

Limb

Preservation

IN CANADA

Limb Preservation Opportunities

**Management for
People Living with Chronic
Lower-limb Ulcers**

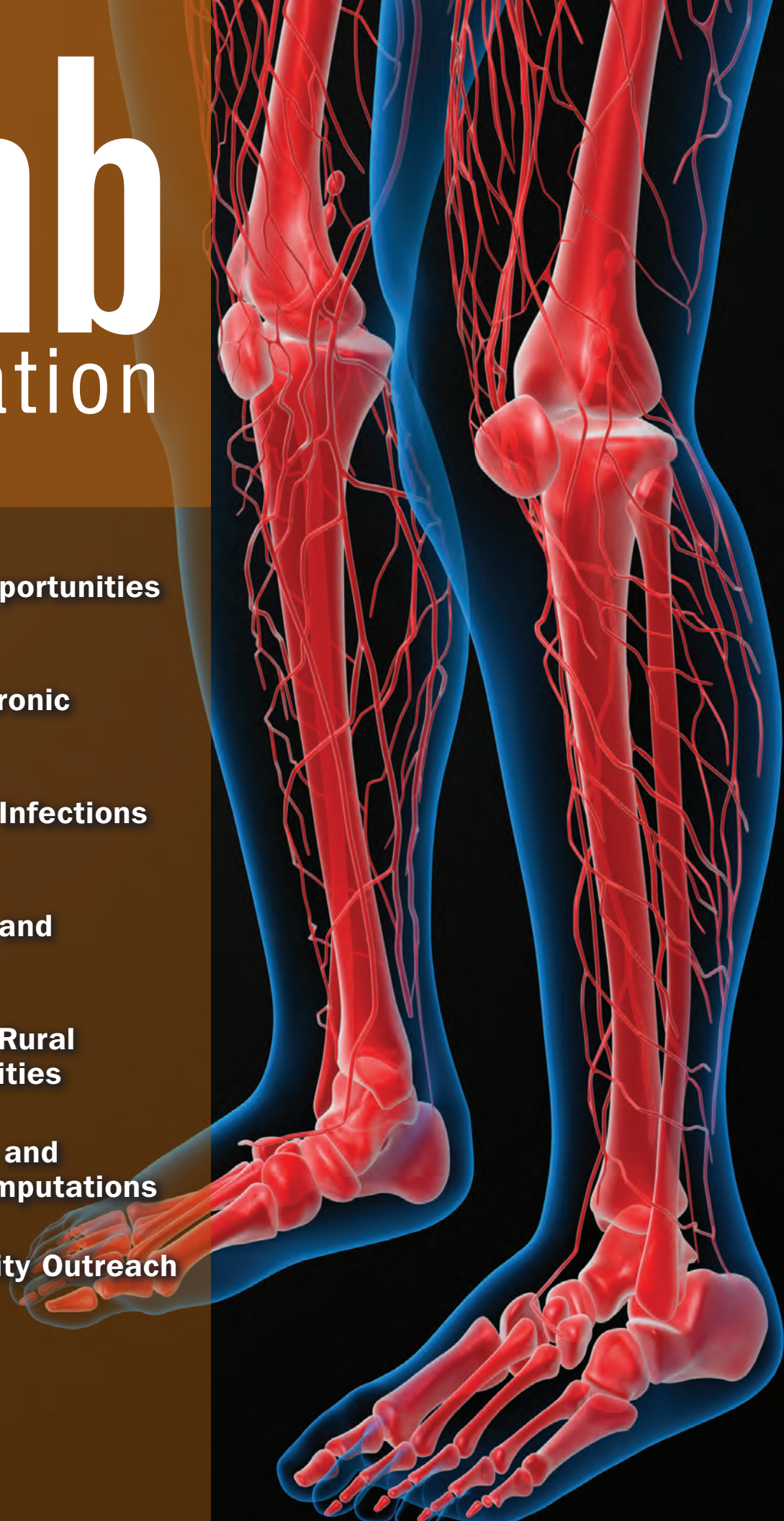
Management of Foot Infections

**Prevention of
Recurrent Ulceration and
Amputation**

**Limb Preservation in Rural
and Remote Communities**

**Pathways, Strategies and
Policies to Prevent Amputations**

Research in Community Outreach



A recently published meta-analysis suggests 3M™ Veraflo™ Therapy could become your new standard of care.

