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Healthcare delivery in the arctic-telehealth prospects

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ABSTRACT

The Arctic region, characterised by its remote and geographically challenging environment, is home to predominantly Indigenous populations who experience significant healthcare disparities compared to urban counterparts. This paper synthesises evidence on the persistent challenges in delivering healthcare in the Arctic, including geographical remoteness, healthcare personnel shortages, and cultural and language barriers. Telehealth emerges as a crucial solution, offering a nuanced approach to overcoming physical and systemic barriers. We review current implementations of telehealth in the Arctic, highlighting successful adaptations to local cultural contexts and technological limitations. By integrating a patient-centred approach, infrastructure readiness, and relevant telehealth services, a holistic healthcare delivery model tailored for the Arctic environment is proposed. New type of technologies is also proposed to enhance remote care possibilities. This paper underscores the need for collaborative efforts in research, policy making, and healthcare provision to ensure the sustainability and effectiveness of health services in the Arctic, aiming to close the gap in health equity. Key references from seminal works and recent studies provide a foundation for the discussions and recommendations presented.

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Introduction

Healthcare delivery in the Arctic region faces unique challenges due to its extreme geographical and climatic conditions [1]. Indigenous populations, who predominantly inhabit these areas, experience significant health disparities compared to non-Indigenous groups. These disparities are exacerbated by factors such as geographical remoteness, harsh weather conditions, limited healthcare infrastructure, and socioeconomic inequalities. Indigenous communities in the Arctic often rely on traditional knowledge and practices for healthcare, which may not always align with Western medical approaches. Moreover, the healthcare workforce in these regions faces high turnover rates, limited training opportunities, and significant logistical challenges, further complicating the delivery of consistent and high-quality care. Climate change poses an additional threat to Arctic health, altering disease patterns and exacerbating existing health challenges. The rapid warming of the Arctic affects the prevalence and distribution of vector-borne diseases, food- and waterborne illnesses, and mental health conditions, necessitating a comprehensive response from healthcare systems. This review aims to examine the multifaceted challenges to healthcare delivery in the Arctic, assess the impact of climate change on health outcomes, and explore innovative solutions such as telehealth and the integration of Indigenous knowledge. By synthesising existing literature and presenting a holistic view of the issues, this paper seeks to inform policy and practice, as well as propose some technologies developed in our lab, to improve healthcare for Arctic populations. This article excludes technology diffusion and life cycle, which are crucial for Arctic telehealth and merit future study.

Methods

This paper synthesises literature on healthcare delivery in the Arctic, focusing on studies that address health disparities, climate change impacts, and telehealth solutions. The literature search was conducted using databases such as PubMed, Scopus, Google Scholar, etc., with keywords including "Arctic healthcare", "Indigenous health", "telehealth", "telemedicine", "climate change", "health disparities", etc. Articles were selected based on relevance and quality, prioritising recent publications and those involving Indigenous perspectives. Inclusion criteria encompassed studies that discussed healthcare challenges, impacts of climate change on health, and innovative healthcare solutions

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in the Arctic context. Additional technologies developed by our group are described also in this paper.

Disparities in health between indigenous and non-indigenous

Indigenous populations in circumpolar regions face significantly worse health outcomes than non-Indigenous groups. Young et al. [2] highlight these disparities in Alaska, Greenland, northern Canada, Russia, and the Nordic countries, disparities include higher rates of smoking, suicide, and tuberculosis, as well as lower life expectancy. For example, Inuit in Nunangat and First Nations in northern Canada report poorer health indicators than national averages, while Sami in Scandinavia show lower confidence in healthcare. In Arctic Russia, Indigenous communities face lower incomes, higher cancer rates, and elevated suicide rates, such as among the Nenets.

Northern spread of infectious diseases

Arctic land surface temperatures have risen significantly since the mid-twentieth century, bringing new health challenges such as increased infectious diseases alongside existing issues like health disparities and chronic diseases [3]. Vector-borne, food- and water borne diseases rise with higher temperatures and intense precipitation in Denmark, Norway, Finland, and Sweden [4,5]. Vibriosis cases in Finland and Sweden during heat waves highlight the correlation between sea surface temperatures and Vibrio infections [6]. Predictive modelling shows that vector-borne diseases are most affected by climatic factors, followed by food- and waterborne diseases, emphasising the need for robust public health infrastructure to mitigate these impacts [7]. A group led by the co-author, Israel Gannot has developed and small laboratory instrument that identifies instantly types of bacteria, including those who are known to be in the arctic areas. This instrument does not need any expertise from the operator and can be used in any remote location with no need for maintenance. All software updates and any faults are done through the internet [8].

