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Review

Barriers to Accessing Vascular Surgery in Northern, Rural, and Remote Canadian Communities

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ABSTRACT

Access to vascular surgery care for diabetes-related foot complications (DRFC) and peripheral arterial disease (PAD) remains limited in rural and remote Canadian communities. This narrative review, conducted through a comprehensive search of PubMed using keywords such as "Health Services Accessibility," "Peripheral Arterial Disease," and "Canada," from inception to March 30, 2025, identified 20 eligible studies from 242 screened. Eligible studies examined barriers to accessing to vascular care for DRFC or PAD in rural/remote regions of Canada. Data were extracted and synthesized using the Socio-Ecological Model of Health and structured into individual, institutional, and systemic level barriers. At the individual level, barriers identified include geography, income, cultural norms and health literacy. Institutional barriers include timely referral, access to specialized care, lack of foot care services and transport. Systemic barriers included inadequate funding of rural health services and the health care system's limitations in addressing the cultural context of remote communities. Indigenous populations, in particular, experienced higher rates of lower limb amputations, presented with more advanced PAD, and up to 15% higher post-amputation mortality.

RÉSUMÉ

L'accès aux soins de chirurgie vasculaire pour les complications du pied diabétique (CPD) et les maladies artérielles périphériques (MAP) reste limité dans les communautés rurales et éloignées, au Canada. Cette revue narrative, réalisée à partir d'une recherche exhaustive dans PubMed à l'aide de mots clés tels que « Accessibilité aux services de santé », « Maladie artérielle périphérique » et « Canada », depuis la création de la base de données jusqu'au 30 mars 2025, a permis d'identifier 20 études éligibles parmi les 242 criblées. Les études admissibles ont examiné les obstacles à l'accès aux soins vasculaires pour les CPD ou les MAP dans les régions rurales/éloignées au Canada. Les données ont été extraites et synthétisées à l'aide du Modèle socio-écologique de la santé, et structurées selon les obstacles individuels, institutionnels et systémiques.

Au niveau individuel, les obstacles identifiés comprennent la géographie, le revenu, les normes culturelles et la littératie en santé. Les obstacles institutionnels incluent l'orientation rapide vers un spécialiste, l'accès à des soins spécialisés, le manque de services de soins des pieds et le transport. Les obstacles systémiques comprenaient le financement insuffisant des services de santé en milieu rural

Introduction

Canada's large geographic area creates unique challenges for health care delivery. In 2021, the Canadian census reported 6.6 million people living rurally, as compared with > 30 million residents living in urban areas.[1] In Canada, rurality is defined as areas outside population centers, which comprise of minimum 1000 individuals and 400 people per square kilometer,[2,3] whereas remoteness is defined as low population, usually reachable using transportation.[4] Although most rural residents are non-Indigenous, the Indigenous populations are disproportionately represented in these settings. A 2020 report from the **O**rganization for **E**conomic **C**o-Operation and

Keywords: peripheral arterial disease; amputation; health services; vascular disease; vulnerability

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Proposed solutions emphasized expanding preventative care, improving access to specialists, creating culturally sensitive vascular health teams and consulting with at-risk communities on developing locally led solutions. Overall, individuals living in rural and remote Canadian communities, particularly Indigenous populations, face significant barriers accessing timely and appropriate vascular surgery care for PAD and diabetic foot complications. Addressing these disparities required a multi-faceted culturally informed approach across individual, institutional and systemic levels.

et les limites du système de santé à prendre en compte le contexte culturel des communautés éloignées. Les populations autochtones, en particulier, présentaient des taux plus élevés d'amputations des membres inférieurs, des cas de MAP plus avancés et une mortalité post-amputation jusqu'à 15 % plus élevée. Les solutions proposées mettaient l'accent sur l'élargissement des soins préventifs, l'amélioration de l'accès aux spécialistes, la création d'équipes de santé vasculaire sensibles à la culture et la consultation des communautés à risque pour élaborer des solutions locales. Dans l'ensemble, les personnes vivant dans les communautés rurales et isolées du Canada, en particulier les populations autochtones, sont confrontées à des obstacles importants pour accéder à des soins chirurgicaux vasculaires appropriés et en temps opportun pour traiter une MAP et les complications du pied diabétique. La réduction de ces disparités exige une approche multiforme tenant compte des spécificités culturelles aux niveaux individuel, institutionnel et systémique.

Development (OECD) indicated that 60% of Indigenous peoples live in rural areas, which is 33% more than the non-Indigenous populations.[5] Therefore, the geographic distribution of the Canadian population is not only a unique demographic pattern but has serious implications for health access and outcomes.

Geography is recognized as both a social and structural determinant of health, with cardiovascular disease (CVD) event rates nearly doubling in northern Ontario's rural regions compared with their urban counterparts.[6] Social determinants of health relate to individuals' environment, whereas structural determinants of health are broader systemic contributors to health.[7] This disparity is multifactorial and in part driven by limited access to a number of health services in remote regions, contributing to poorer clinical outcomes.[8] Remote regions are particularly vulnerable due to limited access to health promotion services, preventive care services, and specialized health services, and the presence of "food deserts," where access to nutritious, affordable food is limited.[9-12] In fact, multiple remote Indigenous communities do not have fundamental necessities, such as water security.[13] These inequities are particularly evident when pertaining to chronic health conditions such as diabetes and its related complications, including chronic wounds and peripheral arterial disease (PAD).[14] On a global level, similar disparities have been observed in low-, middle-, and high-income countries.[15] Furthermore, in medicine, PAD is often viewed as a neglected or ill-defined vascular disease, ultimately leading to reduced perceived importance.[16] This perception is reflected in recent Canadian data. A 2024 study conducted in Nova Scotia showed the prevalence of PAD among the general population to be 2-fold greater than the national average.[17] Furthermore, a 2023 study validating case definitions for vascular disease showed that the case definition for peripheral vascular disease had 36.6% sensitivity, despite having 99% specificity in primary care practice, reflecting an underrecognition.[18]

PAD reflects a systemic state of inflammation leading to atherosclerosis impairing blood flow to the lower limbs and lies on a spectrum from discomfort in the legs while walking, known as claudication, to acute or chronic limb-threatening ischemia. The presence of lower extremity PAD is also associated with high rates of major adverse cardiovascular events, including death.[19,20] Among individuals with diabetes, PAD often plays a central role in the development of diabetes-related foot complications (DRFCs), which include infections, ulcerations, and gangrene.[21] These complications often require surgical intervention and are the leading cause of nontraumatic foot and limb amputations.[22] Importantly, most amputations resulting from diabetes with underlying PAD are preventable with timely and adequate care.[23] Nonetheless, amputation rates among individuals with diabetes and/or PAD have increased substantially over the past 2 decades, highlighting deficiencies in prevention and management.[24] Timely and appropriate access to health care specialists, such as foot- and wound-care specialists, and vascular surgery are associated with less severe presentation and faster healing, whereas delayed consultations lead to faster progression to amputation and unfavorable outcomes.[25-27] However, access to these services is not equally distributed across Canada, particularly in rural and remote areas. Individuals from these regions often present late and with more severe DRFCs, resulting in poorer outcomes.[26,28-31] Although the clinical efficacy of timely vascular care for individuals with PAD and DRFCs is well documented,[32,33] the specific challenges of accessing such care in Canada remains insufficiently explored. This gap in the literature is of particularly concern given the high rates of DRFC- and PAD-related complications, which are largely preventable. Despite extensive documentation of health inequities among rural and Indigenous populations, limited data exist on barriers to surgical care, particularly vascular surgery, in these contexts.