A meta-analysis of 13 studies with 720 patients reported Veraflo Therapy had a significant effect on clinical outcomes when compared to standard of care including 3M™ V.A.C.® Therapy.



**Length of therapy reduced
by more than half.**

(9.88 days vs 21.8 days, $p=0.02$)^{1,2}



Wounds were **2.39 times
more likely to close.**

($p=0.01$)¹

**You know the science
behind V.A.C.® Therapy.**

**Now, know the data
behind Veraflo Therapy.**



To learn more about why you should **Start Smart** with Veraflo Therapy,
please contact your local Sales Executive or visit 3M.ca/connect.

References:

1. Gabriel A, Camardo M, O'Rourke E, Gold R, Kim PJ. Effects of Negative-Pressure Wound Therapy With Instillation versus Standard of Care in Multiple Wound Types: Systematic Literature Review and Meta-Analysis. *Plast Reconstr Surg*. 2021 Jan 1;147(1S-1):68S-76S. doi: 10.1097/PRS.0000000000007614. PMID: 33347065.
2. Camardo, Mark. "Veraflo Meta-Analysis Standardized and Non-Standardized Means.", 3M Internal Report, San Antonio, Texas, 2020.

Available in Canada from your authorized 3M-KCI distributors.
KCI USA, Inc., a 3M Company
KCI owned and operated by 3M Company

KCI Medical Canada Inc.
75 Courtneypark Dr W, Unit 4
Mississauga, ON
L5W 0E3

KCI USA, INC.
12930 IH 10 West
San Antonio, TX
78249

NOTE: Specific indications, contraindications, warnings, precautions and safety information exist for these products and therapies. Please consult a clinician and product instructions for use prior to application. This material is intended for healthcare professionals.

© 2021, 3M. All rights reserved. 3M and the other marks shown are marks and/or registered marks. Unauthorized use prohibited. Used under license in Canada. 2103-19878-E PRA-PM-CA-00192 (03/21)

Contents

| | |
|------------------------------------------------------------------------------------------------|----|
| From the Editor | 5 |
| How a Multidisciplinary Approach Can Change the Fate of Our Patients with Diabetic Foot Ulcers | 6 |
| Management for People Living with Chronic Lower-limb Ulcers | 10 |
| The Management of Foot Infections | 13 |
| The Prevention of Recurrent Ulceration and Amputation | 17 |
| Challenges to and Opportunities for Limb Preservation in Rural and Remote Communities | 21 |
| Implementing Best Practice in Alberta: A Diabetes Foot Care Clinical Pathway | 26 |
| Building the Framework: Developing an Ontario Strategy for Lower-limb Preservation | 30 |
| How to Convince Decision Makers to Invest in Limb Preservation | 34 |
| The Diabetes Foot Care Facebook Group Study | 37 |
| Recommended Reading | 40 |
| Diabetes, Healthy Feet and You—Train-the-Trainer: A Quality Improvement Inquiry | 42 |

Get on the List

Each time a new issue of *Limb Preservation in Canada* becomes available, subscribers will be notified by an email that contains a live link to the online magazine. If you are not already a subscriber, get on the list by sending an email to info@woundscanada.ca. It's free!

Presented in
conjunction with



Limb Preservation in Canada

2021 · Volume 2, Number 1

ISSN 2562-8712

Editor-in-Chief Ahmed Kayssi, MD MSc MPH FRCSC

Editorial Board

Zaina Albalawi, MD MSc FRCPC
Maryse Beaumier, MSc PhD
Julien Bernatchez, MD FRCSC
Karen Campbell, PhD RN NSWOC
Marc-Antoine Despatis, MSc MD FRCSC
Randy Guzman, MD FRCSC FACS RVT RPVI
Warren Latham, BSc MD FRCSC MSc
Perry Mayer, MB BCH FFPM RCPS
Charles de Mestral, MDCM PhD FRCSC RPVI
Elise Rodd, RN BScN ETN
Alan Rogers, MBChB FC Plast Surg MMed FRCSC MSc
Scott Schumacher, DPM DABPS DABPM FAPWHC FASPS FACFAS
Matthew Smith, BSc MSc RPVI FRCSC
Tom Weisz, DCh BA IIWCC

