



**CorHealth
Ontario**

*Advancing cardiac, stroke
and vascular care*

Ontario Framework for Lower-Limb Preservation

October 2021

About CorHealth Ontario

Since June 2017, we are CorHealth Ontario (CorHealth), an organization formed by the merger of the Cardiac Care Network of Ontario and the Ontario Stroke Network, with an expanded mandate spanning cardiac, stroke and vascular care. CorHealth proudly advises the Ministry of Health, Ontario Health, hospitals, and care providers to improve the quality, efficiency, accessibility and equity of cardiac, stroke and vascular services for patients across Ontario. For more information, visit www.corhealthontario.ca.

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Table of Contents

About CorHealth Ontario	2
Acknowledgements	2
Table of Contents	3
Executive Summary	5
Introduction	6
Background	6
Lower-Limb Amputation in Ontario.....	6
Burden of Disease	8
Diabetes	8
Vascular Disease	8
Lower-Limb Wounds	9
Hard-to-Heal Wounds	10
Lower-Limb Amputation.....	11
Indigenous Populations.....	12
Care Pathways	13
Pathway for Preventing and Managing Diabetic Foot Complications	13
Pathway for Preventing and Managing Vascular Wounds.....	13
Pathway Components.....	15
Minimum Care Requirements.....	18
Preventing a Lower-Limb Wound	18
Assessment.....	18
Plan of Care.....	20
Re-screening, Reassessment and Evaluation of Interventions	21
Treating a Lower-Limb Wound and Preserving the Limb	21
Assessment.....	21

Plan of Care.....	22
Re-screening, Reassessment and Evaluation of Interventions	23
Preventing Recurrence of a Lower-Limb Wound	23
Assessment.....	24
Plan of Care.....	24
Re-screening, Reassessment and Evaluation of Interventions	24
Model for Lower-Limb Preservation Care Delivery.....	25
Context and Purpose	25
Lower-Limb Preservation Model of Care	25
Overview	25
Model.....	26
Model of Care Implementation: Key Considerations.....	28
1. Adopting a patient-centered approach.....	28
2. Focusing on aligning patient needs and characteristics with the right care setting	29
3. Connecting providers across the continuum through a shared-care approach ..	31
4. Establishing clear multilateral communication and care navigation	32
5. Adopting a collaborative interprofessional team approach	33
6. Exploring virtual care opportunities	35
Key Lower-Limb Preservation Care Components.....	38
Summary	41
References.....	42
Appendix	47
Lower-Limb Preservation Strategy Advisory Committee	47

Executive Summary

Non-traumatic lower-limb amputation rates in Ontario, most commonly as a result of vascular disease and/or diabetes, are increasingly high, vary greatly across the province and are highest in Indigenous populations. Many of these amputations are preventable with screening, a collaborative interdisciplinary lower-limb preservation team approach and culturally-safe patient education, however integrated amputation prevention efforts are disjointed in many areas of the province. CorHealth has a mandate across cardiac, stroke and vascular care in Ontario to drive evidence-informed practice, advise on health-system planning and resource allocation and measure and report on quality and outcomes. By nature of this mandate, CorHealth is well-positioned to partner with key stakeholders to help steward a more coordinated, integrated and patient-centred approach to lower-limb preservation care in Ontario.

This Ontario Framework for Lower-Limb Preservation is an evidence-informed best-practice roadmap that includes:

- **System-level care pathways** that highlight the key care activities for the prevention and management of lower-limb wounds;
- **Minimum care requirements** to standardize lower-limb preservation care; and
- **Key considerations for a model of care** to guide the development and delivery of integrated regional lower-limb preservation services.

The framework provides guidance to lower-limb preservation providers, organizations and champions on the regional planning, development, delivery and adoption of standardized, integrated lower-limb preservation services in Ontario, accommodating regional needs and resources. Collaborative partnerships across the care continuum can optimize the delivery of best-practice lower-limb preservation care, minimize health care costs and maximize positive patient outcomes including reducing non-traumatic major lower-limb amputations in Ontario.

This important work could not have been undertaken without the generous contributions of time, energy and expertise of the Lower-Limb Preservation Strategy Advisory Committee including key stakeholders, health care providers, patient and family advisors and system partners. It is our aim that this framework begins to lay a foundation for improved integrated and sustainable lower-limb preservation care in Ontario at the system, provider and patient levels.

Introduction

This Ontario Framework for Lower-Limb Preservation is an evidence-informed best-practice roadmap. The framework highlights the key care activities, minimum care requirements and model of care to optimize the delivery of sustainable best-practice lower-limb preservation care and maximize positive patient outcomes while minimizing health care costs. The purpose of this framework is to provide guidance to lower-limb preservation providers, organizations and champions around the regional planning, development, delivery and adoption of standardized, integrated lower-limb preservation services in Ontario, accommodating regional needs and resources. The overall goal is to reduce non-traumatic major lower-limb amputations in Ontario.

Background

Lower-Limb Amputation in Ontario

Lower-limb amputation is one of the most feared complications of peripheral arterial disease (PAD) and diabetes as well as can be a devastating complication of non-healing wounds. PAD, diabetes and both PAD and diabetes together account for between 75 and 94% (93.8%, 81.8% and 75.6% respectively) of non-traumatic lower-limb amputations in Ontario,¹ of which up to 85% have been estimated to be preventable.^{2,3,4} Rates of non-traumatic lower-limb amputation are high in

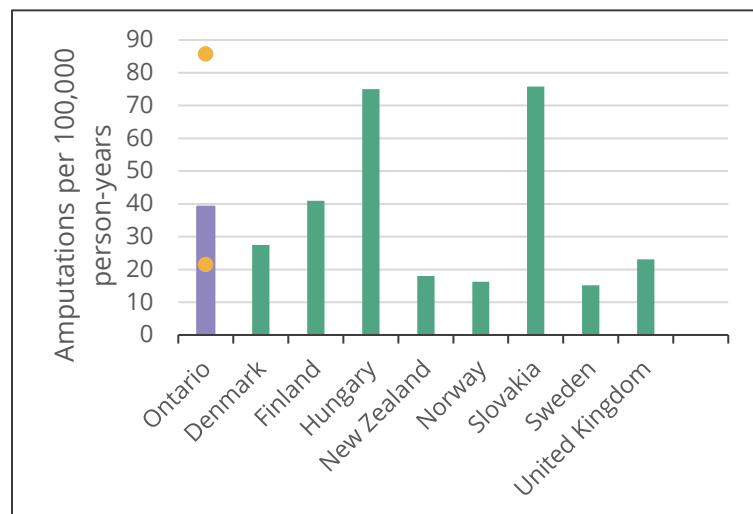


Figure 1. – Major and minor lower-limb amputation rates among patients with diabetes or PAD in Ontario and other jurisdictions with publicly funded health care systems.^{2,5} Ontario data for years 2011-2016, other jurisdiction data for 2010-2014. ● LHIN amputation rate min/max range.

Ontario compared to many other jurisdictions with publicly funded health care systems (figure 1),^{2,5} and major and minor amputations related to PAD, diabetes or both have

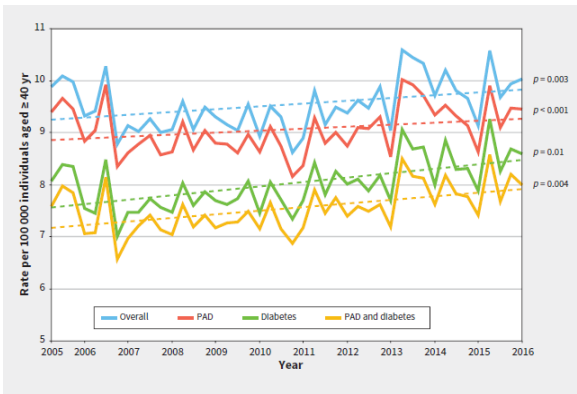


Figure 2. – Major or minor lower-limb amputations related to PAD, diabetes or both in Ontario.¹

increased significantly over the past decade (figure 2).¹ Additionally, provincial lower-limb amputation rates vary greatly, with rates in the North East and North West Local Health Integration Networks (LHINs)* two times higher than the Ontario average and four times higher than LHINs with the lowest amputation rates (figure 3).²

Several recent publications have expressed a strong need for integrated amputation prevention efforts in the province.^{1,2,6,7}

Jurisdictions that have successfully implemented an organized interprofessional approach to wound care and patient education have shown tremendous reductions in lower-limb amputation rates.^{8,9,10}

Evidence-informed standards, guidelines and best-practice recommendations exist to inform the prevention and management of lower-limb wounds to prevent amputation.^{11-19,20,21} Furthermore, effective initiatives have been found to cost 10 to 40 times less,³⁷ and as such, minimal investment can save limbs and lives not to mention millions in health care dollars annually.^{4,7,22}

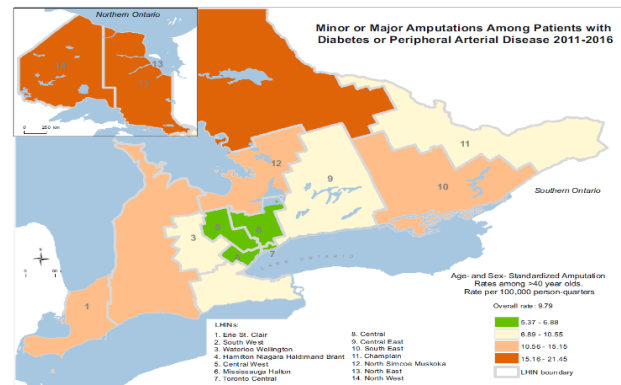


Figure 3. – Age and sex-standardized rates of minor or major amputations for diabetes or PAD across Ontario.² Reprinted by permission from Springer Nature, Canadian Journal of Public Health, 2019.