In this review we aim to elucidate the barriers to vascular surgical access for DRFCs and PAD in rural and remote areas of Canada. By mapping barriers across the individual, institution, and system levels at a nationwide level, our synthesis highlights barriers that are likely to be present across multiple communities. This will establish an evidence-informed foundation from which communities, researchers, and policymakers can assess the relevance of these barriers within their local context and adapt interventions to improve vascular surgical care.

Methods

This narrative literature review was conducted from inception to March 30, 2025, examining access to vascular

surgery care for DRFCs and PAD in rural and remote regions of Canada. We used the **S**cale for the **A**ssessment of **N**arrative **R**eview **A**rticles (SANRA) for our review.[34] The PubMed database was searched using keywords such as "health services accessibility," "peripheral arterial disease," and "Canada" (Supplemental Appendix S1). No restrictions on language, date, or study design were applied. Studies were excluded if they did not focus on individuals living in rural or remote regions of Canada or if they did not examine DRFCs or PAD. Articles were retrieved and screened by title and abstract by 1 reviewer (B.L.). The reference lists of all articles were manually reviewed by B.L. to identify additional relevant studies. Articles that met the inclusion criteria had data collected and analyzed descriptively by 2 reviewers (B.L. and K.E.). Data were extracted from each article using the following predetermined questions: "What arguments did the text make?" "What were the results?" "How is this article related to our paper?" and "Apply this to the socioecological framework (individual, interpersonal, institutional, community, public policy)." Subsequently, 3 authors (B.L., K.E., and L.D.) analyzed the extracted data and developed thematic codes. Data synthesis was initially guided and organized by the Social Ecological Framework, focusing on individual, interpersonal, institutional, community, and public policy levels.[35] This framework was designed to evaluate how health behaviors are influenced at different, but interconnected levels of health systems.[36] By evaluating health behaviors from an upstream to downstream lens, this model highlights the advantages of using multitiered policy interventions to create the greatest overall population change.[37]

In what follows, Indigenous is used to define First Nations, Métis, and Inuit collectively, whereas First Nations refers to individuals who have the title of "Indian status" in Canada, which refers to the legal recognition of First Nations peoples under the Indian Act. Inuit refers to communities living in the Canadian arctic regions, who are distinct from other Indigenous groups.[38]

Results

A total of 242 articles were identified through the initial database search and underwent title and abstract screening. Of these, 20 articles met the inclusion criteria. Fifteen of the 20 studies were original scientific articles. Within this group, 11 focused primarily on rural Indigenous communities,[25,28,39-47] whereas 4 examined all individuals residing in rural areas, including both Indigenous and non-Indigenous populations.[26,29,48,49] The remaining 5 studies included 1 narrative review,[50] 1 systematic review,[31] and 3 commentaries[23,30,51] (Fig. 1). This classification highlights the predominance of primary research specifically focused on rural Indigenous communities, with minimal studies focused on the broader rural populations (Table 1).

Initial data synthesis was mapped using the Social Ecological Model (Fig. 2), which was further categorized into 3 domains: 1) individual-level barriers; 2) institutional-level barriers; and 3) systemic-level barriers. At the individual level, barriers included smoking, low mobility, inadequate footwear, and poor foot care; comorbidities such as diabetes, hypertension, and renal disease; as well as language and cultural barriers, low health literacy, financial constraints, and delayed presentation or diagnosis. At the institutional level, key barriers included limited access to specialized care and rehabilitation centers, absence of standardized clinical pathways for vascular care, unclear referral systems, inconsistent screening practices, and lack of multidisciplinary foot care clinics. System-level barriers included limited access to tertiary centers offering advanced vascular services, poor infrastructure limiting postamputation mobility, lack of national diabetic foot and amputation-prevention pathways, unstable program funding, legacy of colonialism, systemic racism, and intergenerational trauma (Fig. 3).

Discussion

People living in northern, rural, and remote communities of Canada face a disproportionately high burden of DRFCs and lower extremity amputations.[28,39,48] These disparities are linked to barriers at the individual, institutional, and systemic levels.

Poorer outcomes in vascular care stem from a multitude of challenges, including limited health literacy, geographic isolation, inconsistent access to specialized care, and ongoing systemic inequities. Cardiovascular risk factors have been shown to be more prevalent in communities with limited access to health care services.[52] These disparities are further consolidated by research gaps, particularly among Indigenous communities, which have historically been excluded from ethical, community-led research. Past research conducted on Indigenous communities often lacked their involvement, leading to mistrust in clinical researchers and limited relevance.[53] In addition, despite representing a large population living in northern Canada, the Inuit have been involved and included in very limited surgical research, resulting in substantial knowledge gaps within this population.[54] Today, Indigenous communities and external researchers must collaborate to ensure that research addresses community priorities that data ownership remains with the community, and that studies are culturally sensitive, Indigenous informed, and respectful of confidentiality and self-determination. In what follows, we examine the individual, institutional, and systemic barriers affecting peripheral vascular care in remote Canadian communities, before considering potential solutions.

Individual barriers

At the micro level, a multitude of individual-level barriers contribute to the high rates of DRFC and lower extremity amputations among residents of remote communities. Cultural norms and language differences can impede communication between patients and providers, leading to inadequate foot care and footwear.[55] The lack of culturally appropriate diabetes prevention and treatment programs, especially in rural and remote Indigenous communities, further exacerbates these issues. For example, Indigenous communities are often dispersed across vast territories, making the delivery of culturally appropriate diabetes prevention, treatment, and education difficult.[46] Health literacy also contributes greatly to disparities because it can hinder prevention and early intervention of complications related to PAD and DRFCs.[25,43,44,50]

Many individuals living in rural areas also face significant self-care limitations stemming from financial constraints.

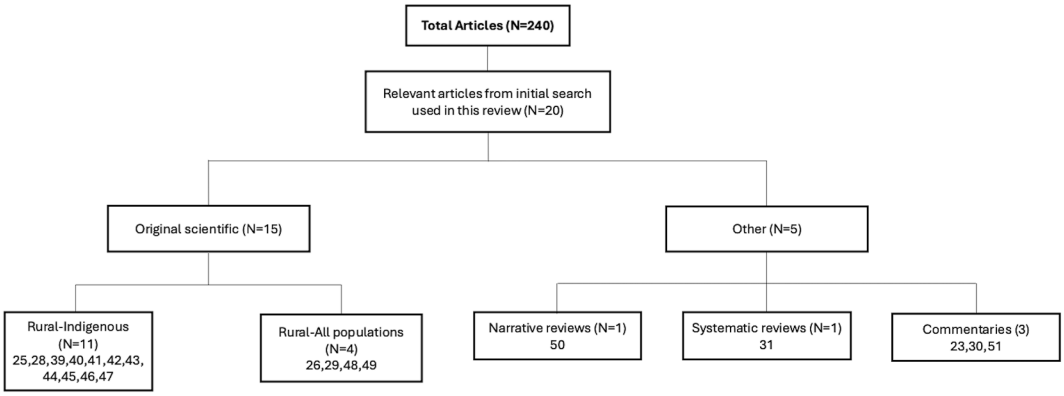

Figure 1. Classification of included studies by article type and population focus.