Contributors

Eliot To, DCh MClSc (Wound Healing) HBSc
Heather Ibbetson, BN BA

Wounds Canada

Senior Editor Sue Rosenthal, BA MA
Assistant Editor Katie Bassett, BMus
Creative Director Robert Ketchen, BASc ACIDO
Advertising Sales Addie North, BA(Hons); Maureen Rego
416-485-2292 · info@woundscanada.ca

All editorial material published in *Limb Preservation in Canada* represents the opinions of the writers and not necessarily those of Wounds Canada.

Discussions, views and recommendations as to medical procedures, choice of treatments, dosage or other medically specific matters are the responsibility of the writers. No responsibility is assumed by the publisher or publishing partners for any information, advice, errors or omissions contained herein.

The inclusion of advertising and sponsored material in *Limb Preservation in Canada* does not constitute a guarantee or endorsement of any kind by Wounds Canada.

All rights reserved. Contents may not be reproduced without written permission of the Canadian Association of Wound Care. © 2021.

Wounds Canada (www.woundscanada.ca) is a non-profit organization dedicated to the advancement of wound prevention and care in Canada. Wounds Canada was formed in 1995 as the Canadian Association of Wound Care.

Wounds Canada Board of Directors

President Barbie Murray, MCISc-WH BScN RN
Past President Morty Eisenberg, MD MScCH CCFP FCFP
Irmajean Bajnok, PhD MScN BScN RN
John Hwang, MD MSc FRCSC
Ahmed Kayssi, MD
Janet Kuhnke, RN BA BScN MS NS-WOC
Ellen Mackay, MSc RD CDE
Petra O'Connell, BSc MHSA
Andrew Springer, DCh
Chairman Emeritus R. Gary Sibbald, BSc MD FRCPC (Med Derm) MACP
CEO Mariam Botros, DCh DE IIWCC

Advancing Lymphedema Care

Supporting health professionals in their lymphedema practice

PATHWAYS MAGAZINE



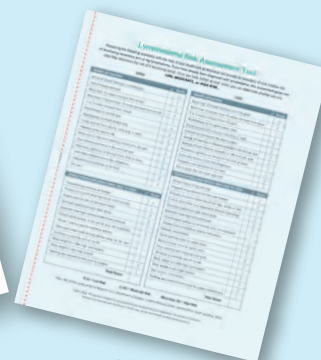
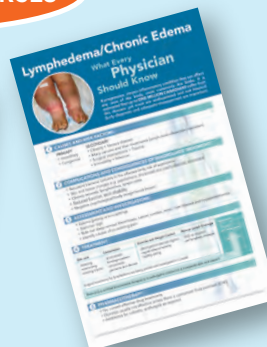
- Up-to-date clinical perspectives and research news
- Written by leading Canadian and International lymphedema experts
- Reviewed by a strong Editorial Board
- Now in print and digital format

SUBSCRIBE TODAY

LYMPHEDEMA RESOURCES



HP TOOL KIT



- Lymphedema assessment tools
- Case studies by lymphedema professionals
- PowerPoint slides and presentations
- Patient and GP education materials ■ Photo library

SUBSCRIBE TODAY

www.canadalymph.ca

National Lymphedema Conference

“Moving Evidence into Practice”

November
26-27, 2021
VIRTUAL

Highly Interactive
Sophisticated 3D Platform
Virtual Exhibit Hall
Live Streaming Sessions
On Demand Viewing
Expert Q&A Forums
Poster Presentations
International
Networking

Call for
ABSTRACTS OPENS
APRIL 15, 2021

www.canadalymph.ca/conference

CLF
CANADIAN
LYMPHEDEMA
FRAMEWORK



PCL
PARTENARIAT
CANADIEN DU
LYMPHOEDÈME

...In collaboration with...



WoundsCANADA.ca

From the Editor- in-Chief

Dear colleagues,
The 2020 Wounds
Canada Limb
Preservation Symposium took
place virtually and in the
midst of a pandemic that has
impacted every aspect of our
personal and professional lives.