* On April 1, 2021, non-patient care functions from the LHINs transferred to Ontario Health; and following the transfer, to ensure the ongoing stability of services while home and community care transitions into Ontario Health Teams, LHINs began operating under the new business name Home and Community Care Support Services to reflect a singular mandate to deliver patient care.

Burden of Disease

Diabetes

In Ontario, there are over 1.5 million people diagnosed with diabetes,^{23,24} and foot complications affect an estimated 15-25% in their lifetime.^{3,4,8,23} Foot ulcers, most often as a result of neuropathy, can have devastating complications, including infection, amputation and even death.¹³ There is one amputation in Ontario every four hours as a result of a diabetic foot ulcer for a total of 2000 amputations every year,^{23,24} with direct health-care costs of \$70,000 per limb or \$140 million annually.²⁴

Furthermore, 42% of patients that have a lower-limb amputation require amputation of the contralateral limb in 1 to 3 years,²⁵ and amputation confers a 5-year mortality rate of 50 to 70%.^{12,13,18,19}

Vascular Disease

It is estimated that the prevalence of PAD (referred to throughout the rest of this framework as vascular disease) is

15-20% for those over the age of 70 years and is often asymptomatic and undetected in the absence of other health issues.^{14,26} Vascular disease is four times more common in people with diabetes and up to 50% of patients with a diabetic foot complication will have significant underlying vascular disease.^{12,13} Vascular disease often results in tissue ischemia and necrosis causing ulceration, and additionally arterial insufficiency is a significant barrier to the wound healing process.¹⁴ As such, wounds as a result of vascular disease can result in serious complications including ongoing infection, gangrene, amputation and death.¹⁴ Unfortunately, given the silent nature of the disease, awareness is not yet widespread even amongst front line health professionals. As such, timely referrals to vascular specialists often come too late to save the limb or prevent extensive tissue loss and suffering.¹⁴

Patients living with both vascular disease and diabetes have been shown to be seven to 15 times more likely to experience major amputation following development of a lower-limb wound.

Lower-Limb Wounds

It is important to consider that patients living with vascular disease and/or diabetes are at considerably increased risk for the development of lower-limb wounds that can become limb-threatening.^{13,14} Arterial insufficiency is a key causative factor of a lower-limb wound, including in those living with diabetes, and significantly inhibits the wound healing process.^{13,14} In order to preserve limbs, accurate assessment and rapid treatment of underlying vascular disease is essential when caring for all patients with lower-limb wounds. Patients living with both vascular disease and diabetes have been shown to be seven to 15 times more likely to experience major amputation following development of a lower-limb wound as compared to those without diabetes.¹⁴ As such, lower-limb wound prevention and management, including early screening and timely access to appropriate vascular and wound care, is key to preventing amputations.

For the purpose of this framework, a vascular wound is defined as a wound with arterial insufficiency. Arterial insufficiency can result from macro- and/or microvascular disease as identified by clinical exam and supported by objective evaluation based on current guidelines. Macrovascular disease is identified by non-palpable pulses and/or an ankle-brachial index (ABI) <0.9. Microvascular disease is identified by cyanotic appearance despite palpable pulses, toe-brachial index (TBI) <0.7, toe pressure <50mmHg and/or angiographical evidence. Patients with normal macrovascular blood flow may still have microvascular disease. Arterial insufficiency frequently occurs with diabetes-related complications, venous insufficiency or other etiologies.

Every lower-limb wound should be considered a vascular wound until proven otherwise.

A key premise for successful wound management is that every lower-limb wound should be considered a vascular wound until proven otherwise. This important message is reflected throughout this framework. Therefore, the minimum care requirements outline the need for providers to conduct vascular

screening for poor blood flow on all at-risk patients including those with vascular disease and/or risk factors including diabetes. All patients with a positive vascular screen should be referred for vascular studies and/or to a vascular specialist for further assessment. Furthermore, patients with identified vascular insufficiency and rapidly evolving tissue loss or active symptoms (e.g., pain, acute wound infection, Charcot

arthropathy, critical limb threatening ischemia, acute limb ischemia) should be urgently referred to a vascular specialist (time is tissue) and/or other lower-limb preservation specialists (e.g., foot, ankle, orthopedic, plastic and/or infectious disease specialists) as required for medical and/or surgical management to preserve the limb.

Hard-to-Heal Wounds

Another important concept that informs the framework is that of a hard-to-heal wound, often called a “chronic” wound, a term that incorrectly signals that the wound is expected not to resolve. A hard-to-heal wound can be defined as a wound that has failed to respond to evidence-informed standard of care in an orderly and timely manner²⁷ and is independent of the wound type and etiology.²⁸ The challenge is to identify a hard-to-heal wound as early as possible.²⁸

For many wounds, one or more of the following three key intrinsic abnormalities will be present and delay or prevent healing:²⁸

- Ischemia;
- Infection; and
- Inflammation.

A wound that exhibits exudate, slough and an increase in size by the third day of its occurrence may already be defined as hard-to-heal.²⁷ In most wounds, notable healing progress should be clear within a four-week period.²⁸ Recognizing early wound size reduction has been shown to be a useful general measure of healing.²⁹

The International Diabetic Foot Care Group and D-Foot International have developed an “easy-to-use” tool to direct treatment based on the severity of a diabetic foot ulcer and comorbidities.³¹ The tool supports primary health care professionals in the prompt referral and treatment of patients with diabetic foot ulcers. For a non-complicated DFU, the standard of care includes a maximum of 2 weeks of observation and treatment with an outcome goal of a 30% decrease of ulcer area and signs of granulation or re-epithelisation. If this goal is not met, referral for specialized care is recommended. For a complicated DFU, the standard of care includes referral for specialized care with a maximum delay of four days.³⁰

The overall goal to prevent hard-to-heal wounds is to identify and manage risk factors early, closely manage the wound and measure and monitor wound size through regular follow-up and arrange timely referral to specialized wound care when required. When in doubt, refer to a credentialed wound specialist.²⁷ The earlier issues are identified and the patient referred for specialized wound prevention and management, the better the results. This includes faster healing rates, fewer antibiotic prescriptions, improved quality of life and wellbeing for patients, significant cost savings and reduced risk of amputation.²⁷

The overall goal to prevent hard-to-heal wounds is to identify and manage risk factors early, treat the wound, closely measure and monitor wound size through regular follow-up and arrange timely referral to specialized wound care when required.

Lower-Limb Amputation

While the overall goal of this framework is to reduce non-traumatic major lower-limb amputation, it is important to note that, in some cases despite the delivery of best-practice care, amputation may be the most appropriate and safest option. The goals of amputation are to relieve pain, encourage wound healing and to create the most useful limb that will support a patient's ability to carry out activities of daily living.³¹ When a lower-limb amputation is indicated, selection of the correct level is of critical importance in order to optimize healing potential and function.³² As such, an interprofessional team approach to amputation is key, and prosthetists/orthotists as well as rehabilitation specialists should be involved early in the planning and decision-making process to support the best possible functional outcome. It is also imperative that patient preferences and functional goals are discussed and considered. Following amputation, rehabilitation care³³, community re-integration, ongoing patient education and psychosocial and financial supports are required to help the patient and their family successfully and positively adapt to life with a lower-limb amputation.³⁴

Indigenous Populations

Indigenous populations, particularly those in Ontario's remote Northwest, experience lower-limb amputation rates seven times the provincial average.³⁵ For Indigenous populations to benefit from this framework, there must be consideration for Indigenous-focused approaches to care and culturally-safe care delivery. Care must be taken to understand the existing regional Indigenous health system of care, including health programs, key health leaders and funding sources, as an essential first step. Special attention must be paid to this population that receives limited support from

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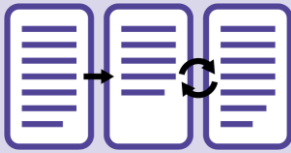
federal and provincial systems.