These barriers limit their ability to ensure adequate foot care, travel to health care appointments, and to maintain a healthy diet.[25,31] This problem is further exacerbated in Indigenous communities where populations were forced onto reserves and lost their hunter-gatherer lifestyles.[56] In fact, socioeconomic status is a known determinant of lower extremity amputation rates, with lower income individuals experiencing higher amputations rates.[48] Transportation costs to urban centers have been particularly cited as a major barrier, limiting access to necessary care for rural populations.[25,42] Even within existing programs, such as the Centralized Specialty Clinic Model in Manitoba, the high cost of transport from rural areas continues to be a significant barrier to access to care.[25]

In addition, higher rates of smoking, poor nutrition, suboptimal glycemic control, obesity, diabetes, and hypertension among certain northern communities contribute to increased complication rates and this is in part due to limited access to care.[28,45,50] Late presentation is another challenge, with remote populations frequently presenting with more advanced diabetic foot ulcers and delayed diagnosis of PAD, leading to more urgent interventions and quicker progression to amputation.[28,29,43,50] This may be linked to geographic barriers as patients from remote and rural communities often need to travel great distances to access specialized care, limiting continuity of care and delaying treatment.[43] Increased rurality is directly associated with higher amputation risk in both Indigenous and non-Indigenous populations and with earlier occurrence of major lower extremity amputation.[25,40] In Québec, midsized agglomerations (10,000-100,000 inhabitants), rural areas, and small towns (< 10,000 inhabitants) have higher rates of total and major lower extremity amputations compared with census metropolitan areas.[48]

Indigenous people are more likely to be diagnosed with diabetes at a younger age and undergo major amputations earlier, with higher rates of comorbidities, such as chronic renal disease and potential genetic predispositions, further compounding the individual risk to develop vascular complications.[28,31,42,50] In fact, several Indigenous populations have alleles conferring a higher risk of diabetes.[57] Individual experiences of illness are also shaped by broader systemic inequities. Indigenous identity, which is highly represented in rural and remote regions of Canada, introduces a particular level of vulnerability in the absence of culturally relevant interventions. Many of these barriers are particularly evident amongst Indigenous rural communities; however, non-Indigenous individuals living remotely also face significant barriers at the individual level. In remote communities, food deserts are prevalent[58] despite unhealthy eating habits being a known determinant of health.[58] Furthermore, many remote regions of Canada have populations that are poorer and older than their urban counterparts,[59] which can make accessing specialized care more difficult. Digital inequity also contributes, with only 62% of rurally located Canadians having efficient internet access at speeds of 50 megabytes per second, compared with 91.4% nationally.[60] This digital inequity limits access to telehealth services, developed during the COVID-19 pandemic, which have become increasingly important in the management of chronic disease. Furthermore, people living in rural and remote communities often face increased difficulties accessing the support they need with few informal and family caregivers available to help with managing their chronic disease.[61]

Institutional barriers

At the meso level, institutional barriers play a significant role in perpetuating the disparities in diabetic foot care and amputation prevention among remote-dwelling populations in Canada. One of the most significant barriers identified was access to specialized care. Geographic isolation is linked to worse vascular outcomes due to limited access to wound care, multidisciplinary foot clinics, vascular surgeons, home care, and rehabilitation services.[25,29,40,42] Specialized vascular imaging and surgical services are often concentrated in urban areas and academic centers, creating barriers for rural patients.[28] In addition, few rehabilitations services are available in remote regions such as northern Manitoba, limiting effective postoperative recovery.[42] Lower rates of specialist consults are also directly associated with higher amputation rates, further contributing to poor outcomes.[47] Rural, remote, and First Nations communities are more likely to have hospital and clinic teams providing basic foot care,

Table 1. Individual characteristics of included studies

Study	Design	Population	Setting	Sample size	Focus	Key findings
Loewen et al., 2017	Incidence study	Indigenous	Northwestern Ontario	NA	DRFC	High amputation rates in remote First Nations population; benefit of standardized ulcer protocol for vascular screening
Shah et al., 2019	Cohort study	Indigenous	Ontario (province-wide)	12,847 amputees	PAD	Higher amputation and postamputation mortality in First Nations; gaps in early PAD detection despite similar revascularization rates
de Mestral et al., 2020	Ecological study	Mixed	Ontario (14 regions)	11,658 amputees	PAD + DRFC	Higher amputation rates in rural/low-income regions; lower rates linked to access to vascular surgery and revascularization
Bonneau et al., 2018	Narrative review	Indigenous	Canada-wide	NA	PAD	Advanced PAD presentation and shorter time to amputation in Indigenous patients; lack of structured screening programs
Rose et al., 2008	Retrospective cohort	Mixed	Manitoba (tertiary clinic)	325 patients (101 Indigenous)	DRFC	Earlier major amputation in rural patients, regardless of ethnicity; outcomes linked to nonurban residence and late referrals
Martens et al., 2007	Ecological study	Indigenous focused, with some non-Indigenous	Manitoba (on-reserve First Nations across 9 tribal councils)	48,036 First Nations; 1,054,422 non−First Nations	DRFC	Amputation rates linked to specialist access, not geography; health care model more predictive than remoteness in First Nations communities
Meatherall et al., 2005	Descriptive study	Mixed	Manitoba and Northwestern Ontario (urban and rural)	44 patients (21 Indigenous, 23 non-Indigenous)	DRFC	Limited rehabilitation and infrastructure in rural Indigenous communities hinder postamputation outcomes; systemic barriers extend beyond surgery
Reid et al., 2006	Cross-sectional cohort study	Indigenous	Norway House, remote northern Manitoba	69 diabetic participants	PAD + DRFC	High burden of foot complications in remote Indigenous community; poor screening and limited access to preventive care services
Goulet et al., 2006	Retrospective cohort	Mixed	Manitoba (tertiary care center)	678 patients (84 Aboriginal, 594 non-Aboriginal)	PAD	Worse revascularization outcomes in Aboriginal patients linked to advanced PAD at presentation; geographic barriers to early care suspected but not assessed
Boyd, 2021	Commentary	Indigenous	Canada-wide	NA	PAD	Vascular care centralized in southern Canada; geographic isolation limits timely access for northern and Indigenous populations
Health Trends Alberta, 2015	Surveillance report	Mixed	Alberta (province-wide)	5176 lower leg amputations	DRFC	Amputation rates 3-fold higher in First Nations with diabetes; no significant difference by health zone geography
Hanley et al., 2005	Cross-sectional cohort	Indigenous	Sandy Lake, Ontario	189 participants	PAD + DRFC	High PAD risk factors and early neuropathy in remote Indigenous community; highlights need for preventive strategies
Drudi et al., 2024	Retrospective multiple cross-sectional study	Rural, nonspecified	Québec (province-wide)	10,275 amputees	PAD + DRFC	Higher LEA rates in rural and small-town Québec; rising minor amputation rates suggest gaps in early foot care access
Blanchette et al., 2023	Scoping review	Indigenous	Canada-wide	NA	DRFC	Indigenous populations in rural/remote areas face higher DRFC and LEA rates; PAD underdiagnosed, with access barriers to foot care and rehabilitation
Chan et al., 2020	Serial cross-sectional study	Mixed	Alberta (province-wide)	NA	DRFC	Rural/remote sites rely on hospital teams due to limited community-based foot care services

Continued

Table 1. Continued.

