing digital equity through Indigenous self-determination. Rather than viewing the program solely as a training intervention, stakeholders interpreted it as a model for reconfiguring how virtual care capacity is developed, governed, and sustained (e.g., through Indigenous-led institutions and community-defined priorities). These observations informed subsequent discussions about replication and adaptation in other jurisdictions. Taken together, these synthesized themes highlight how Indigenous-led capacity building, relational accountability, and community governance function as interconnected mechanisms supporting sustainable virtual care delivery.

Discussion

Immediate program-level findings

The results of this report highlight opportunities and challenges in sustainably delivering virtual healthcare within Indigenous communities in Saskatchewan while maintaining cultural alignment and local leadership. At a program level, the synthesized themes demonstrate that Indigenous-led capacity building can support the practical integration of virtual care through relational accountability, cultural safety, and locally governed facilitation roles. This initiative demonstrates that digital health transformation faces challenges in achieving sustainability unless technological innovation is grounded in community-driven leadership and culturally aligned pedagogy. By training Indigenous professionals to lead virtual care delivery, medical educators directly support digital equity and sovereignty. The immediate findings of this case study emphasize that workforce development is central to the ethical implementation of virtual healthcare in rural and remote Indigenous contexts.

While virtual healthcare platforms are increasingly considered as potential solutions to geographic health disparities, their impact depends on *who* is empowered to implement and steward them.

Broader implications for digital health equity

Beyond these program-level insights, the findings point to broader systemic implications for how digital health initiatives are designed, governed, and scaled. This work challenges dominant narratives that view capacity building as secondary or as a by-product of infrastructure development. Instead, human capacity, culturally aligned leadership, and relational trust must be recognized as foundational pillars of digital transformation. By embedding training within an Indigenous-led institution, expertise is decentralized, and legitimacy is restored to community knowledge systems. Importantly, this distinction between immediate findings and broader implications helps clarify the contribution of this report as descriptive rather than evaluative. The insights presented illuminate mechanisms through which virtual care may become sustainable when grounded in Indigenous governance.

Taken together, these insights reposition virtual health not as a temporary workaround for remote care but as a clear pathway to Indigenous health sovereignty, one that must be scaled through trust, reciprocity, and shared power and decision-making. Building on these findings, it is important to explore the underlying principles and structural considerations that enable the success and sustainability of Indigenous-led virtual healthcare. The following sections contextualize these important points, discussing how knowledge mobilization, Indigenous sovereignty in digital health, ethical AI frameworks, and implementation lessons learned are interwoven into the program's design and their broader implications for digital health equity.

Implications and knowledge mobilization

At every stage, knowledge mobilization has anchored this work, not as an endpoint, but as a methodology. In this context, knowledge mobilization refers to the ethical and reciprocal process through which learning generated during program implementation is shared, adapted, and applied in ways that prioritize community benefit. We define knowledge mobilization as the ethical, reciprocal process of generating, adapting, and applying knowledge in ways that serve the community first. This means not only building skills but sharing ownership, governance, and learning across systems. By situating the program at SIIT, we grounded it in a trusted Indigenous institution that holds cultural authority and educational capacity. The knowledge stays close to where it is most needed and can evolve in dialogue with those it is meant to serve. True knowledge mobilization requires deep reciprocity, institutional humility, and structural support. In this work, we see mobilization not as translation, but as transformation—moving both knowledge and power. This approach reinforces the role of Indigenous-led institutions as sites of both learning and governance, mirroring national efforts now underway to prepare the next generation of Indigenous virtual care professionals through institutions like SIIT, which has placed innovation and digital health leadership at the core of its strategic agenda [1]

Indigenous sovereignty, AI, and governance

As digital health systems evolve, including increasing use of Artificial Intelligence (AI), we must remain vigilant to avoid reproducing the same systemic exclusions we seek to overcome. AI is often framed as neutral or purely technical, but its deployment without Indigenous leadership risks reinforcing colonial assumptions and data biases. As emphasized in recent advocacy from within our Virtual Health Hub team,[7] Two-Eyed Seeing[10] must not be treated as a philosophical add-on—it is a transformative framework that reshapes how we define,

collect, and apply health data. If AI is to be a tool for equity, it must be developed with and by Indigenous communities, grounded in their knowledge systems, and accountable to their governance. This means designing AI systems that are not only technically functional but also culturally coherent tools that braid together Western digital infrastructure with Indigenous oral traditions, relational accountability, and collective values. We align this perspective with the CARE principles: Collective benefit, Authority to control, Responsibility, and Ethics,[15] which guide ethical engagement with Indigenous data. At its core, this work requires a paradigm shift: to ensure Indigenous Peoples have full sovereignty over their health information, technologies, and policies. Only then can digital health innovations contribute meaningfully to reconciliation, healing, and health equity. Moreover, we see our program as one step toward fulfilling the Truth and Reconciliation Commission's Call to Action 19: to establish measurable goals to close the health gap between Indigenous and non-Indigenous populations.[17] Our work, rooted in the Cree principle of *wâhkôhtowin*—the interconnectedness of all beings—positions virtual care not just as service delivery, but as a relational and restorative process [7]