Government funded systems should be carefully investigated and supported including the federal [Non-Insured Health Benefits \(NIHB\) program for First Nations and Inuit](#), and provincial [Ontario Ministry of Indigenous Affairs Aboriginal Health Access Centres \(AHAC\)](#) and [Ministry of Health and Long Term Care Ontario Aboriginal Diabetes Strategy \(MOHLTC OADS\)](#) initiatives and culturally

appropriate programs. It is also imperative

that the lower-limb preservation health care team understand the unique history, experiences and struggles of Indigenous communities by educating themselves about Indigenous history, traumas and key issues facing Indigenous peoples today.³⁶ Health care teams should include members of the Indigenous community as active participants and must work to build relationships and trust with and incorporate Indigenous leadership and Indigenous health program champions in lower-limb preservation planning and decision-making.³⁶

Canada's history of traumas imposed on the Indigenous population have impacted every aspect of life including basic human needs. Over generations, this has had serious negative effects on Indigenous interactions with the health care system dictating the need for systemic changes to improve relations and health outcomes including reducing lower-limb amputation. By partnering and learning together we can truly move towards truth and reconciliation.³⁷



Care Pathways

The system-level care pathways described below highlight the evidence-informed best-practice key care activities for the prevention and management of lower-limb wounds. They are meant for use by lower-limb preservation organizations, administrators, champions and leaders to guide the development and delivery of lower-limb preservation services in Ontario, accommodating regional needs and resources.

Pathway for Preventing and Managing Diabetic Foot Complications

The Wounds Canada Pathway for Preventing and Managing Diabetic Foot Complications⁴ was developed by the Diabetic Foot Canada Task Force. The one-page infographic highlights the key care activities for the prevention and management of foot complications for patients living with diabetes. The pathway accompanies the Wounds Canada Best Practice Recommendations for the Prevention and Management of Diabetic Foot Ulcers (2019)¹³. Together they provide practical, “easy-to-follow” best-practice evidence to support providers, patients, families and the health care team in planning and delivering the best clinical practice for the prevention and management of diabetic foot ulcers or other foot complications. Many other standards, guidelines and best practice recommendations also exist for the prevention, assessment and management of the diabetic foot and diabetic foot ulcers.^{11-12,15-19,21}

Pathway for Preventing and Managing Vascular Wounds

Best-practice evidence exists for the prevention and management of vascular wounds, albeit awareness is not yet widespread. The Wounds Canada Best Practice Recommendations for the Prevention and Management of Peripheral Arterial Ulcers¹⁴ provides a summary of current best-practice guidelines to optimize the prevention and management of vascular wounds and to reduce unnecessary limb loss. The Wound, Ostomy and Continence Nurses (WOCN) Society has also published an evidence-informed Guideline for Management of Wounds in Patients with Lower-Extremity Arterial Disease²⁰ to guide the screening, diagnosis, treatment and management of patients with wounds as a result of vascular disease.



Described below is a new Pathway for Preventing and Managing Vascular Wounds (figure 4). This pathway is aligned with the Wounds Canada Best Practice Recommendations for the Prevention and Management of Peripheral Arterial Ulcers and the Wound, Ostomy and Continence Nurses (WOCN) Society Guideline for Management of Wounds in Patients with Lower-Extremity Arterial Disease. The pathway highlights the key care activities for vascular wound prevention and management in a practical one-page infographic. It emphasizes the importance of regular screening, early identification, timely assessment and best-practice treatment of a vascular wound (time is tissue) to guide the development and delivery of lower-limb preservation services to reduce preventable lower-limb amputations. Additionally, it includes the definition of a vascular wound and again highlights the importance that every lower-limb wound should be considered a vascular wound until proven otherwise.

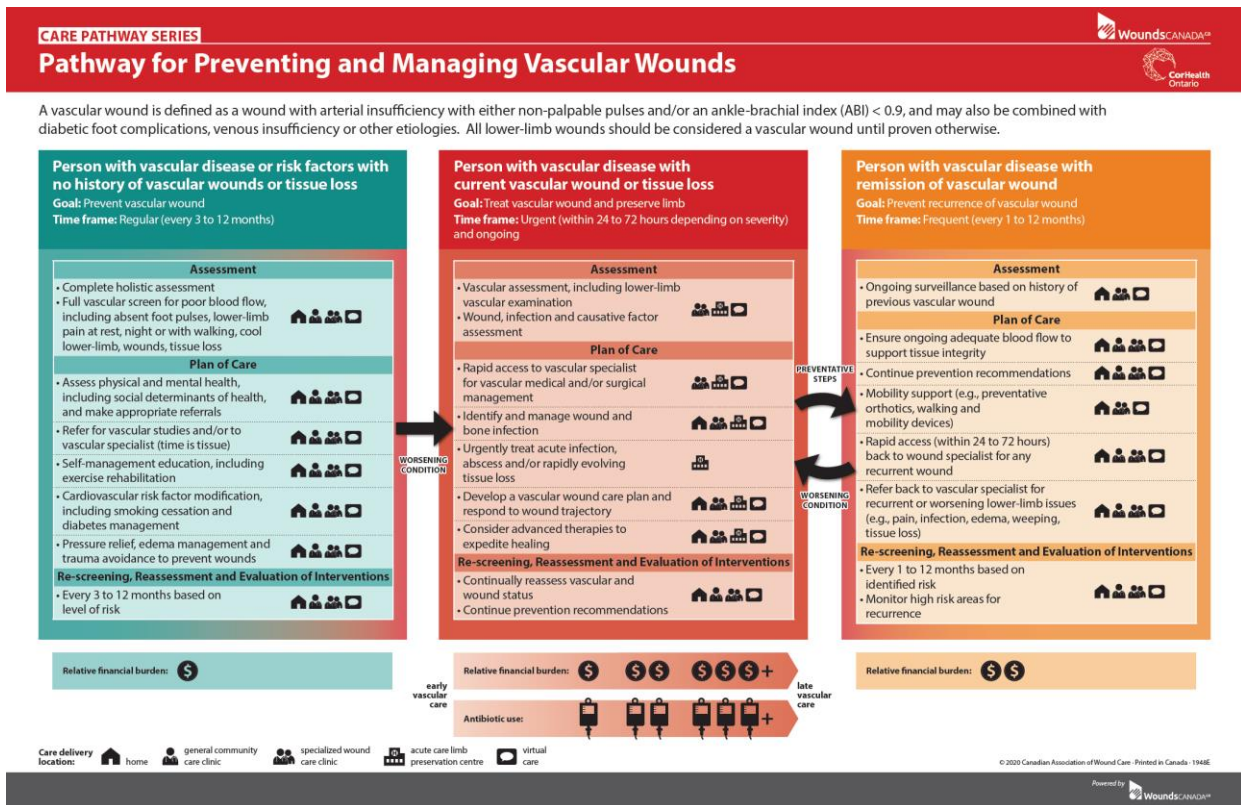


Figure 4. – Pathway for Preventing and Managing Vascular Wounds



Pathway Components

For patients with vascular disease and/or risk factors including diabetes with no history of vascular wound or tissue loss, the overall goal is to **prevent** a vascular wound. Key messages include the following:

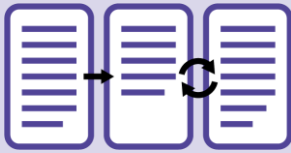
- Vascular screening for poor blood flow
- Assessment of mental and physical health, cardiovascular risk factors and social determinants of health with referrals as appropriate
- A focus on prevention to minimize health care costs and maximize individual outcomes
- Culturally-safe self-management education in preferred languages for patients and families
- Timely referral for vascular studies and/or to a vascular specialist for all patients with a positive vascular screen
- Urgent (within 24 to 72 hours depending on severity) access to a vascular and/or other lower-limb preservation specialist for all patients with tissue loss or active symptoms including pain (time is tissue)

Person with vascular disease or risk factors with no history of vascular wounds or tissue loss	
Goal: Prevent vascular wound	
Time frame: Regular (every 3 to 12 months)	
Assessment	
• Complete holistic assessment	
• Full vascular screen for poor blood flow, including absent foot pulses, lower-limb pain at rest, night or with walking, cool lower-limb, wounds, tissue loss	
Plan of Care	
• Assess physical and mental health, including social determinants of health, and make appropriate referrals	
• Refer for vascular studies and/or to vascular specialist (time is tissue)	
• Self-management education, including exercise rehabilitation	
• Cardiovascular risk factor modification, including smoking cessation and diabetes management	
• Pressure relief, edema management and trauma avoidance to prevent wounds	
Re-screening, Reassessment and Evaluation of Interventions	
• Every 3 to 12 months based on level of risk	