Barriers to healthcare access and telehealth solutions

Healthcare access in the circumpolar North is hindered by structural poverty, institutionalised racism, and challenging geography, leading to notable disparities in heart disease and self-inflicted injuries [9]. Barriers include long travel times, harsh weather, provider shortages, and systemic issues like funding gaps, all exacerbated by cultural and language differences, discrimination, and colonial legacies that create mistrust among Indigenous populations [10]. Telehealth offers a promising solution, particularly for Indigenous communities, but must be culturally adapted to address historical trauma and respect traditional practices. While barriers include privacy concerns, low digital literacy, and limited internet access, facilitators like cultural relevance, community engagement, and therapeutic relationships show potential to improve outcomes. Telehealth strategies that integrate Indigenous values and involve local providers can bridge gaps, enhance trust, and complement in-person care [11].

Proposed solution for healthcare enhancement

To address the multifaceted healthcare challenges in the Arctic, a holistic and culturally sensitive approach to telehealth is essential. The proposed solution encompasses patient-centred approaches, a comprehensive telemedicine system layout, and relevant telehealth services tailored to the Arctic's unique needs.

Patient-centered approach

A patient-centred approach via telemedicine empowers Arctic residents to actively participate in their healthcare decisions by providing access to health records, educational resources, and opportunities for shared decision-making.

Patient engagement and empowerment

Telehealth platforms offer educational resources, webinars, and virtual sessions, enabling patients to understand their medical diagnoses, treatment options, preventive measures, and self-management strategies. For instance, mobile health (mHealth) has proven to be effective in delivering health education in a culturally acceptable way, reaching broad populations including Indigenous communities through high mobile phone usage [12]. AI-driven tools like chatbots, such as ChatGPT by OpenAI, aid diabetes patients in understanding their diagnosis and treatment, monitoring symptoms, and providing feedback [13]. Telemedicine also facilitates access to health information, allowing patients to review their medical records, ask questions, and stay informed about their health status, as seen with Patient Accessible Electronic Health Records (PAEHR) in Norway [14]. Shared decision-making, integral to person-centred care, is promoted through telemedicine consultations, where patients collaborate with

healthcare providers to determine treatment plans based on their preferences and values. Research, such as the "Not Deciding Alone" project, highlights methods for developing shared decision-making interventions for Indigenous Peoples, enhancing opportunities for their participation in healthcare decisions [15]. This approach improves treatment adherence, patient satisfaction, and health outcomes, while also addressing health disparities.

Cultural sensitivity

In the Arctic Circle, ensuring telemedicine platforms are culturally sensitive and inclusive is crucial for effective healthcare delivery. This involves offering services in indigenous languages like Inuktitut and Saami, as seen during the COVID-19 pandemic when health advisories were translated into multiple Indigenous dialects [16]. Cultural competency training for healthcare providers is essential, as highlighted by a 2023 study recommending both in-person and online options [17]. Community engagement and co-creation of telemedicine programmes, such as the "OL@-OR@" mHealth program for Māori and Pasifika communities, ensure services are tailored to specific needs [18]. The "Two-Eyed Seeing" approach, which integrates Indigenous knowledge with Western medicine, is advocated by the First Nations Health Authority to improve healthcare outcomes, incorporating traditional practices like storytelling and the use of traditional medicines [19].

Predictive and preventive medicine

Predictive and preventive medicine in the Arctic Circle, enabled through telemedicine, involves using data analytics, genetic testing, machine learning, and remote monitoring to forecast and mitigate health risks. Telemedicine platforms facilitate virtual health screenings, early disease detection, and health education campaigns, reducing the prevalence of conditions like diabetes and cardiovascular diseases. For instance, Digital Health Interventions (DHIs) have shown significant improvements in medication adherence and mental health [20]. Predictive analytics, such as those used by companies like "Reveal®", identify at-risk patients for targeted interventions, enhancing patient outcomes [21]. Telemedicine also supports vaccination programmes by providing virtual education and overcoming barriers like language and travel challenges, crucial for indigenous populations with historical mistrust in healthcare [22]. Additionally, telemedicine aids in disease surveillance and outbreak response, as demonstrated by the Arctic Investigation Program (AIP) in Alaska, utilising real-time monitoring and rapid intervention to control communicable diseases [23,24]. Technologies like big data analytics, AI, and blockchain further enhance surveillance and response capabilities, ensuring comprehensive public health management.