Study	Design	Population	Setting	Sample size	Focus	Key findings
Dannenbaum et al., 2008	Descriptive study	Indigenous	Eeyou Istchee, Québec (9 Cree communities)	1363 patients	DRFC	High diabetes and macrovascular disease burden in remote Cree communities; geographic isolation limits access to specialized care
Manji et al., 2025	Retrospective cohort study	Mixed	Alberta, Canada (Calgary vs Edmonton and surrounding zones)	NA	DRFC	Specialized limb preservation program reduced hospitalizations and LOS for foot complications; regions without access showed worse outcomes, underscoring care gaps outside major centers
Hussain et al., 2019	Commentary	Mixed	Ontario (14 LHINs)	NA	PAD + DRFC	Sparse population regions had highest amputation rates; calls for integrated, local foot care pathways to address geographic barriers
Chan et al., 2021	Retrospective descriptive study	Indigenous	30 remote First Nations communities, Sioux Lookout region, Ontario	2395 diabetic patients	DRFC	High diabetes complication burden in remote First Nations communities; highlights challenges in tracking outcomes due to small population sizes
Attawar, 2007	Qualitative case study (master's thesis)	Indigenous	One southern Manitoba First Nations community	NA	DRFC	Extremely high diabetes and amputation rates in remote Manitoba First Nations; poor outcomes linked to lack of referrals, service gaps, and systemic care coordination issues

DRFC, diabetes-related foot complication; LEA, lower extremity amputation; LHIN, local health integration networks; LOS, length of stay; NA, not available; PAD, peripheral arterial disease.

suggesting a lack of services such as podiatry in their regions.[26] Another key barrier is the lack of an integrated and standardized clinical system for vascular care. Contrary to other specialized care pathways, Ontario does not have an integrated network to prevent amputation.[29] Programs such as the Sioux Lookout Diabetic Foot Ulcer Protocol have attempted to introduce standardized vascular assessment plans, yet similar initiatives have not been widely adopted across remote regions of Canada.[28] Calls have been made for integrating foot care and amputation-prevention pathways across Canada, citing our fragmented system.[23] Canada's current model relies on patients traveling long distances to vascular centers of excellence without clear referral pathways, leading to higher amputation rates amongst those in sparsely populated areas.[23] Moreover, inconsistent and insufficient DRFC screening practices in rural areas contribute to advanced complication rates.[62] In one northern community in Manitoba, it was reported that there was less than 1 screening foot examination per individual with diabetes per year over the 7-year period of study.[43] Similarly, in northwestern Ontario, variability in both treatment and diagnostic approaches for diabetic foot ulcers were found due to limited resources and standardized guidelines.[28] Coordination of care, specifically poor communication and role clarity, undermine these communities as well. In some villages, family medicine doctors were not aware that a foot nurse was working in the community, highlighting significant communication gaps and unclear roles among health care providers.[47] In addition, the lack of multidisciplinary foot care clinics and input further complicates appropriate diabetic foot care both acutely and long term.[23,43] Funding challenges compound these issues. In fact, in northern Manitoba, a diabetic foot screening program specifically designed for remote communities was terminated due to resource limitations.[43]

Finally, institutional practices in many regions appear to prioritize acute over preventive care. Increased rurality has been shown to correlate with higher amputation risk, suggesting institutional failures in early detection and management of PAD and diabetic foot disease.[40] Even seemingly minor issues, such as access to proper footwear, can worsen outcomes in these patients.[25,43] Together these institutional barriers highlight the urgent need for coordinated, structured, and institutionally validated pathways to approach diabetic foot care and amputation prevention in remote Canadian communities.

Systemic barriers

At the macro level, systemic factors shape the disparities seen in diabetic foot care and PAD management across Canada, especially among rural communities. Infrastructure barriers remain a system-wide challenge across the country, especially accessing large tertiary and academic centers, which typically have specialized vascular care,.[30,43] Further infrastructural challenges include the many unpaved roads in isolated communities, which limits postamputation mobility and affects prosthetic use, leading to poorer long-term outcomes after amputation.[42] The health care system's fragmentation further complicates this situation. There is currently no integrated pathway for diabetic foot care and

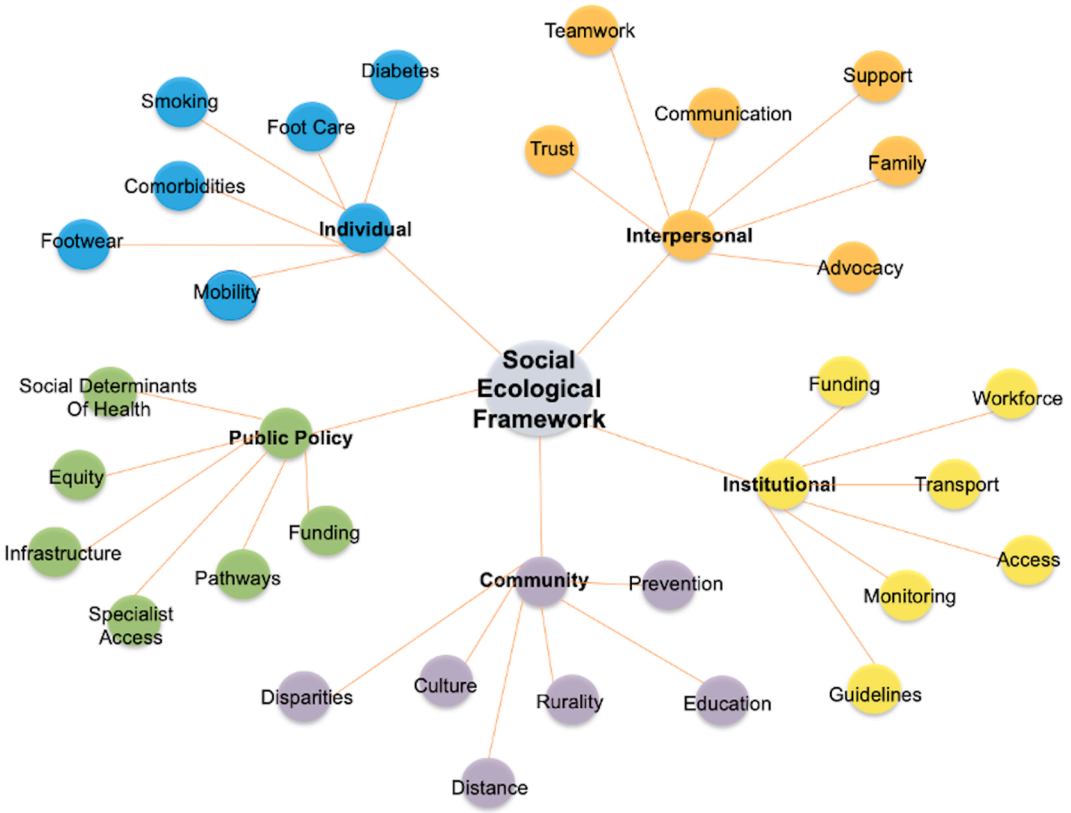

Figure 2. Barriers to accessing vascular surgery care for diabetes-related foot complications and peripheral arterial disease through the socioecological framework.