Ethical deployment frameworks

Looking ahead to future expansions in digital health, it is clear that integrating AI requires more than technological readiness; it demands alignment on ethical, cultural, and governance aspects from the outset. A recently proposed five-step framework offers a structured approach grounded in community profiling, digital readiness assessments, collaborative prioritization of health needs, culturally responsive deployment, and outcome evaluation informed by local voices.[18] This model shifts away from extractive or technocratic approaches, emphasizing shared power and relational accountability throughout the design and implementation process. Two-Eyed Seeing, often referenced as a guiding lens, must be understood not as a symbolic gesture but as a structural principle—one that insists Indigenous perspectives are embedded from the beginning, not added after the fact.[19] When AI-enabled virtual care tools are co-developed in this way, they have the potential to uphold data sovereignty, reinforce nation-to-nation relationships, and directly advance Truth and Reconciliation Commission Call to Action 19, not only by increasing access but also by transforming how health technologies are conceived, governed, and utilized. The report further affirms that ethical deployment of AI and other digital tools must follow frameworks that prioritize Indigenous governance, including the CARE principles,[15] and the Two-Eyed Seeing approach.[10] Virtual care must not replicate colonial decision-making structures but instead redistribute power and enhance self-determined access to care.

Lessons learned

We learned that capacity building must form the foundation of equity in digital health. We recognize that Indigenous authority and culturally grounded pedagogy drive successful virtual care implementation. When Indigenous learners are trained within community-governed institutions, they build trust, sustain continuity of care, and strengthen relationships among patients, providers, and systems. We observed that relational governance empowers communities to lead technology adoption and protect the long-term sustainability of virtual care. We continue to measure success through community-defined indicators such as cultural safety, belonging, retention of Indigenous health professionals, and increased participation in local health governance. Evidence from other Indigenous-led initiatives shows that when communities design and govern their own programs, they improve wellbeing, expand autonomy, and build lasting capacity.[17] These lessons reinforce that community leadership does not merely support virtual care—it determines whether digital health transformation will be sustainable. We commit to maintaining long-term partnerships with Indigenous Nations and strengthening institutional accountability as virtual care systems evolve.

Implications for medical education

This report illustrates that medical education plays a pivotal role in ensuring that digital health

becomes a force for equity, rather than another layer of disparity. By preparing local Indigenous professionals to facilitate and steward virtual care, educators directly contribute to reshaping healthcare access in rural and remote areas. The implementation of the VHHA program demonstrates that technology adoption is inseparable from cultural relevance and trust, and these must therefore be embedded as core competencies within digital health curricula. Supporting learners within Indigenous-governed spaces ensures that training reflects the values, lifeways, and priorities of the communities it is intended to serve, reinforcing that cultural safety is not an adjunct skill but a foundational requirement for ethical care. Our experience suggests that the future of digital health education must move beyond a focus solely on tools and platforms, toward an emphasis on community sovereignty, relational accountability, and the governance of technology. When learners are equipped not just to use virtual systems but to lead their deployment and evolution, virtual care becomes both sustainable and transformative. In this way, medical education contributes to reconciliation-aligned system change, promoting self-determined health innovation and strengthening the continuity of care for Indigenous patients where they live.

Limitations

This report draws primarily on experiential insights, operational observations, and informal feedback collected during the program's early implementation phase. These insights reflect program-level learning rather than data generated through systematic qualitative or quantitative methodologies. As a result, generalizability is limited, and we cannot directly measure program outcomes using conventional academic indicators of learning or performance. Additionally, the findings represent an initial snapshot, and longer-term outcomes—such as retention of graduates in community roles, sustained implementation of virtual care technologies, and measurable improvements in patient experience require further follow-up. Continued impact evaluation will benefit from co-developed tools and indicators reflecting community priorities, such as cultural safety, relational continuity, and trust in local health systems. As the program evolves, future work will incorporate more structured evaluation processes aligned with Indigenous data governance principles and ethical guidelines such as OCAP® and CARE. This will support ongoing quality improvement, ensure that success is defined and measured by communities involved, and strengthen the scholarly rigour of future reports.

Conclusion

Digital health is not inherently equitable. Equity arises when tools are placed in the hands of communities, and when the people delivering care are the same people shaping its design. This descriptive case study demonstrates that Indigenous-led, community-governed capacity building can support the sustainable implementation of virtual healthcare in rural and remote Indigenous contexts. The Virtual Health Hub Assistant program represents more than a training model—it is a blueprint for shared power, belonging, and Indigenous-led health transformation. True sustainability in Indigenous health systems will not be achieved through bandwidth or innovation alone, but through trust, identity, and community-embedded leadership. Future directions include formal evaluation approaches co-developed with Indigenous communities and guided by Indigenous-defined indicators of success, ensuring that digital health innovation remains accountable to those it is intended to serve.

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