For patients with vascular disease with a current vascular wound or tissue loss, the overall goal is to **treat** the wound and **preserve** the limb. Key messages include the following:

- Urgent (within 24 to 72 hours depending on severity) access to a vascular and/or other lower-limb preservation specialist for medical and/or surgical management (time is tissue)
- Referral to a credentialled wound specialist for development of a vascular wound care plan and responding to wound trajectory
- Continuous reassessment of vascular and wound status
- Continued prevention

Person with vascular disease with current vascular wound or tissue loss	
Goal: Treat vascular wound and preserve limb	
Time frame: Urgent (within 24 to 72 hours depending on severity) and ongoing	
Assessment	
• Vascular assessment, including lower-limb vascular examination	
• Wound, infection and causative factor assessment	
Plan of Care	
• Rapid access to vascular specialist for vascular medical and/or surgical management	
• Identify and manage wound and bone infection	
• Urgently treat acute infection, abscess and/or rapidly evolving tissue loss	
• Develop a vascular wound care plan and respond to wound trajectory	
• Consider advanced therapies to expedite healing	
Re-screening, Reassessment and Evaluation of Interventions	
• Continually reassess vascular and wound status	
• Continue prevention recommendations	



For patients with vascular disease with remission of a vascular wound, the overall goal is to **prevent recurrence** of a vascular wound. Key messages include the following:

- Ongoing and frequent surveillance and monitoring of areas at high risk of recurrence due to underlying vascular pathology
- Rapid access (within 24 to 72 hours) to a credentialed wound specialist for any recurrent wound
- Early referral back to a vascular and/or other lower-limb preservation specialist for recurrent or worsening lower-limb issues
- Continued prevention including mobility support, pressure relief and trauma avoidance

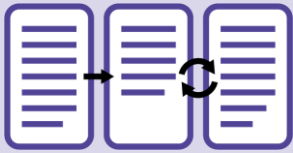
Person with vascular disease with remission of vascular wound	
Goal: Prevent recurrence of vascular wound	
Time frame: Frequent (every 1 to 12 months)	
Assessment	
• Ongoing surveillance based on history of previous vascular wound	🏠 👤 📄
Plan of Care	
• Ensure ongoing adequate blood flow to support tissue integrity	🏠 👤 📄
• Continue prevention recommendations	🏠 👤 📄
• Mobility support (e.g., preventative orthotics, walking and mobility devices)	🏠 👤 📄
• Rapid access (within 24 to 72 hours) back to wound specialist for any recurrent wound	🏠 👤 📄
• Refer back to vascular specialist for recurrent or worsening lower-limb issues (e.g., pain, infection, edema, weeping, tissue loss)	🏠 👤 📄
Re-screening, Reassessment and Evaluation of Interventions	
• Every 1 to 12 months based on identified risk	🏠 👤 📄
• Monitor high risk areas for recurrence	🏠 👤 📄

It should be noted that the pathway and care activities can generally also be applied to patients with upper-limb wounds although they may not be vascular or diabetic in nature. Specialist opinion should be sought.

An important icon on the pathway illustrates the differences in health system financial burden as the level of care transitions. The relative cost of prevention is small compared to the increasing costs of vascular, wound and lower-limb preservation care, particularly when early care is not accessed or available. The ongoing costs of care and follow-up continue to place a financial burden on the

The relative cost of prevention is small compared to the increasing costs of vascular, wound and lower-limb preservation care, particularly when early care is not accessed or available.

system, much of which can be avoided through regular vascular screening, cardiovascular risk factor modification, patient education and key care activities to prevent vascular wounds through collaborative lower-limb preservation services.



Care Pathways

The pathway also illustrates the increased use of antibiotics as care needs increase, and in particular intravenous (IV) antibiotics, for infection control during treatment of a vascular wound. The cost of antibiotics is a hidden, but major contributor to the financial burden of wound care on the health care system. Wound treatment and management continue to be one of the costliest interventions in health care. There is also a considerable impact to a patient's quality of life as IV antibiotics are often prescribed for a lengthy period of time, have side effects and mandate regular and ongoing health care provider visits. There is the potential to reduce antibiotic requirements through early wound identification and intervention. This also results in health care savings.



Minimum Care Requirements

Evidence-informed best-practice minimum care requirements to standardize the prevention and management of lower-limb wounds in individuals with vascular disease and/or vascular risk factors including diabetes are described below. They have been developed based on existing provincial, national and international guidelines, standards and best practice recommendations.^{11-21,27,38,39}

It is important to note that best-practice lower-limb preservation care applies to all patients at risk of non-traumatic lower-limb amputation. As such, the minimum care requirements include references to the care of patients with vascular disease and/or vascular risk factors including diabetes. Furthermore, many patients may have both vascular disease and diabetes and care providers will need to ensure that the minimum care requirements for both are met.

A high-level summary of the minimum care requirements, aligned with the model of care described in the following section, is presented at the end of this framework. The table outlines the key lower-limb preservation care components and provides guidance as to where each of the components can be delivered (e.g., primary community care centre, specialized wound clinic and/or acute limb preservation centre as defined within the model of care).

Preventing a Lower-Limb Wound

The minimum care requirements described in this first section are for **patients with vascular disease and/or vascular risk factors including diabetes with no history of lower-limb wounds**. These minimum care requirements should be carried out regularly (every 3 to 12 months) at a frequency based on level of risk (see table 1). The overall goal is to prevent the development of a lower-limb wound.

Assessment

- Conduct a holistic health assessment at a minimum annually on all patients and include all available health information (e.g., medical history, physical exam including pedal pulses, blood work, risk factors, functional, physical and



mobility status, psychosocial and emotional needs) to establish, document and implement a plan of care

- Conduct a full vascular screen, at a frequency based on level of risk, for poor blood flow including absent foot pulses (e.g., palpation of lower-limb pulses), lower-limb pain at rest, night or with walking, cool lower-limb, wounds and tissue loss
- Conduct a foot screen on all patients with diabetes, at a frequency based on level of risk and at a minimum annually, using a standard validated tool

Foot Screen Tool

[Inlow's 60-second diabetic foot screen tool](#)

Table 1. – The International Working Group on the Diabetic Foot (IWGDF) Risk Stratification System and corresponding foot screening and examination frequency.⁴⁰

Category	Wound risk	Characteristics	Screening frequency*
0	Very low	No loss of protective sensation (LOPS) No peripheral vascular disease (PVD)	Once a year
1	Low	LOPS or PVD	Once every 6-12 months
2	Moderate	LOPS and PVD <i>or</i> LOPS and foot deformity <i>or</i> PVD and foot deformity	Once every 3-6 months
3	High	LOPS or PVD <i>and</i> one or more of the following: <ul style="list-style-type: none"> • History of a wound • A lower-limb amputation (minor or major) • End-stage renal disease 	Once every 1-3 months
Urgent Risk		Active wound, infection, active Charcot, critical limb threatening ischemia	Urgent care required

*Screening frequency is based on expert opinion since there is no published evidence to support these intervals.



Plan of Care

- Patients with positive indicators on vascular screen:
 - With a wound with tissue loss and/or active symptoms including pain (e.g., critical limb threatening ischemia, acute limb ischemia) – urgently (within 72 hours depending on severity) refer to a vascular specialist (time is tissue)
 - Without tissue loss or active symptoms
 - refer for vascular studies (e.g., ankle-brachial index, vascular ultrasound), and if positive, to a vascular specialist for vascular assessment
- Refer patients with a current hard-to-heal wound or at moderate to high risk for a wound to a credentialed wound specialist and/or a regulated foot care professional for wound prevention, assessment, treatment and management
- Establish, document and implement an individualized evidence-informed plan of care, guided by patient preferences and goals, to be reviewed at every appointment to ensure it is current, updated as required and accessible to all care providers within the patient’s circle of care
- Include patients and family/caregivers in the co-development of their plan of care and develop a process to incorporate, document and address mutually agreed-upon patient-centred needs, preferences and goals including quality of life
- Assess other physical and mental health issues, including social determinants of health, and develop a process to facilitate timely referrals for management and support of health issues and basic human needs in order to optimize individual outcomes and improve quality of life
- Provide patients with:

Vascular and Wound Assessment Tools

[Wound, Ischemia and foot Infection \(WIFI\)](#) classification system to predict amputation risk and revascularization benefit

[SINBAD](#) (site, ischemia, neuropathy, bacterial infection, area and depth) system for classifying and scoring wounds

[Photographic Wound Assessment Tool \(PWAT\)](#) to track wound healing



- Ongoing culturally-appropriate, understandable, individualized education and resources in preferred languages to optimize prevention, recognition and self-management of wounds to help them gain not only the knowledge but also the confidence, agency, skills and motivation to successfully create and sustain self-care behaviours and become active and informed partners in their care
- Aggressive cardiovascular risk factor modification and support, including smoking cessation and diabetes management/blood sugar control, with pharmacotherapy as required, to recommended targets based on best-practice guidelines
- Wound prevention strategies including appropriate footwear, pressure relief, edema management and education regarding trauma avoidance to prevent development of a wound

Re-screening, Reassessment and Evaluation of Interventions

- Conduct re-screening, reassessment and an evaluation of interventions every 3 to 12 months, at a frequency based on level of risk and identified risk factors, to prevent development of a wound

Treating a Lower-Limb Wound and Preserving the Limb

The minimum care requirements described in this second section are for **patients with a current hard-to-heal lower-limb wound or tissue loss**. These minimum care requirements should be carried out urgently (within 72 hours to one week depending on severity) and on an ongoing basis until wound healing. The overall goal is to treat the lower-limb wound, minimize complications and preserve the limb.