amputation prevention at the national or provincial levels, and referral networks are often unclear or nonexistent.[23] However, there are current projects aiming to address these issues and pathways are starting to emerge.[63,64] This disconnected system contributes to regional disparities and forces patients to navigate between provincial and federal jurisdictions. Federal health transfer policies, such as the **F**irst **N**ations and **I**nuit **H**ealth **B**ranch (FNIHB), have established differences in health care models between southern and northern First Nations communities in Manitoba, leading to inequities in diabetes care.[41] In addition, funding instability further hampers access to critical care for these populations,

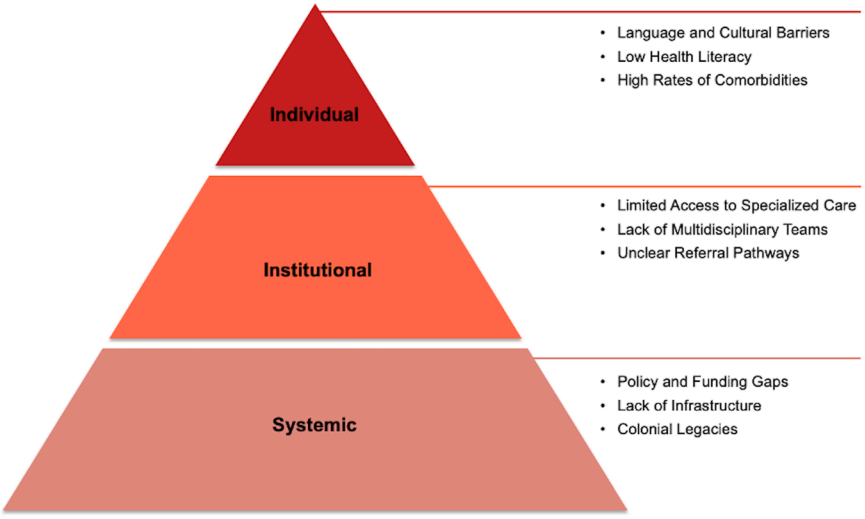

Figure 3. Barriers to accessing vascular surgery care for diabetes-related foot complications and peripheral arterial disease through a tiered framework.

limiting the health care network's ability to prevent unnecessary complications.[42,43] Social determinants of health also play a crucial systemic role.[65] Material and social deprivation at the neighborhood level is associated with reduced access to preventive vascular care, and lower income is linked to higher amputation rates and prevalence of diabetes.[29,41,48]

These systematic barriers are not unique to Indigenous populations and persist among all remote/rural communities, but additional factors must be addressed specifically to First Nations communities. Intergenerational trauma, systemic racism, and the legacy of colonialism further exacerbate health disparities.[31] Moreover, many health services in Indigenous communities are culturally unsafe, failing to acknowledge Indigenous values and experiences and deterring engagement with the health care system.[31,45,50] These disparities are evident in vascular statistics amongst Indigenous populations. A First Nations population in Ontario had 3- to 5-fold higher rates of lower extremity amputation compared with other Ontario residents.[40] The rates of lower extremity amputations in the Sioux Lookout region were 7-fold higher than the Ontario average at 1078 compared with 146 per 100,000 individuals.[28] Furthermore, in the same community, the 5-year incidence of major complications in people with diabetes was 16.8%.[39] Among Indigenous peoples, rural residence was found to be a major risk factor for complications in those with diabetic foot ulcers.[50] First Nations people were found to have a greater incidence of all major lower extremity complications, with rurality contributing to this finding.[55] In one Indigenous northern community in Manitoba, 82% of individuals with diabetes were found to have foot complications, with 41% being at risk of future ulceration.[43] Indigenous people were also found to have higher rates of comorbidities, including neuropathy, poor glycemic control, smoking, elevated low-density lipoprotein, and elevated triglycerides, all of which can all contribute to diabetic foot complications.[45] Further supporting this, it was found that 12.5% of a Cree population cohort with diabetes also had macrovascular disease.[46]

Ultimately, addressing these systemic issues requires a culturally safe, trauma-informed, equity-oriented approach that includes all stakeholders. In the Indigenous settings, the OCAP principles of **o**wnership, **c**ontrol, **a**ccess, and **p**ossession should be at the forefront of this reform,[66] as well as the Inuit and Métis principles. This approach must include policy reform, community-led research and health initiatives, input from local stakeholders, an improved rural health care infrastructure, and a specific approach to account for the unique situation of Indigenous populations.

Proposed solutions

Despite many challenges identified at all levels of health policy, several proposed solutions have been described in the literature. Implementing standardized diabetic foot ulcer management protocols, including risk stratification and timely vascular assessment, have been recommended as potential strategies to limit amputations in remote communities.[28] Interdisciplinary limb preservation programs, such as the Toe and Flow Model, have demonstrated reduced hospitalization risk by up to 30% as well as a 21% shorter length of hospital stay compared with standard care.[49] In addition, involving podiatrists in DFRCs has been associated with shorter healing times and improved healing rates.[67] The need to increase the number of preventive programs in rural settings that focus on foot care, footwear, and health literacy has also been identified as a major necessity.[23,25,55] A national call has been made for the development of an integrated foot care and amputation prevention pathway that would connect all levels of health care, including primary care, outpatient foot clinics, rehabilitation services, hospital services, and home care, with the goal of reducing the fragmentation we are witnessing in the current care model.[23] Telemedicine has been proposed as a method to bridge this gap. A nursing-based telemedicine wound care service was tested in northern Québec with participants reporting greater accessibility, shorter wait times, and better quality of care for their patients.[68] Furthermore, pre- and postoperative surgical telemedicine care is already being used in certain northern regions of Canada.[69] In Ontario, the government recently launched the **C**hronic **L**imb **T**hreatening **I**schemia (CLTI) pathway, which aims to provide coordinated care across the province and reduce regional variability in treatment.[70] Notably, the **C**anadian **S**ociety of **V**ascular **M**edicine (CSVM), in partnership with **C**anadian **S**ociety of **V**ascular **S**urgery (CSVS) and Diabetes Canada, is spearheading a PAD national action plan with an Indigenous-specific pathway to promote equitable vascular care across Canada that is culturally safe.

Increased screening in primary care and home care/long-term care through the establishment of a high-risk foot care team is another proposed solution geared toward early detection and intervention.[26] The implementation of a high-risk foot team and education services in Alberta significantly increased basic foot screening between 2014 and 2019, particularly in rural areas.[26] There is a significant need for better integration of rural and urban health services and access to specialists, which needs to be addressed at the policy level.[41]

Although these initiatives demonstrate measurable benefits in addressing the barriers rural Canadian communities face, no program to date has successfully addressed all 3 levels simultaneously. Most interventions target individual and institutional levels, with more recent interventions beginning to engage policy-level change. Given the complexity of these barriers, it is unlikely for any single intervention to address all 3 levels, rather improvement will require multiple coordinated interventions operating across all domains.