Across Canada and much of the world, health-care professionals and patients have scrambled to understand and adapt to a constantly evolving crisis and its effects. This has understandably been traumatic for many of our colleagues battling the pandemic on the front lines. We are thankful to those who have put their lives at risk while performing their duties, and to those who have fought hard to ensure that our communities receive the health-care services they need. We salute you and are grateful for all the incredible work you do.

Patients at risk for limb loss have been hit especially hard by the pandemic. Community and hospital-based health-care services, already scarce in many parts of the country, became even less accessible. The pandemic has amplified the urgent need for better co-ordination of amputation prevention services and the creation of clearly defined pathways through which patients can be prioritized and treated.

Despite the considerable challenges faced by our community, the pandemic has also provided us opportunities to challenge the status quo and to explore ways of better serving our patients. The ability to organize large meetings virtually has allowed us to broaden our reach to corners of the

country otherwise not easily accessible. World-renowned limb preservation organizations, such as our keynote speaker Dr. Giacomo Clerici's centre in Italy, continue to provide comprehensive interdisciplinary care for their patients, despite the pandemic.

As the speakers at the Wounds Canada Limb Preservation Symposium in October 2020 made clear, significant advances have been made in the management of non-healing wounds, including the management of lower extremity infections and chronic pain. We heard about the importance of caring for patients even after they undergo an amputation, in order to prevent re-amputation. We also learned about the importance of gathering and analyzing data when conversing with health-care policy decision-makers. Finally, we were reminded of the significant challenges facing our Indigenous communities and the role that wearable and other technologies can play in addressing some of these issues. The symposium speakers have graciously allowed summaries of their sessions to be shared here with you.

Thank you for your passion for limb preservation and amputation prevention. May we all get through this difficult time together as a diverse community of practice, stronger and more knowledgeable, and committed to patient advocacy and care.

Respectfully,

A handwritten signature in blue ink that reads "Ahmed Kayssi".

Ahmed Kayssi, MD MSc MPH FRCSC

How a Multidisciplinary Approach Can Change the Fate of Our Patients with Diabetic Foot Ulcers

By Giacomo Clerici, MD

The diabetic foot is not a disease but a syndrome that leads to a heightened risk of amputation and mortality. Diabetic foot syndrome is complex, often affected by overlapping and conflicting factors (such as neuropathy, ischemia and infection). Patients at higher risk of major amputation usually have infection, ischemia or both. This includes patients with advanced diabetic foot syndrome. To reduce the risk of amputation, health-care teams must pursue an aggressive treatment plan.

The rate of death for patients with diabetic foot ulcers is 2.5 times higher than for patients with diabetes who do not have diabetic foot ulcers.¹ Ulceration is also correlated to a higher mortality rate than the most frequent oncological diseases or cancers.² In 2006 we published the data of 564 patients with ischemic diabetic foot. The mortality rate of the patients who underwent a successful revascularization was 50% after five years; when revascularization could not be carried out, mortality was 50% after six months.³

A skillful interprofessional team and timely therapeutic strategies are essential for effectively managing diabetic foot ulcers, and a multidisciplinary approach can have a substantial impact on

the prognosis of these patients.⁴ Studies around the world have shown that setting up an interdisciplinary foot care team and implementing strategies for the prevention and management of diabetic foot disease is associated with a decrease in the frequency of diabetes-related lower extremity amputations (LEAs): in Italy from 2001 to 2010, nationwide analyses confirmed a progressive reduction of hospitalization and amputation rates for major LEAs when using a multidisciplinary approach.⁵

A multidisciplinary approach should be based on the following four key aspects:

- **Medical:** to ensure metabolic control, to evaluate long-term complications and factors like infections, ischemic heart disease, renal insufficiency, nutrition and anemia
- **Vascular:** to evaluate the degree of ischemia related to wounds, to define the treatment plan, to perform open or endovascular surgery and to manage peripheral arterial disease
- **Surgical:** to perform emergent debridement or amputations for infection control, to plan advanced surgery, for surgical management of osteomyelitis, to perform amputations, to per-

Case Study

A picture of a patient's foot with an ischemic and infected ulcer was circulated on the social media platform Twitter to seek provider input (Figure 1). The post received several suggestions that recommended that the foot be taken for immediate primary amputation. The patient had a very high white blood cell count, but by removing all of the infected tissues and pursuing an aggressive treatment plan, the multidisciplinary team only had to amputate the toes (transmetatarsal amputation) and treat superficial ulceration with a dermal substitute. Within a few weeks, the wound was healed.