Assessment

- Conduct a comprehensive vascular assessment (by a vascular specialist) on patients with an identified vascular wound
- Additionally, conduct a comprehensive wound assessment (by a credentialled wound specialist) using a validated and reliable wound assessment tool(s)
- Conduct an assessment and identification of risk and causative factors that may impact skin integrity and wound healing



Plan of Care

- Patients with:
 - An acute wound infection, abscess, Charcot arthropathy and/or rapidly evolving tissue loss (e.g., critical limb threatening ischemia and acute limb ischemia) – refer urgently (within 72 hours depending on severity) to a vascular and/or other specialist for medical and/or surgical management
 - A current wound – refer for timely treatment by a credentialed wound specialist
- Provide patients with:
 - Wound and peri-wound skin **cleansing** with an available wound antiseptic or antimicrobial wash or surfactant solution to loosen superficial devitalised tissue, wound debris, foreign debris and biofilm and to decontaminate the area
 - Wound **debridement** using an appropriate method leaving the wound bed and edge in a condition that will optimize the performance of a wound dressing
 - Local **infection management** including culture-informed antibiotic treatment
 - Urgent (within 24 hours) systemic antibiotic treatment and/or urgent surgical intervention for a suspected deep/surrounding tissue or bone infection (osteomyelitis), systemic infection or pain in the insensate foot
 - Wound **moisture management** (moisture balance for healable and non-ischemic ulcers; moisture reduction for maintenance, non-healable and ischemia ulcers)
 - An antimicrobial and/or antibiofilm wound **dressing** that addresses any residual biofilm and prevents contamination, recolonization and biofilm re-formation and manages exudate effectively thereby promoting wound healing
 - **Pain management**
 - **Advanced therapies** (e.g., hyperbaric oxygen therapy, negative pressure wound therapy, ultrasound therapy) and/or referral to other appropriate interprofessional lower-limb preservation team members if at high risk for amputation to augment and expedite the wound healing process



- **Education and counselling** on adequate hydration and nutritional support to promote wound healing
- Establish, document and implement an individualized evidence-informed plan of care as per above
- Include patients and family/caregivers in the co-development of their plan of care as per above
- Document the progress of wound healing including measurements, pain scores and serial photography using a consistent method to validate progress towards healing and update the plan of care regularly to respond to the wound trajectory
- Prescribe and fit supportive mobility devices (e.g., post-operative shoe, wheelchair, heel offloading devices) as required (by a regulated foot health professional) to support treatment and healing

Re-screening, Reassessment and Evaluation of Interventions

- Continually reassess wound and vascular status, at a frequency based on level of risk, to monitor wound treatment, to minimize or eliminate complications, to achieve complete wound healing and to preserve the limb
- Continue prevention recommendations

Always consider if revascularization is warranted when a lower-limb wound is not healing despite optimal management.

Preventing Recurrence of a Lower-Limb Wound

The minimum care requirements described in this third section are for **patients with remission of a lower-limb wound**. These minimum care requirements should be carried out regularly (every 1 to 12 months) at a frequency based on level of risk (see table 1). The overall goal is to prevent recurrence of a lower-limb wound.



Assessment

- Conduct ongoing screening, assessment and surveillance every 1 to 12 months, at a frequency based on level of risk, to prevent recurrence

Plan of Care

- Conduct scheduled follow-up with a vascular specialist at a minimum annually for all patients at high risk for wound recurrence or with a history vascular disease, critical limb threatening ischemia and/or revascularization to ensure ongoing adequate blood flow to support tissue integrity
- Continue prevention recommendations
- Provide patients with:
 - Supportive mobility devices (e.g., footwear, orthotics) as required, prescribed and fitted by a regulated foot health professional, to prevent recurrence
 - Rapid access (within 24 to 72 hours) to a credentialed wound specialist for any recurrent wound
 - Access to a vascular specialist for reassessment for any recurrent or worsening lower-limb issues (e.g., pain, infection, edema, weeping, tissue loss)

Re-screening, Reassessment and Evaluation of Interventions

- Conduct re-screening, reassessment and evaluation of interventions every 1 to 12 months, at a frequency based on level of risk and identified risk factors, and monitor high-risk areas to prevent recurrence of wound and to preserve the limb



Model for Lower-Limb Preservation Care Delivery

Context and Purpose

In alignment with provincial plans to better connect care for patients through Ontario Health Teams (OHTs) – a new approach to health care that brings together health care providers as one collaborative team - the lower-limb preservation model of care described below is meant to offer practical guidance and key considerations associated with the organization and integration of services aimed at:

- Reducing avoidable lower-limb complications and amputation;
- Keeping people at risk of lower-limb complications and amputation well; and,
- Reducing acute (hospital) care utilization.

The patient-centered model of care is structured to describe and define key care services across the patient journey, based on patient needs, and rooted in the axiom of ‘the right care, at the right place, by the right provider, at the right time’.

The following provides a description of the key components and intended benefits of adopting an integrated model. It is meant as a set of pragmatic descriptors and considerations for care providers and health care administrators to use in building their own regional evidence-informed, integrated and sustainable model of lower-limb preservation care and service delivery.

Lower-Limb Preservation Model of Care

Overview

The model was established based on the recognition that patients at risk of lower-limb amputation are a heterogeneous group, and that their patient journeys and associated care needs make up a set of interconnected clinical pathways. Each clinical pathway is associated with specific patient care needs and most appropriate clinical provider care settings – across primary care, home and community care and acute care services. The integrated clinical pathways within the model of care therefore outline:

- Care delivery locations (where care can be delivered);
- The risk-based characteristics of patients receiving care within each care delivery location (who can receive care where);



Model for Lower-Limb Preservation Care Delivery

- An interprofessional team approach to lower-limb preservation care delivery (who can deliver that care); and
- The importance of connecting providers across the continuum through a shared-care approach to support care integration.

Model

Implementation of an integrated lower-limb preservation model of care will improve the health outcomes and preserve limbs for patients at risk of non-traumatic major lower-limb amputation in Ontario by helping to ensure an efficient use of limited health care resources, improving equitable access to early screening and standardizing best-practice care. In addition, through emphasizing points of integration across the continuum of care, the model will help to minimize the risk of patients ‘falling through the cracks’ or ‘getting lost in the system’.

The model represents an integrated, patient-centred organization of care, whereby patients move across the multiple levels of care as guided by disease complexity and risk of adverse outcomes. Care plans and health information are regularly shared across all levels to enable seamless individualized care and improved patient outcomes and to promote effective navigation through the system of care.

Through emphasizing points of integration across the continuum of care, the model will help to minimize the risk of patients ‘falling through the cracks’ or ‘getting lost in the system’.

The importance of active collaboration and close communication between providers to support smooth care transitions and efficient sharing of health information is reinforced.

In response to CorHealth’s continued aim to improve vascular care, reduce amputations and preserve limbs, this model for lower-limb preservation care is rooted to provide primary care, general community care clinics and/or home care settings with highly integrated and timely access to specialized wound care clinics and acute limb preservation centers for increasingly complex care.