Telemedicine system

The COVID-19 pandemic highlighted the crucial role of telemedicine in delivering healthcare to remote and underserved communities. Despite global efforts, ensuring routine and sustainable access to telemedicine remains a challenge. To address this, the WHO released a Consolidated Telemedicine Implementation Guide in 2022 to aid policymakers and implementers in designing effective telemedicine systems [25]. This work will explore key functional requirements and considerations from "Step 05" of the guide, detailing what the technology must achieve to meet health objectives. Relevant guiding questions will be integrated throughout this chapter.

Technology readiness level

Tailoring telehealth systems to the available technology infrastructure and patient needs is crucial, especially in developing regions where not all components may be affordable or accessible [26]. China, with 39% of its population in rural areas, has advanced telehealth through "Internet + health" initiatives, a national telehealth network, integration with national health insurance, and extensive 5 G networks [27]. A systematic review by Ye et al. [28] offers practical guidelines for developing countries, illustrating adaptable telehealth frameworks. At the basic level, cellphones without internet connectivity can provide health information via text messages. With internet access, computers, and smartphones, remote consultations become possible for symptom reporting and treatment advice. Advanced infrastructure incorporating audio, video, and stable internet enhances diagnostic accuracy in specialities like dermatology. High-level infrastructure with wearables and cloud-based storage supports continuous health monitoring and real-time data synchronisation, enabling sophisticated treatments like remote surgeries and deep brain stimulation.

Infrastructure layout

To ensure uninterrupted telemedicine services, reliable power supply infrastructure is essential, including grid power for primary electricity and renewable energy options like solar panels, wind turbines, and mechanical energy harvesting for areas without grid access. Backup systems such as uninterruptible power supplies (UPS), generators, and battery energy storage systems (BESS) should be deployed to maintain power during outages,

ensuring continuous operation of telemonitoring devices and communication networks. Connectivity should support both asynchronous (store and forward) and synchronous (real-time) communication. Traditional telephone lines can serve as backups, while mobile networks and strategically placed telecommunication towers extend coverage. Satellite internet provides reliable high-speed connectivity in areas with limited terrestrial infrastructure, and fibre optic cables offer high-speed internet to larger towns and nearby communities. Robust data management and security measures are vital, including hardcopy printed records, local on-site data storage, and cloud servers for electronic health records (EHR). Additionally, blockchain technology can enhance data sharing, privacy, and interoperability in telemedicine systems [29].

Hardware layout

A home-based telemedicine system integrates devices like telephones, mobile phones, smartphones, tablets, laptops, and PCs for communication and consultation. Home diagnostics, such as the Home Smart Clinic by Tytocare, enable remote physical exams and high-quality medical data transmission to healthcare providers. Wearable technology monitors vital signs, offering continuous health data for proactive patient monitoring. In rural clinics, essential equipment includes digital questionnaires, teleconsultation devices, and digital diagnostic tools like blood pressure monitors and ECGs. Imaging devices like ultrasound machines and small MRIs support remote diagnostics. Patient education is enhanced through kiosks and multimedia projectors, while AR and VR technologies provide advanced medical training. Robotics and high-speed internet facilitate telesurgery, enabling remote procedures. Mobile health units and drones expand healthcare access by delivering medical supplies and supporting telemedicine in isolated areas, reducing hospital costs and ensuring continuous patient monitoring. Future drone technology improvements will enhance healthcare delivery by increasing payload capacities and integrating with emergency response systems [30].