Figures 1 (a–e): The healing progression of an ischemic, ulcerated foot after amputation



form reconstruction of the foot and to correct foot deformities and joint instabilities

- **Rehabilitation and prevention:** to screen and classify risk, to select shoes and orthotics, and to educate the patient and provide psychological support

It is also helpful to have a team leader who can manage impaired metabolic control, diabetic com-

plications, comorbidities and acute and chronic ulcers, and diagnose soft tissue or bone infections.

Foot-care is a cornerstone for treating patients with active ulcers or wounds. Three essential therapies increase the chances of ulcers healing: correct offloading (with the use of a total contact cast, or non-removable or removable knee-high walkers), aggressive treatment of infection and revascu-

larization in case of ischemic lesions or chronic limb-threatening ischemia.^{6–10}

One procedure that can work to reduce amputation is revascularization down to the foot in patients with chronic limb-threatening ischemia (CLTI). This procedure has yielded impressive results and has contributed to a reduction in the amputation rate over the last 20 years. However, patients with amputation still face high mortality rates. It is imperative, therefore, that a multidisciplinary team continue to follow the patient.

Revascularization is recommended even if patients have no tissue loss but do have rest pain, as revascularization eases rest pain and reduces amputation risk. Revascularization can help preserve the limb by improving blood flow and can be performed on patients without significant tissue loss (small ischemic ulcers) as a curative mechanism. (In the author's personal experience, 99% of amputations are preceded by an ulceration.) Revascularization is not synonymous with limb preservation, however. It has to be deployed alongside corrective offloading, foot care and adjunctive therapies (e.g., negative pressure therapy, dermal substitutes).

Conclusion

Today we have many effective therapies, tools and strategies that can reduce the amputation rate. As we move forward, amputation must be an option only rarely for patients with diabetes. Since a majority of amputations are preceded by an ulceration, the most effective way to reduce them is to prevent ulcers. Screening for neuropathy and arteriopathy, the use of correct shoes and insoles, and patient education could effectively change the fate of our patients. ■

References

1. Brownrigg JR, de Lusignan S, McGovern A, Hughes C, Thompson MM, Ray KK, Hinchliffe RJ. Peripheral neuropathy and the risk of cardiovascular events in type 2 diabetes mellitus. *Heart*. 2014;100(23):1837–1843.
2. Armstrong DG, Cohen K, Courric S, Bharara M, Marston W. Diabetic foot ulcers and vascular insufficiency: Our population has changed, but our methods have not. *J Diabetes Sci Technol*. 2011;5(6):1591–1595.

3. Faglia E, Clerici G, Clerissi J, Gabrielli L, Losa S, Mantero M, et al. Early and 5-year amputation rate in patients with critical limb-threatening ischemia: Data of a cohort study of 564 patients. *Eur J Vasc Endovasc Surg*. 2006;32(5):484–490.
4. Anichini R, Brocco E, Caravaggi CM, Da Ros R, Giurato L, Izzo V, Meloni M, et al. Physician experts in diabetes are natural team leaders for managing diabetic patients with foot complications. A position statement from the Italian diabetic foot study group. *Nutr Metab Cardiovasc Dis*. 2020;30(2):167–178.
5. Lombardo FL, Maggini M, De Bellis A, Seghieri G, Anichini R. Lower extremity amputations in persons with and without diabetes in Italy: 2001–2010. *PLoS One*. 2014;9(1):e86405.
6. Faglia E, Caravaggi C, Clerici G, Sganzeroli A, Curci V, Vailati W, et al. Effectiveness of removable walker cast versus nonremovable fiberglass off-bearing cast in the healing of diabetic plantar foot ulcer: A randomized controlled trial. *Diabetes Care*. 2010;33(7):1419–1423.
7. Piaggese A, Goretti C, Iacopi E, Clerici G, Romagnoli F, Toscanella F, Vermigli C. Comparison of removable and irremovable walking boot to total contact casting in offloading the neuropathic diabetic foot ulceration. *Foot Ankle Int*. 2016;37(8):855–861.
8. Clerici G, Faglia E. Saving the limb in diabetic patients with ischemic foot lesions complicated by acute infection. *Int J Low Extrem Wounds*. 2014;13(4):273–293.
9. Faglia E, Clerici G, Caminiti M, Quarantiello A, Gino M, Morabito A. The role of early surgical debridement and revascularization in patients with diabetes and deep foot space abscess: Retrospective review of 106 patients with diabetes. *J Foot Ankle Surg*. 2006;45(4):220–226.
10. Faglia E, Dalla Paola L, Clerici G, Clerissi J, Graziani L, Fusaro M, et al. Peripheral angioplasty as the first-choice revascularization procedure in diabetic patients with critical limb ischemia: Prospective study of 993 consecutive patients hospitalized and followed between 1999 and 2003. *Eur J Vasc Endovasc Surg*. 2005;29(6):620–627.