Lower-Limb Preservation Model of Care Delivery

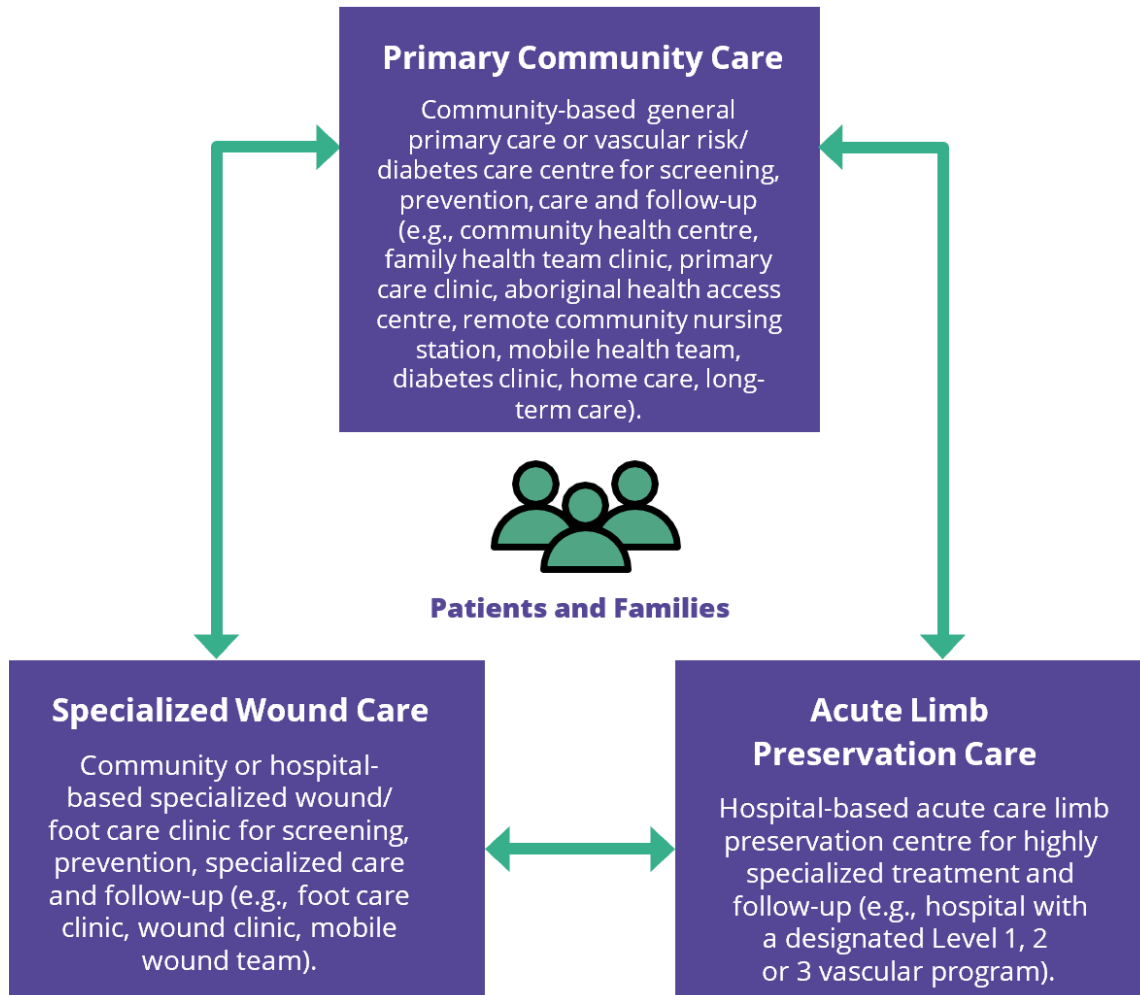
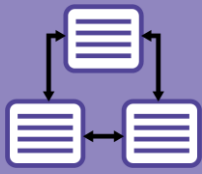


Figure 5. – Three-level model for integrated lower-limb preservation care in Ontario.

It should also be noted that, much of the primary and specialized care described in the model may be provided in the patient’s place of residence (e.g., home, retirement home, long-term care home), in keeping with a “care closer to home” priority, and/or virtually (e.g., electronic communication, phone, video conferencing) whenever possible.



Model for Lower-Limb Preservation Care Delivery

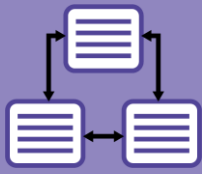
Model of Care Implementation: Key Considerations

The following are key considerations and practical guidance associated with the design, development and implementation/operationalization of an integrated lower-limb preservation model of care. These considerations are based on intra and extra jurisdictional lessons learned and successful practices and are not meant to be exhaustive, but each should be considered when establishing a regional integrated model of lower-limb preservation service delivery. These considerations include:

1. Adopting a patient-centred approach
2. Focusing on aligning patient needs and characteristics with the right care setting
3. Connecting providers across the continuum through a shared-cared approach
4. Establishing clear multilateral communication and care navigation
5. Adopting a collaborative interprofessional team approach
6. Exploring virtual care opportunities

1. Adopting a patient-centered approach

Consider adopting a patient-centered approach in each stage in the design, development and implementation/operation of the regional integrated lower-limb preservation model of care. Central to effective integrated care is active patient involvement in decision making, communications and navigation throughout the system. Involving patients and caregivers in co-building an integrated model of care can affirm and ground priorities in patients' needs and has the potential to identify 'blind-spots' early, as opposed to retrospective patient experience and satisfaction



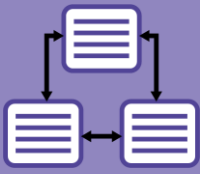
Model for Lower-Limb Preservation Care Delivery

reviews. Given the heterogeneity of the population at risk of lower-limb amputation, be inclusive of the diversity of patient/caregiver perspectives and experiences.




While this framework is rooted in clinical best-practice and has been co-developed as a result of clinical engagement, it is important to work with diverse communities to ensure that the framework in practice remains culturally appropriate and safe. For example, the application of this framework by Indigenous-focused interprofessional care teams should incorporate Indigenous leadership in decision making and aim to provide culturally-specific, coordinated and integrated best-practice care.

2. Focusing on aligning patient needs and characteristics with the right care setting

A robust system of care must be able to meet the continuously changing patient care needs in a timely manner and in the right setting and by the right provider. For patients with vascular disease and/or vascular risk factors including diabetes, the intensity of care and corresponding care setting should be determined by individual need, complexity, and risk of adverse outcomes. The following chart provides an example of the characteristics of patients with vascular disease and/or vascular risk factors including diabetes, aligned with the model:



Model for Lower-Limb Preservation Care Delivery

Primary Community Care 	Specialized Wound Care 	Acute Limb Preservation Care 
<p>Patients with:</p> <ul style="list-style-type: none"> no history of lower-limb wounds or tissue loss who require regular screening, preventative care, cardiovascular risk factor management and follow-up to prevent a lower-limb wound remission of a lower-limb wound who require ongoing surveillance and follow-up to prevent recurrence 	<p>Patients with no history of lower-limb wound or tissue loss who require:</p> <ul style="list-style-type: none"> preventative wound care and follow-up to prevent a lower-limb wound <p>Patients with a current lower-limb wound or tissue loss who require:</p> <ul style="list-style-type: none"> more specialized care and follow-up to treat the wound and minimize complications <p>Patients with:</p> <ul style="list-style-type: none"> remission of a lower-limb wound who require ongoing surveillance and follow-up to prevent recurrence 	<p>Patients with a current lower-limb wound or tissue loss who require:</p> <ul style="list-style-type: none"> highly specialized medical and/or surgical management to treat vascular disease and/or a lower-limb wound and related complications to preserve the limb

The intensity and level of care may increase or decrease over time based on the individual's complexity and risk. Patients may access the health care system at any time during the trajectory of their condition from initial diagnosis to end-of-life.

Lower-limb preservation services need to be able to provide timely and seamless access in response to the needs of the population they serve. As a result, care will need to be shared across providers with communication and privacy policies integrated within the regional network, working to ensure smooth care transitions. In this way the patient can receive the right care by the right informed provider at the



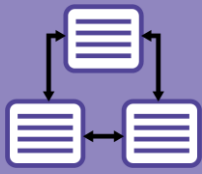
Model for Lower-Limb Preservation Care Delivery

right place and within the right time frame. For example, a patient initially diagnosed with an acute lower-limb wound infection may need urgent assessment and medical and/or surgical management by a vascular and/or other lower-limb preservation specialist at an acute limb preservation centre. As the patient's condition stabilizes and overall risk decreases, care may be shared with or transferred for management by wound care providers in the community, at home or at a generalized community care clinic, with ongoing specialized support as required.

3. Connecting providers across the continuum through a shared-care approach

Provision of high-quality care - by the right provider, at the right time, in the right place - must be rooted in available capacity to deliver care, which includes provider knowledge and skill sets that align to patient needs. As patient care needs intensify, transition from primary, community and/or home care to specialist care may be required. Transitions of care, however, can present risks including patient disorientation within their care journey, anxiousness associated with long or undefined wait times, as well as the potential to 'fall through the cracks' (e.g., become lost within the system, and/or missing treatment and care). A shared-care approach has two fundamental benefits/advantages: it can help to build capacity through timely access to specialized knowledge and skills, and it can help to ensure that patient transitions to specialists and back to primary, community and/or home care are well coordinated and seamless. Clear communication regarding transitions and expectations of care between teams, providers, and patients is a fundamental component of the shared-care approach.