In addition to the solutions proposed by Canadian researchers, multiple global successes could be adopted or modified to meet the needs of Canada's specific context. A United Kingdom initiative, known as the "RAPID project," demonstrated technical feasibility of a technology-based clinical care pathway aimed at improving access to diabetic foot care in remote regions of Scotland.[71] Similarly, a telemedicine foot care service piloted in rural Australia with local health care professionals reported increased access to specialists, reduced travel time, and Indigenous patients having a higher sense of cultural safety.[72] In the United States, a pilot study evaluating a mobile application aimed at analyzing wounds and connecting patients with specialists showed promising results in patient satisfaction, subjective utility, and early change in wound care management.[73]

Solutions geared toward improving this population's health outcomes will also decrease the significant costs to the

public health system. Smolderen et al. demonstrated that, in Canada, the mean hospitalization cost per patient with PAD is $4677.[74] Similarly, Syed et al. reported that, in one cohort of diabetic foot ulcer patients, the mean acute care costs were as high as $71,757 per year.[75] To tackle these cost-related issues, programs such as cardiac rehabilitation, are shown to be cost-effective in PAD and decrease cardiovascular-related mortality, and should be explored in the rural context.[76] Simple strategies, such as drug choice, prescription patterns, and pharmacy fees, may have the potential to reduce annual drug costs by up to $1377, and implementation of these strategies should also be explored in the rural context.[77]

New research methods that are community-based, culturally sensitive, safe, and conducted by and with communities—rather than "of" communities—have also been successful, with high participant engagement, such as the 76% participation rate in the Sandy Lake study.[45] More specifically, evidence from surgery experiences of Indigenous people has demonstrated that trust, relationality, and clear communication are essential for acceptance of invasive medical procedures.[78,79] Studies have shown that a predominantly Western view of medicine, limited involvement of family and community members, and insufficient explanation of interventions can contribute to apprehension about surgery and decrease engagement from operative care.[78,79] These considerations are particularly important when developing culturally safe interventions in vascular surgery, where invasive treatments are common. At the community level, more research must be done to gather information on diabetes prevalence, which can be used to advocate for resource allocation and support community health models.[39] Moreover, investigations into the challenges of accessing PAD and diabetic foot care should be prioritized to inform future interventions and reduce higher rates of morbidity and mortality.[80] Together, these proposed solutions have the potential to create a new Canadian landscape where care for peripheral vascular disease and DRFCs is accessible, equitable, and meets the needs of urban, rural, Indigenous, and non-Indigenous populations in Canada and worldwide.

Strengths and limitations

This review has several limitations. First, there are very few data on PAD and DRFCs from rural and remote communities in Canada. Much of the available data focused on First Nations, which limits generalizability across other populations such as Inuit and non-Indigenous. Second, the variability in study design, outcomes, and inconsistent methods of data collection made it difficult to compare studies. Third, although many studies touched on social determinants of health and systemic issues, most did not specifically analyze these barriers, leading to potential gaps in knowledge. Furthermore, many studies included did not directly involve community-based members and, as such, the data should be interpreted with caution.

Nevertheless, to our knowledge this narrative review is the first to comprehensively evaluate the barriers to accessing vascular care for PAD and DFRC in rural and remote Canada. The inclusion of studies spanning individual-, institution-, and system-level factors allows for a comprehensive understanding of the multilevel determinants to accessing vascular care in rural Canada. Future research is needed to better identify health inequities in underrepresented communities such as the Inuit and non—First Nations populations, with their input. There is also a need for research that addresses higher level issues at the system level, including funding models and health care pathways.

Conclusions

Disparities in the prevention and management of DRFCs and PAD are a major challenge for Canadians living in rural and remote regions. These barriers are deeply rooted into our Canadian health care system and they are interconnected at individual, institutional, and systemic levels. Key factors contributing to these inequities include health literacy, socioeconomic factors, geographic isolation, limited access to specialized care, and legacy of colonialism. Despite these challenges, promising solutions have been proposed, including integrating health networks, community-led research initiatives, and multidisciplinary teams in local communities. However, targeted interventions alone will not be sufficient, with significant upstream policy reform needed. Future efforts should strive to ensure equitable access to limb-preserving care for all Canadians, regardless of where they live.

Patient Consent

The authors confirm that patient consent is not applicable to this article. This is a narrative review using publicly available information and no new patient information was collected.

Ethics Statement

Ethics approval was not required for this review article.

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Declaration of Generative AI and AI-assisted Technologies in the Writing Process

During the preparation of this work the author(s) used ChatGPT to improve grammar and sentence flow. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the published article.

References

1. Statistics Canada, Government of Canada. Population of urban areas growing faster than rural areas, although rural population still increasing. Available from: https://www150.statcan.gc.ca/n1/daily-quotidien/220209/g-a003-eng.htm. Accessed May 19, 2025.

2. Statistics Canada, Government of Canada. Dictionary. Census of population, 2021—rural area (RA). Available from: https://www12.statcan.gc.ca/census-recensement/2021/ref/dict/az/definition-eng.cfm?ID=geo042. Accessed June 24, 2021.

3. Statistics Canada, Government of Canada. Dictionary. Census of population, 2021—population centre (POPCTR). Available from: https://www12.statcan.gc.ca/census-recensement/2021/ref/dict/az/definition-eng.cfm?ID=geo049a. Accessed June 24, 2025.

4. Statistics Canada, Government of Canada. Remoteness of area—1—Easily accessible area. Available from: https://www23.statcan.gc.ca/imdb/p3vd.pl?function=getvd&tvd=1405166&cvd=1405166&clv=0&mlv=1&d=1&adm=0&dis=0. Accessed June 24, 2025.

5. Organisation for Economic Co-Operation and Development. Linking Indigenous communities with regional development in Canada. OECD rural policy revue. Available from: https://doi.org/10.1787/fa0f60c6-en. Accessed May 19, 2025.

6. Tu JV, Chu A, Maclagan L, et al. Regional variations in ambulatory care and incidence of cardiovascular events. CMAJ 2017;189:E494-501.

7. Crear-Perry J, Correa-de-Araujo R, Lewis Johnson T, et al. Social and structural determinants of health inequities in maternal health. J Womens Health 2021;30:230-5.

8. Canadian Institute for Health Information. Rural health care in Canada. Available from: https://www.cihi.ca/en/topics/rural-health-care-in-canada. Accessed May 19, 2025.

9. Rush KL, Burton L, Seaton CL, et al. A cross-sectional study of the preventive health care activities of western Canadian rural-living patients unattached to primary care providers. Prev Med Rep 2022;29:101913.

10. Liddy C, McKellips F, Armstrong CD, et al. Improving access to specialists in remote communities: a cross-sectional study and cost analysis of the use of eConsult in Nunavut. Int J Circumpolar Health 2017;76:1323493.