Giacomo Clerici is a graduate in medicine and surgery at the University of Pavia. He specialized in internal medicine and trained in diabetic foot care. He is a former member of the Italian Diabetes Associations, SID and AMD, and The European Diabetic Foot Study Group (DFSG) of EASD. He is a member of the International Association of Diabetic Foot Surgeon (A-DFS). He has written several papers and chapters in books dedicated to diabetic foot problems and has spoken at many international conferences and courses worldwide (Canada, US, Mexico, India, China, Brazil, Saudi Arabia, Israel). Currently, he is a professor in the Master's in Wound Care program at Bicocca University, Milan, and the co-ordinator of diabetic foot centres in the northern and southern parts of Italy.

Continue your education with ...



- ✓ Built on decades of excellence in educational programs for health-care professionals
- ✓ Flexible, interprofessional education
- ✓ Online courses, webinars, hands-on skills labs and live events
- ✓ Developed, reviewed and delivered by Canada's top skin and wound experts
- ✓ Students engage in the type of education best suited to their current level of expertise, specific interests, time availability and resources

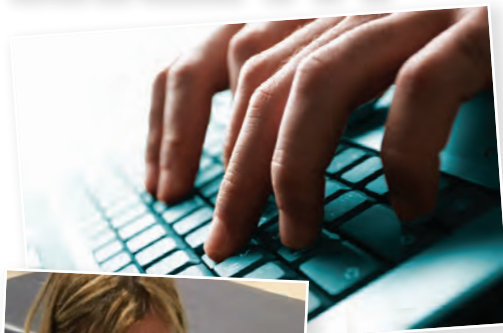
What our students have to say:



Take this course and take good notes for the future, as there is so much to absorb and lots of networking opportunities. – *Christine*

Do it. Well organized and great focus on theory prior to course makes for a better in-class experience. – *Barbara*

Great experience, non stressful environment, supportive. – *Maria*



Management for People Living with Chronic Lower-limb Ulcers

By Barbie Murray, MCISc-WH BScN RN; Martin Van der Vyver, MD FRCPC

Managing chronic lower-limb ulcers involves using both best practice guidelines and strategies for pain management. Wounds Canada's Best Practice Recommendations support the identification of strategies for the effective management of complex issues related to non-healing arterial and venous ulcers of the lower extremity. Clinicians are advised to conduct a comprehensive assessment of the patient, including a complete history of physical and psychosocial factors, as opposed to focusing only on the wound.

A Patient Priority Approach

Even when managing the local wound becomes the physician's priority, pain management is often the patient's priority. To encourage patient engagement in the process of healing, their priorities of care have to be put first. The management of pain should include consideration of the following: pain from infection, pain from the wound and skin, and neuropathic pain. This may involve multi-level and targeted strategies.

Additional strategies that can be beneficial in managing lower-extremity ulcers, once vascular status is verified to be adequate, are conservative sharp-wound debridement and compression. Wound debridement can be carried out in a variety of ways, can facilitate wound bed preparation

and the removal of wound debris and biofilm that contribute to infection, and can stimulate the wound healing process.