Software layout

Creating a telemedicine platform for rural areas involves integrating several key software components to ensure accessibility, reliability, and effectiveness. For patients, the platform should include a user-friendly portal for booking appointments, accessing medical records, and communicating with healthcare providers, along with a responsive mobile app for smartphone and tablet access. High-quality, low-bandwidth video conferencing, secure instant messaging, and real-time language translation services are essential for virtual consultations. The platform should incorporate a robust Electronic Health Records (EHR) system, online booking, automated appointment reminders, queue management tools, and integration with wearable devices and home monitoring equipment for remote health data collection. Secure sharing of diagnostic images, electronic prescription systems, and medication tracking tools streamline remote consultations and treatment management. For healthcare providers, the platform must include a comprehensive doctor portal for managing appointments, reviewing patient records, and conducting virtual consultations. Key features include high-quality, low-bandwidth video conferencing, secure instant messaging, and access to a robust EHR system with interoperability features. Bandwidth optimisation technologies, offline capabilities, and cloud hosting ensure reliable performance, while technical support and training programmes enhance usability. Decision support tools and AI capabilities assist with diagnostic and treatment decisions, predictive analytics, patient triage, and routine task automation, adhering to trustworthy AI principles. Security and compliance are critical, requiring end-to-end data encryption, multi-factor authentication, role-based access control, and adherence to regulations like HIPAA and GDPR. The concept of digital twin for health (DT4H), defined by Katsoulakis et al. [31], represents a virtual model of a person for dynamic simulation of treatment strategies, health monitoring, and early intervention, integrating multi-scale data and offering personalised healthcare, predictive interventions, and remote monitoring while presenting challenges in technology, ethics, societal impact, and legal guidance.

Telehealth services

Meeting the standard of care for circumpolar Indigenous communities through telehealth services involves addressing unique challenges and requirements specific to these remote and often underserved populations. The key components of telehealth services needed included in the following chapters.

Maternal services

The COVID-19 pandemic accelerated the adoption of telehealth in prenatal and postnatal care, with a 2023 systematic review of 23 studies finding high satisfaction among pregnant women and healthcare professionals, who favoured a hybrid model for reduced travel and wait times [32]. Marshall et al. [33] reported that over half of 1,978 surveyed women used telehealth during

the pandemic, with 80% rating it as high-quality and a third open to future telehealth visits. Another review (2022) found telehealth for low-risk pregnancies resulted in similar outcomes to in-person care and was particularly effective for postpartum depression, gestational diabetes, and hypertension [34]. A 2023 narrative review confirmed telehealth's acceptability and cost-effectiveness, without increasing adverse outcomes for mothers or babies [35]. A global scoping review highlighted mHealth and telehealth's role in supporting pregnancy care during emergencies, with mobile apps and SMS being key technologies [36].

For mental health services, telemental health has proven effective in managing disorders like insomnia, depression, and schizophrenia in rural populations, reducing relapse and rehospitalization rates [37]. A 2023 UK survey found that while telehealth improved access and attendance, it posed challenges for older adults and those with disabilities [38]. Despite these issues, 86% of mental health professionals favoured telehealth for psychological therapies. Telepsychiatry can provide remote assessments, counselling, and crisis intervention, and AI-equipped telepsychiatry can address psychiatrist shortages and the urban-rural service gap [39]. AI-powered mental health apps, like Woebot, significantly improve substance use, cravings, depression, and anxiety, offering 24/7 support and reducing the need for in-person appointments [40]. Online counselling platforms and mental health apps provide accessible support for a range of conditions, enhancing mental health care in rural and underserved areas.

Primary care and pediatric services

Telehealth in primary care and paediatric services offers essential healthcare solutions, particularly in rural areas. A scoping review [41] highlighted numerous advantages of telehealth in primary care, including promoting self-care, reducing patient visits and costs, improving access, saving time, increasing appointment attendance, enhancing clinical outcomes, and improving screening rates. These benefits were especially significant in rural and underserved areas, utilising technologies such as televisions, telephones, glucometers, cameras, mobile phones, spirometers, pulse oximeters, heart rate monitors, computers, digital otoscopes, and telephonic stethoscopes. Another review [42] evaluated telemedicine technologies optimised during the COVID-19 pandemic, noting the importance of teleconsultations for patient education, emotional support, and managing primary health care, with AI playing a crucial role in diagnosing and classifying COVID-19 cases. Machine learning, particularly using biomarkers for tuberculosis diagnosis, proved beneficial in both high and low burden settings [43]. Remote patient monitoring with biosensors and wearable devices reduced hospital visits and improved diagnoses.