11. Rural Canada. Access to health care. Available from: https://publications.gc.ca/collection-r/lopbdp/bp/prb0245-e.htm. Accessed May 19, 2025.

12. Robitaille É, Paquette MC. Development of a method to locate deserts and food swamps following the experience of a region in Quebec, Canada. Int J Environ Res Public Health 2020;17:3359.

13. Sarkar A, Hanrahan M, Hudson A. Water insecurity in Canadian Indigenous communities: some inconvenient truths. Rural Remote Health 2015;15:3354.

14. Brundisini F, Giacomini M, DeJean D, et al. Chronic disease patients' experiences with accessing health care in rural and remote areas. Ont Health Technol Assess Ser 2013;13:1-33.

15. Rosengren A, Smyth A, Rangarajan S, et al. Socioeconomic status and risk of cardiovascular disease in 20 low-income, middle-income, and high-income countries: the Prospective Urban Rural Epidemiologic (PURE) study. Lancet Glob Health 2019;7:e748-60.

16. Demsas F, Joiner MM, Telma K, et al. Disparities in peripheral artery disease care: a review and call for action. Semin Vasc Surg 2022;35:141-54.

17. MacLean EA, Fogarty EJ, Peterson BJ, Xu S, Giacomantonio NB. Peripheral arterial disease in Nova Scotia: increased prevalence, low public awareness, and Poor Edinburgh Claudication Questionnaire sensitivity. CJC Open 2024;6:1210-9.

18. Thomas RD, Kosowan L, Rabey M, et al. Validation of a case definition to identify patients diagnosed with cardiovascular disease in Canadian primary care practices. CJC Open 2023;5:567-76.

19. Hiatt WR. Medical treatment of peripheral arterial disease and claudication. N Engl J Med 2001;344:1608-21.

20. Kullo IJ, Rooke TW. Peripheral artery disease. N Engl J Med 2016;374:861-71.

21. Meloni M, Vas PRJ. Peripheral arterial disease in diabetic foot: one disease with multiple patterns. J Clin Med 2025;14:1987.

22. Stancu B, Ilyés T, Farcas M, et al. Diabetic foot complications: a retrospective cohort study. Int J Environ Res Public Health 2022;20:187.

23. Hussain MA, Al-Omran M, Salata K, et al. A call for integrated foot care and amputation prevention pathways for patients with diabetes and peripheral arterial disease across Canada. Can J Public Health 2019;110:253-5.

24. Hussain MA, Al-Omran M, Salata K, et al. Population-based secular trends in lower-extremity amputation for diabetes and peripheral artery disease. CMAJ 2019;191:E955-61.

25. Rose G, Duerksen F, Trepman E, et al. Multidisciplinary treatment of diabetic foot ulcers in Canadian Aboriginal and non-Aboriginal people. Foot Ankle Surg 2008;14:74-81.

26. Chan CB, Dmytruk K, Labbie M, O'Connell P. Organizational changes in diabetic foot care practices for patients at low and moderate risk after implementing a comprehensive foot care program in Alberta, Canada. J Foot Ankle Res 2020;13:26.

27. Blanchette V, Brousseau-Foley M, Cloutier L. Effect of contact with podiatry in a team approach context on diabetic foot ulcer and lower extremity amputation: systematic review and meta-analysis. J Foot Ankle Res 2020;13:15.

28. Loewen K, Vigliarolo J, Lance B, et al. Rates of diabetes-related lower-limb amputation in northwestern Ontario: an incidence study and introduction of a standardized diabetic foot ulcer management protocol. Can J Rural Med 2017;22:100-7.

29. de Mestral C, Hussain MA, Austin PC, et al. Regional health care services and rates of lower extremity amputation related to diabetes and peripheral artery disease: an ecological study. CMAJ Open 2020;8:E659-66.

30. Boyd AJ. Vascular surgery in Canada: challenges in the Great White North. Eur J Vasc Endovasc Surg 2021;62:842-4.

31. Blanchette V, Patry J, Brousseau-Foley M, et al. Diabetic foot complications among Indigenous peoples in Canada: a scoping review through the PROGRESS-PLUS equity lens. Front Endocrinol 2023;14:1177020.

32. Wan D, Virani S, Abramson BL, et al. Peripheral artery disease centres of excellence in Canada—call to action. Can J Cardiol 2025;41:1652-5.

33. Liu Y, Yu M, LaMantia JN, et al. Associations between specialty care and improved outcomes among patients with diabetic foot ulcers. PLoS One 2023;18:e0294813.

34. Baethge C, Goldbeck-Wood S, Mertens S. SANRA—a scale for the quality assessment of narrative review articles. Res Integr Peer Rev 2019;4:5.

35. Akbar L, Zuk AM, Tsuji LJS. Health and wellness impacts of traditional physical activity experiences on indigenous youth: a systematic review. Int J Environ Res Public Health 2020;17:8275.

36. Tamura K, Langerman SD, Ceasar JN, et al. Neighborhood social environment and cardiovascular disease risk. Curr Cardiovasc Risk Rep 2019;13:7.

37. Sallis JF, Cervero RB, Ascher W, et al. An ecological approach to creating active living communities. Annu Rev Public Health 2006;27:297-322.

38. Queen's University. Indigenous terminology guide. Available from: https://www.queensu.ca/indigenous/ways-knowing/terminology-guide. Accessed June 28, 2025.

39. Chan BTB, Sodhi SK, Mecredy GC, Farrell T, Gordon J. Diabetes prevalence and complication rates. Can Fam Physician 2021;67:601-7.

40. Shah BR, Frymire E, Jacklin K, et al. Peripheral arterial disease in Ontario First Nations people with diabetes: a longitudinal population-based cohort study. CMAJ Open 2019;7:E700-5.

41. Martens PJ, Martin BD, O'Neil JD, MacKinnon M. Diabetes and adverse outcomes in a First Nations population: associations with healthcare access, and socioeconomic and geographical factors. Can J Diabetes 2007;31:223-32.

42. Meatherall BL, Garrett MR, Kaufert J, et al. Disability and quality of life in Canadian aboriginal and non-Aboriginal diabetic lower-extremity amputees. Arch Phys Med Rehabil 2005;86:1594-602.

43. Reid KS, Martin BD, Duerksen F, et al. Diabetic foot complications in a northern Canadian Aboriginal community. Foot Ankle Int 2006;27:1065-73.

44. Goulet S, Trepman E, Mmath MC, et al. Revascularization for peripheral vascular disease in Aboriginal and non-Aboriginal patients. J Vasc Surg 2006;43:735-41.

45. Hanley AJG, Harris SB, Mamakeesick M, et al. Complications of type 2 diabetes among Aboriginal Canadians: prevalence and associated risk factors. Diabetes Care 2005;28:2054-7.

46. Dannenbaum D, Kuzmina E, Lejeune P, Torrie J, Gangbe M. Prevalence of diabetes and diabetes-related complications in First Nations communities in northern Quebec (Eeyou Istchee), Canada. Can J Diabetes 2008;32:46-52.

47. Attawar DS. Diabetes-related foot complications and amputations in a Manitoba First Nation community: a systems approach to prevention. University of Manitoba, 2008. Available from: http://hdl.handle.net/1993/29692.