There is, therefore, a need for an established (or perhaps expanded) regional health care provider network and an ongoing formal arrangement for a shared-care approach across the care continuum in the event of a change in clinical status. For example, an individual with a healed lower-limb wound with recurrent lower-limb issues such as pain or tissue loss may need referral back to a vascular and/or other lower-limb preservation specialist. Care should be quickly escalated and smoothly transferred to the acute limb preservation centre for timely assessment and/or treatment or support provided from specialists to guide management of individual care in the primary community care setting. Patients may require care from different settings within the model and regional network throughout their vascular and/or diabetes journey and wound trajectory. As such, a shared-care approach and integrated communication and collaboration among teams, providers and patients



Model for Lower-Limb Preservation Care Delivery

needs to be facilitated by well-established relationships and agreed-upon referral criteria.

Within the shared-care model	Benefits of shared-care
<ul style="list-style-type: none"> • Secure messaging between provider and specialist or team • Request for treatment and/or service/program options • Request for advice and/or identify if a referral is needed • Receive advice quickly and securely • Ability for bidirectional communications, discussion, or clarification 	<ul style="list-style-type: none"> • Rapid access to experience-based specialist knowledge • Reduced patient anxiety related to delayed treatment • Decreased patient travel • Improved knowledge sharing between clinicians • Improved confidence in the comprehensive plan of care • Increased collaboration between different providers and teams

4. Establishing clear multilateral communication and care navigation

Given the health diversity (e.g., differences in clinical conditions and circumstances) of the population at risk of lower-limb amputation and the resultant complexity in navigating care providers and settings, seamless and coordinated care should be founded on clear, accurate and multi-directional communication and health information sharing, as well as personalized care navigation (e.g., navigation that is tailored to the unique needs of the patient, wherever they are in their care journey). Care navigation for people at risk of lower-limb amputation can help patients and caregivers understand where they are within their care journey. In addition to improving care and outcomes, proper care navigation can promote shared decision making, smoother care transitions and overall better patient and caregiver experiences.

Multilateral communication links (e.g., through shared technology and/or standard referral and documentation forms), collaboration and knowledge transfer as guided by individual need and preference, can help to support smooth care transitions, efficient health information sharing and improved health outcomes. Where possible, a dedicated triage/navigation coordinator can help facilitate timely and appropriate access between providers within the regional network.



Model for Lower-Limb Preservation Care Delivery

The articulation of this framework may look different depending on the context of care delivery, including but not limited to varying access to health care services in remote, rural, Northern and/or Indigenous communities. Partnerships, for example with Indigenous community leaders, tribal councils, health cooperatives and established Indigenous health programs, across larger geographies with strong communication channels and processes can support this gap. While the coordination of care may look different depending on where the care is being delivered across Ontario, the pathways, minimum care requirements and model of care should be followed wherever possible and adapted according to regional settings, needs, resources and contexts.

5. Adopting a collaborative interprofessional team approach

There is good evidence that successful implementation of a collaborative interprofessional team approach to lower-limb preservation care can result in significant reductions in lower-limb amputation rates and many international organizations have recognized the benefits of this approach. Of course, enlisting patient and family/caregivers as part of the team is also imperative. A coordinated and integrated, interprofessional system of care for preventing and managing lower-limb wounds can not only improve patient outcomes but also improve patient and provider experience and lower the cost of care (quadruple aim).

Following is a list of interprofessional team members who have a role to play in preserving limbs in Ontario.

- Allied regulated health professionals (physical therapists, occupational therapists, kinesiologists, dietitians, social workers, pharmacists)
- Community health workers
- Foot specialists (chiropractors, podiatrists, pedorthists)
- Home care providers
- Hospital administrators and medical directors
- Indigenous leaders, health care workers and healers
- Nurses (registered practical nurses, registered nurses, nurse practitioners) with wound expertise
- Orthotists/prosthetists with wound expertise
- Pain management specialists
- Medical specialists (family medicine, emergency department, endocrinologists, physiatrists, infectious disease specialists, nephrologists)



Model for Lower-Limb Preservation Care Delivery

- Surgical specialists (vascular, vascular interventional radiology, orthopedic, foot and ankle, plastic)
- Wound specialists (Nurses Specialized in Wound, Ostomy and Continence (NSWOC) certified; International Interprofessional Wound Care Course (IIWCC); Master's level graduate degree in wound care; American Board of Wound Management Certified Wound Specialist)

How these team members fit into the model and the role they play will depend on regional availability and resources. Additionally, teams may include members from various settings. The model allows for flexibility in the co-development and implementation of lower-limb preservation teams and services, accommodating unique regional needs and resources. However, it is important to build teams with the knowledge, skills and abilities to meet the lower-limb preservation minimum care requirements. Wound care expertise is particularly important and should always be provided by credentialed wound care experts.

Additionally, developing opportunities for knowledge sharing and regional capacity building (e.g., through communities of practice), providing education/training for providers wishing to expand their skills/role and developing advanced medical directives to allow an expanded scope of practice (e.g., to allow remote nurses to refer directly to a vascular and/or other lower-limb preservation specialist), among other ideas, may be considered. It should also be noted that successful programs/services require organizational and system support and, as such, organizations and leaders are encouraged to work to co-develop policies, processes and strategies to support lower-limb preservation across Ontario.

Clearly articulating accountability is key to the success of this collaborative framework. As an example, the development of OHTs provides a unique opportunity for the articulation of this framework within a pre-defined relationship and accountability structure. With OHTs being clinically and fiscally responsible for delivering a full and coordinated continuum of care to a defined geographic population, they are able to work together as a team to deliver this care for patients at risk for lower-limb amputation. Lower-limb preservation programs are well-suited as a model for future OHTs.



Model for Lower-Limb Preservation Care Delivery

6. Exploring virtual care opportunities

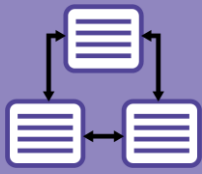
The practice of virtual care, the delivery of health care services where patients and providers are separated by distance, has significantly expanded in many areas of the health care system in response to the COVID-19 pandemic. Virtual care offers increased access to patient care in urban, remote, rural, Northern and/or Indigenous communities, while reducing direct and indirect costs for patients and families. Virtual care may also be considered within the framework of the quadruple aim of better outcomes, increased value for money and better patient and provider experience.

Virtual care presents unique opportunities for preventing and managing lower-limb wounds by increasing collaboration and communication across the lower-limb preservation system. While frequent visits to wound clinics for wound assessment and management are often a reality, using virtual care platforms offer the opportunity for patients to receive some components of wound and/or specialist care from their own home or community. For example, with the appropriate supports and technology in place, virtual care can provide the specialist with the critical information required to make informed decisions about the need for in-person care and management. Additionally, collaborative virtual visits between the specialist and another health care provider present with the patient in their home or community offers the opportunity to increase access to care and at the same time increase competency and build relationships to support a shared-care approach.

Virtual care presents unique opportunities for preventing and managing lower-limb wounds by increasing collaboration and communication across the lower-limb preservation system.

Key Challenges & Opportunities for Virtual Wound Care

The following shares some key challenges and offers opportunities for the use of virtual care for lower-limb wound prevention and management.



Model for Lower-Limb Preservation Care Delivery

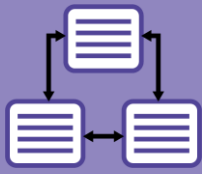
Challenges

- The vascular patient population tends to be older and may not be comfortable with technology leading to difficulties using virtual care options.
- Some virtual vascular wound or diabetic foot complication care is reliant on home care nursing which may not be available to all patients.
- Infrastructure in some remote, rural, Northern and/or Indigenous communities can be sub-optimal, resulting in unreliable and/or inconsistent connections at times.
- A lack of availability of other technology tools to support virtual care (e.g., wound management software to enhance remote monitoring and clinical photography) may limit use.

Opportunities

1. Consider the set-up of virtual care prior to hospital discharge; patients should be aware that it will be used post-discharge, with pre-virtual care readiness complete.
2. Use wound care virtual apps for photo sharing and wound assessment and measurement as well as measurement of wound-level outcomes.
3. Align regional team members to a common app or platform so that individual information is accessible to the entire care team across the care continuum.
4. Measure and monitor the efficiency and effectiveness of virtual wound care and in particular how an individual moves along the care pathway and their wound trajectory.
5. Be aware of privacy requirements and how to comply with the Personal Health Information Protection Act (PHIPA) when using virtual care in the wound care space, especially when messaging/sharing of wound photographs or images is required.

Virtual care is seen by many as a 'new normal' following the COVID-19 pandemic. Ongoing work is needed to overcome the challenges and create consistent, evidence-informed guidance and standards around the appropriate use and delivery of virtual care.