In paediatric care, telemedicine addresses challenges in rural communities by offering direct care, medical education, and speciality consultations without burdening families, thus reducing under-5 mortality through neonatal care, infectious disease treatment, and NCD management. A narrative review [44] found telemedicine provides universal coverage for children at a lower cost in low-middle income countries (LMICs), despite challenges, using simple technology, low-bandwidth internet, smartphones, instant messaging, and solar energy. A 2022 systematic review of RCTs [45] evaluated telemedicine's feasibility, accessibility, satisfaction, and treatment outcomes for paediatric conditions like obesity, asthma, mental health, otitis media, skin conditions, type 1 diabetes, ADHD, and cystic fibrosis, finding outcomes comparable or better than traditional methods, improving symptom management, quality of life, satisfaction, medication adherence, visit completion rates, and disease progression. Future research should focus on enhancing access, cost-effectiveness, and eliminating barriers to maximise telemedicine's potential in both primary care and paediatric services.

Chronic diseases management

Managing chronic diseases such as diabetes, hypertension, and chronic obstructive pulmonary disease (COPD) through telehealth involves continuous monitoring and regular follow-ups. Telehealth facilitates regular check-ins and remote monitoring, transmitting vital signs and health data to healthcare providers for timely interventions. A 2022 study [46] showed that telemedicine significantly improves chronic disease management, particularly through teleconsultation and telemonitoring. For example, it improves systolic blood pressure in hypertensive patients and enhances medication adherence in rheumatoid arthritis patients. AI's role in telecardiology is expanding, with algorithms analysing ECGs [47] and cardiac imaging tests [48], aiding in early diagnosis and treatment of heart disease. AI also enhances remote monitoring through wearable devices, providing real-time analysis of health parameters like heart rate, blood pressure, and glucose levels [49]. In Saudi Arabia, the Sehaa tool uses big data analytics to detect diseases such as heart disease and diabetes using Twitter data [50,51]. Tele-oncology, the remote delivery of cancer care, improves access to cancer treatment and screenings, particularly in remote

and low-income areas. Programmes like those in Arizona use tele-oncology for cancer screenings, with specialists providing remote analysis and treatment plans. AI enhances tele-oncology by analysing large datasets for more accurate diagnoses and personalised treatment recommendations [99]. However, ethical considerations must ensure patient safety, privacy, and informed consent, supporting rather than replacing human clinicians. Together, telehealth and AI improve chronic disease management, cancer care, and overall health outcomes.

Women's health

Women over the age of 40 and those who have the BCRA-1, BCRA-2 and need to have mammography every year and those with suspected lesions must do it weekly. Needless to mention that each trip to a clinical centre with mammographs is difficult and mostly impossible in the arctic harsh conditions. Our lab developed a device with a thermal camera and dedicated software installed on a cellphone for breast imaging. The method was first developed to predict treatment efficacy [52]. Currently it is further developed for self-screening. The device captures the ground situation when Mammography is done at the clinical centre. Then the woman takes the device with her back to her town. She does the self-screening. The software installed in the cellphone, is analysing the data and compares it to the previous measurements. The data is then transferred to the clinical centre for further evaluation. If there is an anomaly, then she needs to travel to that centre for further consultation and treatment as needed. This technology was introduced in NUNAMED – Movement in Health, Nuuk, Greenland, October 5–7, 2019. Additional technologies by Gannot and colleagues were presented in a special technology session in NUNAMED 2022 – a conference on medicine and health in Greenland – which took place in September 30 – 2 October 2022, in Nuuk, Greenland, as well.

Emergency, acute care and rehabilitation services

Telehealth plays a crucial role in emergency and acute care by enabling remote medical professionals to guide first responders and caregivers in providing initial care. Tele-triage services assess the severity of emergencies, prioritise cases, and offer real-time advice, enhancing emergency care delivery, reducing response times, and potentially saving lives [53]. In rural and prehospital settings, telehealth has improved patient outcomes, care quality, and safety, despite limited reports of actual patient outcomes [54]. In the circumpolar region, drones can offer a cost-effective alternative for mapping infectious disease landscapes, conducting search and rescue missions, and delivering medical supplies to remote areas, although challenges like limited payload capacity and security concerns must be addressed [55]

Telerehabilitation delivers virtual rehabilitation services to patients at home, overcoming geographic, physical, and cognitive barriers. Technological advancements allow healthcare providers to monitor, educate, treat, and support patients remotely [56]. A 2023 study [57] found high satisfaction among patients with musculoskeletal conditions, chronic pain, neurological conditions, and Parkinson's, who appreciated the ease of use, effectiveness, and safety of telehealth, as well as reduced financial and travel burdens. The multidisciplinary approach of integrated telehealth models in rehabilitation was well-received, supporting telemedicine as an effective model in physical medicine and rehabilitation clinics.