Compression, when used appropriately and when adequate blood flow has been confirmed, can decrease overall pain by decongesting tissues, reducing the stretching of the skin in the lower extremities and minimizing the occurrence of stasis dermatitis. In the presence of peripheral arterial disease (PAD), however, compression therapy can increase pain.

Even when managing the local wound becomes the physician's priority, pain management is often the patient's priority.

Several barriers need to be addressed to align current practice with best practice recommendations. The more traditional approach to wound management has tended to focus on dressing choices and treating primarily the local wound. This fails to acknowledge the underlying complexities that contribute to the overall healing of a wound. Traditional practice also tends to be based on a clinician-centred approach, rather than a patient-centred one that engages the patient. A best practice approach emphasizes the

need for the patient's understanding of the process, which empowers them to participate in how treatment is carried out. Overcoming barriers to change through a multidisciplinary approach and prioritizing the patient's story can facilitate this empowerment. The treatment that follows needs to be comprehensive and focused, and should always be guided by best practice recommendations.

Addressing Pain

As discussed, managing wound-related pain is important to the healing process. Up to 65% of slow- or non-healing wounds cause severe or persistent pain, which is often considered the worst part of living with a chronic wound.¹ Wound-related pain can have a major impact on sleep,

Overcoming barriers to change through a multidisciplinary approach and prioritizing the patient's story can facilitate . . . empowerment.

mood, appetite and activity. One approach to classifying pain looks at its duration. Procedural pain is hyper-acute and does not last long; it is often experienced during cleansing, wound debridement and dressing changes. There is strong evidence for use of a combination of 2.5% lidocaine/2.5% prilocaine applied 30 to 45 minutes *before* dressing changes.² In the case of multiple and/or large ulcers, clinicians should exercise caution to remain within the recommended safe dosage.

Management of persistent pain can be challenging. The abbreviation ABCD offers a useful, simple approach:³

- **A = Assessment** means verifying if the pain is coming from the wound bed or surrounding area, identifying how long the pain has existed and how intense it is, as well as any impact it is having on quality of life. It is also important to determine the nature of the pain: nocicep-

tive (sharp, aching, gnawing) or neuropathic (tingling, pins and needles, electric). This distinction will help to guide the choice of systemic pain medications.

- **B = Beware** of contributing factors such as edema and ischemia.
- **C = Consider** local dressings that support the wound healing environment and topical analgesics.
- **D = Drugs**, oral and parental.

Topical Medications

Topical medications present an attractive option, especially in geriatric populations, because the potential side-effects are fewer and less severe than with oral and systemic medications. Unfortunately, two limitations apply to most topical treatments:

- Individual response is unpredictable.
- The degree and duration of benefit is highly variable.

One exception is the application of an ibuprofen foam dressing. Randomized controlled trials have shown good evidence for their safety and efficacy.⁴ This dressing has a quick onset (24–48 hours)

Barbie Murray has been a nurse for 38 years and is actively involved in nursing education and wound management. After completing her Master of Clinical Science in wound healing at Western University in 2011, she served as Academic Dean for the Faculty of Health Sciences at Victoria University in Uganda, Africa. She has participated in CMEs for advanced wound care practices in Canada, East Africa and the United Arab Emirates. Currently employed as a clinical nurse specialist in Halifax, Nova Scotia, she co-ordinates a multi-disciplinary leg ulcer clinic, which manages complex wounds through vascular, orthopedic, plastic surgery and infectious disease services.

Martin Van der Vyver is Medical Director of the Acute Pain Service at Sunnybrook Health Science Centre. He received his MD in 1988 and FRCPC in 2005, and is a staff physician in the department of anesthesia and an assistant professor at the University of Toronto. His clinical interests are regional anesthesia and acute pain management after surgery and trauma.

with no more reported side-effects than other plain foam dressings. Another promising topical option is 4% lidocaine in a TRI-726 matrix.⁵ This topical agent has demonstrated a much longer lasting therapeutic effect than similar topical treatments. It should be applied only once a week. No large or quality-controlled studies currently support the use of other topical treatments.