Model for Lower-Limb Preservation Care Delivery

The following articles provide additional virtual care guidance:

- [Virtual Care Delivery to Cardiac, Stroke, and Vascular Patients – Learnings for Beyond the COVID-19 Pandemic](#) published in November 2020 by CorHealth Ontario
- [Policy 101 Virtual Care: Policy and Practice Implications for Wound Management](#) published in the Spring 2020 (volume 18, number 1) edition of Wound Care Canada
- [Fast-track Pathway for Diabetic Foot Ulceration during COVID-19 & Beyond](#) published in August 2020 by the International Diabetic Foot Care Group and D-Foot International
- [Virtual Care Playbook](#) published in March 2020 by the Canadian Medical Association, The College of Family Physicians of Canada and the Royal College of Physicians and Surgeons of Canada
- [Virtual Care Guide for Patients](#) published in June 2020 by the Canadian Medical Association, The College of Family Physicians of Canada and the Royal College of Physicians and Surgeons of Canada

Key Lower-Limb Preservation Care Components

Below is a high-level summary of the minimum care requirements aligned with the model of care. The table outlines the key lower-limb preservation care components (e.g., expertise, infrastructure, resources) and provides guidance as to where each of the components can be delivered (e.g., primary community care, specialized wound clinic and/or acute limb preservation centre as defined within the model of care). These components can be used as building blocks to guide and support organizations, administrators and champions in the co-development of regional lower-limb preservation services based on regional needs and resources. How services are developed, implemented and adopted may be unique across different regions in the province. These care components are meant to provide a vision of what an ideal regional lower-limb preservation program can look like.

Lower-Limb Preservation Care Components			
Care Components	Primary	Specialized	Acute
Shared-care approach with seamless collaboration and communication across the regional continuum of care	✓	✓	✓
Provision of home or community-based vascular, foot, lower-limb and/or wound screening, assessment, primary care and prevention	✓	✓	
Clinician/team with expertise and demonstrated competence in: <ul style="list-style-type: none"> • health assessment • vascular and foot screening (including pedal pulses and/or access to ankle/toe brachial index measurement and/or vascular ultrasound) • risk assessment, identification and referral • care planning • patient education (including wound prevention and self-management) • cardiovascular risk factor modification • wound prevention strategies 	✓	✓	

Lower-Limb Preservation Care Components			
Care Components	Primary	Specialized	Acute
Processes and partnerships in place for timely referral for vascular diagnostic testing/imaging	✓		
Processes and partnerships in place for timely referral to specialized care for vascular, foot, lower-limb and/or wound assessment and treatment	✓	✓	
Provision of home, community or hospital-based lower-limb wound care		✓	✓
Specialized lower-limb wound care clinician/team with expertise and demonstrated competence in the comprehensive assessment and management of lower-limb wounds including: <ul style="list-style-type: none"> cleansing, debridement and infection, moisture and pain management development of a wound care plan and responding to wound trajectory supportive mobility devices continued wound prevention strategies 		✓	✓
Appropriate inventory of consumable lower-limb wound assessment equipment and treatment supplies that are immediately available		✓	✓
Provision of specialized acute lower-limb preservation medical and/or surgical care within 72 hours depending on severity			✓
Highly specialized lower-limb preservation interprofessional care team with expertise and demonstrated competence in the assessment and management of patients with vascular disease and/or a lower-limb wound including: <ul style="list-style-type: none"> vascular diagnostic testing/imaging medical and/or surgical management including wound treatment, revascularization, soft tissue reconstruction and foot and ankle surgery advanced wound therapies 			✓

Lower-Limb Preservation Care Components			
Care Components	Primary	Specialized	Acute
Co-location in the same physical space if possible			
Hospital with a designated Level 1, 2 or 3 vascular program			✓
Appropriate inventory of consumable lower-limb preservation medical and surgical treatment supplies that are immediately available			✓
Hyperbaric oxygen chamber where possible			✓
On-site urgent/emergent diagnostic testing/imaging (e.g., Computed Tomography Angiography (CTA), Magnetic Resonance Angiography (MRA) and angiography) and results			✓
On-site urgent/emergent specialist/surgeon expertise (e.g., vascular; infectious disease; orthopedic, foot and ankle, plastic) to support lower-limb preservation			✓

Summary

CorHealth embarked on a journey to develop a Lower-Limb Preservation Strategy to improve the outcomes and experiences of patients at risk of non-traumatic major lower-limb amputation in Ontario. This framework offers practical evidence-informed best-practice considerations for implementation of integrated and standardized lower-limb preservation care based on regional needs. An accompanying Change Package provides actionable change ideas, tools and resources that can be adopted and/or adapted to improve lower-limb preservation care delivery, services and outcomes. Also included in the strategy is a measurement and reporting plan to evaluate change success and monitor provincial outcomes, as well as policy work to identify potential opportunities to improve funding policy to support lower-limb preservation. Those who are interested in joining this journey will hopefully be inspired and enabled to do so. CorHealth continues to recognize the immense value of improving lower-limb preservation care in Ontario and will continue to offer support and guidance where possible to other organizations and champions of lower-limb preservation care.

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Appendix

Lower-Limb Preservation Strategy Advisory Committee

Name	Role	Organization
Dr. Ahmed Kayssi (Chair)	Vascular Surgeon	Sunnybrook Health Sciences Centre
Dr. Mohammed Al-Omran	Vascular Surgeon	St. Michael's Hospital
Ms. Roslynn Baird	Executive Director	Indigenous Diabetes Health Circle
Ms. Mariam Botros*	Chief Executive Officer	Wounds Canada
Mr. Jeremy Caul*	Registered Nurse/ Case Manager	Sioux Lookout First Nations Health Authority
Lindsey Cosh	Foot Care Program Coordinator	Indigenous Diabetes Health Circle
Dr. Heather Cox	Vascular Surgeon	Peterborough Health Sciences Centre
Dr. Karen Cross*	Plastic Surgeon	St. Michael's Hospital
Dr. Robyn Evans*	Medical Director, Wound Healing Clinic	Women's College Hospital
Ms. Catharine Gray	Chair, Chiropody Program	The Michener Institute of Education, UHN
Mr. Pierre Hanna	Patient Advisor	
Dr. James Hill*	Chiropodist, Podiatric Physician & Surgeon	Foot Care Institute, Windsor Ontario John D. Dingell VA Medical Center, Detroit, Michigan
Mr. Dominic Hough	Chiropodist	Central Lambton Family Health Team
Dr. Varun Kapila*	Vascular Surgeon	William Osler Health System
Dr. Warren Latham	Orthopedic Surgeon	Scarborough Health Network
Mr. Robert Little*	Patient Advisor	

Name	Role	Organization
Ms. Tarrah Long*	Clinical Lead, Wound Care & Tissue Viability	Niagara Health System
Ms. Dawn MacDonald*	Director, Wound Program	St. Joseph's Care Group, Thunder Bay
Dr. Peter Magner	Internal Medicine/ Nephrology	The Ottawa Hospital
Ms. Lina Martins	Clinical Nurse Specialist, Skin & Wound Care	London Health Sciences Centre
Ms. Amanda Mayo	Physiatrist	Sunnybrook Health Sciences Centre
Ms. Ann-Marie McLaren*	Chiropodist	St. Michael's Hospital
Dr. Oleg Mironov	Interventional Radiologist	St. Joseph's Healthcare Hamilton
Ms. Mary Ellen Mitchell*	Chiropodist	Elliot Lake Family Health Team
Ms. Theresa Morris*	Director of ED, Trauma and Flow	Windsor Regional Hospital
Dr. Christine Murphy*	Vascular Nurse Specialist, Limb Preservation/Vascular Wound Care; Assistant Professor, Wound Healing Program	The Ottawa Hospital Western University
Ms. Tiffany Ng	Chiropodist	North York Family Health Team
Mr. Steve Ramganesh	Nurse Practitioner: Wound Management	William Osler Health System
Dr. Andrew Simpson	Orthoplastic Surgeon	London Health Sciences Centre
Ms. Jacky Sweetnam*	Manager, Home & Community Care Branch	Ministry of Health
Ms. Shelley Tees	Wound & Limb Preservation Clinical Nurse Specialist	Thunder Bay Regional Health Sciences Centre
Ms. Jennifer White*	Director Renal, Diabetes, Metabolic & Oncology	Peterborough Health Sciences Centre

Name	Role	Organization
Dr. Catharine Whiteside	Executive Director, Diabetes Action Canada - CIHR SPOR Network	University Health Network, University of Toronto

*Members of the Framework Working Group, chaired by Dr. Christine Murphy

The Ontario Ministry of Health was a meeting observer at Advisory Committee meetings and had the opportunity to review and provide feedback on the development of this Ontario Framework for Lower-Limb Preservation.