48. Drudi LM, Blanchette V, Sylvain-Morneau J, et al. Geographic variation in first lower extremity amputations related to diabetes and/or peripheral arterial disease. Can J Cardiol 2024;40:2606-15.

49. Manji A, Basiri R, Harton F, Rommens K, Manji K. Effectiveness of a multidisciplinary limb preservation program in reducing regional hospitalization rates for patients with diabetes-related foot complications. Int J Low Extrem Wounds 2025;24:117-23.

50. Bonneau C, Caron NR, Hussain MA, et al. Peripheral artery disease among Indigenous Canadians: what do we know? Can J Surg J Can Chir 2018;61:305-10.

51. Alberta Health, Health System Accountability and Performance. Surveillance and Assessment Branch. Lower leg amputations among Albertans with diabetes. Available from: https://open.alberta.ca/publications/lower-leg-amputations-among-albertans-with-diabetes. Accessed September 1, 2025.

52. Anand SS, Abonyi S, Arbour L, et al. Explaining the variability in cardiovascular risk factors among First Nations communities in Canada: a population-based study. Lancet Planet Health 2019;3:e511-20.

53. Fitzpatrick EFM, Martiniuk ALC, D'Antoine H, et al. Seeking consent for research with indigenous communities: a systematic review. BMC Med Ethics 2016;17:65.

54. McVicar JA, Poon A, Caron NR, et al. Postoperative outcomes for Indigenous peoples in Canada: a systematic review. CMAJ 2021;193:E713-22.

55. McIntyre I, Boughen C, Trepman E, Embil JM. Foot and ankle problems of Aboriginal and non-Aboriginal diabetic patients with end-stage renal disease. Foot Ankle Int 2007;28:674-86.

56. Leung L. Diabetes mellitus and the Aboriginal diabetic initiative in Canada: an update review. J Fam Med Prim Care 2016;5:259.

57. Hegele RA. Genes and environment in type 2 diabetes and atherosclerosis in Aboriginal Canadians. Curr Atheroscler Rep 2001;3:216-21.

58. Robitaille É, Paquette MC. Development of a method to locate deserts and food swamps following the experience of a region in Quebec, Canada. Int J Environ Res Public Health 2020;17:3359.

59. Wilson CR, Rourke J, Oandasan IF, Bosco C. Progress made on access to rural health care in Canada. Can Fam Physician 2020;66:31-6.

60. Canada School of Public Service, Government of Canada. Bridging the gap: unraveling the digital divide (DDN2-A26). Available from: https://www.csps-efpc.gc.ca/tools/articles/digital-divide-eng.aspx. Accessed May 19, 2025.

61. Canadian Home Care Association. The delivery of home care services in rural and remote communities in Canada identifying service gaps and examining innovative practice. Available from: https://cdnhomecare.ca/wp-content/uploads/2020/04/rural-and-remote-home-care-gaps-and-innovations-english.pdf. Accessed September 1, 2025.

62. Patel J, Zamzam A, Syed M, et al. A scoping review of foot screening in adults with diabetes mellitus across Canada. Can J Diabetes 2022;46:435-440.e2.

63. Zamzam A, McLaren AM, Ram E, et al. A novel Canadian multidisciplinary acute care pathway for people hospitalised with a diabetic foot ulcer. Int Wound J 2023;20:3331-7.

64. Thanh NX, Dmytruk K, O'Connell P, et al. Return on investment of the diabetes foot care clinical pathway implementation in Alberta, Canada. Diabetes Res Clin Pract 2020;165:108241.

65. Flaubert JL, Menestrel SL, Williams DR, et al. Social determinants of health and health equity. In: The future of nursing 2020-2030: charting a path to achieve health equity. Washington (DC): National Academies Press, 2021. Available from: https://www.ncbi.nlm.nih.gov/books/NBK573923. Accessed June 24, 2025.

66. Taylor J. An Indigenous ethical model for drone operations in Canada. Drone Syst Appl 2023;11:1-4.

67. Blanchette V, Hains S, Cloutier L. Establishing a multidisciplinary partnership integrating podiatric care into the Quebec public health-care system to improve diabetic foot outcomes: a retrospective cohort. Foot Edinb Scotl 2019;38:54-60.

68. Gagnon MP, Breton E, Courcy F, et al. The influence of a wound care teleassistance service on nursing practice: a case study in Quebec. Telemed J E Health 2014;20:593-600.

69. Jong M, Mendez I, Jong R. Enhancing access to care in northern rural communities via telehealth. Int J Circumpolar Health 2019;78:1554174.

70. Ontario Health. Clinical practice guidelines chronic limb threatening ischemia. Available from: https://www.corhealthontario.ca/CLTI-clinical-practice-guidelines_eng.pdf. Accessed September 29, 2025.

71. MacRury S, Stephen K, Main F, et al. Reducing amputations in people with diabetes (RAPID): evaluation of a new care pathway. Int J Environ Res Public Health 2018;15:999.

72. Graham K, Siatis CM, Gunn KM, et al. The experiences of health workers using telehealth services for diabetes-related foot complications: a qualitative exploration. J Foot Ankle Res 2023;16:47.

73. Keegan AC, Bose S, McDermott KM, et al. Implementation of a patient-centered remote wound monitoring system for management of diabetic foot ulcers. Available from: https://www.frontiersin.org/

journals/endocrinology/articles/10.3389/fendo.2023.1157518/full. Accessed May 19, 2025.

74. Smolderen KG, Bell A, Lei Y, et al. One-year costs associated with cardiovascular disease in Canada: Insights from the REduction of Atherothrombosis for Continued Health (REACH) registry. Can J Cardiol 2010;26:e297-305.

75. Syed MH, Al-Omran M, Ray JG, Mamdani M, de Mestral C. High-intensity hospital utilization among adults with diabetic foot ulcers: a population-based study. Can J Diabetes 2022;46:330-336.e7.

76. Nguyen CH, Marzolini S. Pre-participation withdrawal and non-completion of cardiac rehabilitation in peripheral artery disease: matched comparisons to coronary artery disease. J Cardiopulm Rehabil Prev 2024;44:55-63.

77. McClure GR, McIntyre WF, Belesiotis P, et al. Strategies to reduce out-of-pocket medication costs for Canadians with peripheral arterial disease. Can J Surg 2024;67:E1-6.

78. Waugh EB, Hefler M, Pascoe S, et al. What do Aboriginal people in the Northern Territory value during the operation journey? A qualitative study. Med J Aust 2025;223:30-7.

79. Cassidy-Matthews C, Pearce M, et al. "My feelings and my thoughts are my lived experience, not the numbers they show me on a piece of paper": Indigenous experiences of liver transplantation in British Columbia, Canada. Int J Circumpolar Health 2024;83:2359747.

80. Essien SK, Linassi G, Larocque M, Zucker-Levin A. Incidence and trends of limb amputation in first nations and general population in Saskatchewan, 2006-2019. Available from: https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0254543. Accessed March 8, 2025.

Supplementary Material

To access the supplementary material accompanying this article, visit *CJC Open* at https://www.cjcopen.ca/ and at https://doi.org/10.1016/j.cjco.2026.01.004