Discussion

The delivery of healthcare in the Arctic presents a complex interplay of challenges unique to its environment, population, and infrastructure. These challenges include severe geographical remoteness, climatic extremes, limited healthcare facilities, and pronounced health disparities among Indigenous populations. The reviewed literature provides a comprehensive understanding of these multifaceted issues, highlighting several key themes: healthcare disparities, climate change impacts, barriers to healthcare access, and potential telehealth solutions.

Indigenous populations in the Arctic region experience disproportionately poor health outcomes compared to non-Indigenous groups. These disparities are evident in higher rates of chronic diseases, infectious diseases, mental health issues, and lower life expectancy. The socio-economic determinants, such as lower income, higher unemployment, and limited access to quality healthcare, further exacerbate these health issues. The reliance on traditional knowledge and practices for healthcare among Indigenous communities underscores the necessity for culturally sensitive healthcare approaches that respect and integrate these practices with Western medical systems.

Climate change poses a significant and growing threat to health in the Arctic. The region's rapid warming affects the prevalence and distribution of infectious diseases, particularly vector-borne, food-borne, and water-borne illnesses. For example, the increase in tick-borne diseases in the Arkhangelsk region correlates

with rising temperatures. Additionally, the mental health of Arctic residents is impacted by the changing environment, with increased stress and anxiety related to the unpredictability of weather patterns and the effects on traditional ways of life. Public health infrastructure in the Arctic must be robust and adaptive to address these evolving health challenges effectively.

Healthcare access in the Arctic is hindered by multiple barriers, including physical geography, provider-related challenges, cultural and language differences, and systemic issues. The vast distances and harsh weather conditions make travel for healthcare both difficult and costly. High turnover rates among healthcare providers, combined with insufficient training and resources, lead to burnout and reduced quality of care. Cultural and language barriers between non-Indigenous healthcare providers and Indigenous patients create mistrust and dissatisfaction with the healthcare system. Systemic issues, such as inadequate funding and fragmented health services, further impede access to consistent and high-quality healthcare.

Telehealth emerges as a promising solution to address the healthcare challenges in the Arctic. The proposed solution encompasses three key components: a patient-centred approach, a comprehensive telemedicine system, and tailored telehealth services.

A patient-centred approach via telemedicine empowers Arctic residents to actively participate in their healthcare decisions. This involves providing access to health records, educational resources, and opportunities for shared decision-making. Telehealth platforms can offer educational resources, webinars, and virtual sessions, enabling patients to understand their medical diagnoses, treatment options, preventive measures, and self-management strategies. Culturally sensitive services, including the use of Indigenous languages and integration of traditional practices, are crucial for gaining trust and ensuring effective healthcare delivery.

A robust telemedicine system tailored to the Arctic's unique needs includes reliable power supply infrastructure, internet connectivity, and secure data management. The system must support both asynchronous and synchronous communication, utilising technologies such as mobile networks, satellite internet, and fibre optic cables. Hardware components like smartphones, tablets, home diagnostics, and wearable technology facilitate remote consultations and continuous health monitoring. Ensuring data security and privacy through encryption, multi-factor authentication, and adherence to regulations is essential for patient trust and system reliability.

Telehealth services should be designed to meet the specific needs of Arctic populations and have potential to cover the standard of care as we know it, including primary care, paediatric care, maternal care, mental health services, paediatric services, chronic disease management, and emergency care. For instance, telehealth can support prenatal and postnatal care, mental health counselling, remote monitoring of chronic conditions, and emergency tele-triage. These services must be adaptable to the social and cultural contexts of Indigenous communities, emphasising community engagement, convenience, and the inclusion of traditional healing practices.

Conclusion

Improving healthcare delivery in the Arctic requires a multifaceted approach that addresses the unique challenges posed by the region's geography, climate, and population. The integration of telehealth, combined with culturally sensitive and patient-centred approaches, holds significant promise for enhancing healthcare access and quality. Policymakers and healthcare providers must work collaboratively with Indigenous communities to develop and implement healthcare solutions that respect traditional practices and leverage modern technologies. By adopting a holistic and adaptive approach, it is possible to mitigate the health disparities and climate change impacts in the Arctic, ensuring better health outcomes for all its residents.

Disclosure statement

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