Oral and Systemic Medications

NSAID is an effective pain reliever if infection is the underlying causing of the pain. However, its use is absolutely contraindicated in the presence of renal insufficiency and poorly controlled hypertension. There is strong evidence for both pregabalin and gabapentin as first-line agents in the management of neuropathic pain, but the incidence of side-effects, such as sedation and visual disturbances, can be high in the geriatric population.⁶ Therefore, discussing the benefit and risks with patients is important before prescribing, as is encouraging the reporting of all side-effects. Another option is nortriptyline (a tricyclic antidepressant).⁶ All agents targeting neuropathic pain need to be started at a lower dose with a slow upward titration as needed. It may therefore take weeks before the optimal effect is reached or a decision made that this treatment is not effective.

Opioids have a limited role to play in managing wound pain. Short term (< 7 days) use of oral opioids as part of a multimodal protocol is acceptable as per the 2017 Canadian opioid prescribing guidelines.⁷ Frequent dosing (q4h/PRN) of short-acting medications is thought to be generally safer compared with longer-acting agents. The goal with opioid therapy is improving quality of life.

If pain is improved but quality of life is worse or remains unchanged, the clinician should stop prescribing and reassess.

Each of these options can support health-care professionals in managing pain associated with wounds. Developing a patient-centred plan of care, which includes managing the various types of pain and adopting current best practice guidelines such as those published by Wounds Canada, can optimize the care for patients living with lower limb ulcers. ■

References

1. Upton D, Solowiej K, Hender C, Woo KY. Stress and pain associated with dressing change in patients with chronic wounds. *J Wound Care*. 2012;21(2):53–54.
2. Briggs M, Nelson EA, Martyn-St James M. Topical agents or dressings for pain in venous leg ulcers. *Cochrane Database Syst Rev*. 2012;11:CD001177.
3. Price P, Fogh K, Gylln C, Krasner DL, Osterbrink J, Sibbald RG. Managing painful chronic wounds: The Wound Pain Management Model. *Int Wound J*. 2017;4(1):4–15.
4. Romanelli M, Dini V, Polignano R, Bonadeo P, Maggio G. Ibuprofen slow-release foam dressing reduces wound pain in painful exuding wounds: Preliminary findings from an international real-life study. *J Dermatolog Treat*. 2009;20(1):19–26.
5. Treadwell T, Walker D, Nicholson BJ, Taylor M, Alur H. Treatment of pain in wounds with a topical long-acting lidocaine gel. *Chronic Wound Care Manag Res*. 2019;6:117–121.
6. Mu A, Weinberg E, Moulin DE, Clarke H. Pharmacologic management of chronic neuropathic pain: Review of the Canadian Pain Society consensus statement. *Can Fam Physician*. 2017;63(11):844–852.
7. Busse JW, Craigie S, Juurlink DN, Buckley N, Wang L, Couban RJ, et al. Guideline for opioid therapy and chronic noncancer pain. *CMAJ*. 2017;189(18):E659–E666. Retrieved from: www.cmaj.ca/content/cmaj/189/18/E659.full.pdf.

The Management of Foot Infections

By Min Lee, MD FRCSC; John Steinberg, DPM

Limb preservation can involve both established and emerging strategies to identify, prevent and surgically manage foot infections in patients living with peripheral arterial disease (PAD), chronic limb-threatening ischemia, and diabetes. If a person with diabetes needs treatment, a multidisciplinary approach is recommended. This approach combines antiplatelet agents, a statin, glucose management, exercise therapy, hypertension management and hyperlipidemia management.¹⁻²

Each health-care professional should focus on the three main goals of any multidisciplinary wound care team: eliminate infection, treat ischemia and address biomechanical abnormalities of the foot. Diabetic foot infections cause more inpatient days than any other diabetes-related complication. In the United States, diabetic foot infections amount to 20 to 25% of all diabetes-related hospital admissions. Clinics in the United States often implement low-cost treatments like dressings before moving to higher-cost items like inpatient admission and amputation.³⁻⁴ Given the expense involved for inpatient and surgical care, we should consider more frequent use of “expensive conservative care” (e.g., specialty offloading devices, at-home advanced nursing care, wound care products and frequent wound care visits), as these outpatient costs are a fraction of inpatient care. This care could include advanced tissue products, grafting, offloading and weekly outpatient clinic visits. Waiting to treat

uncomplicated diabetic foot ulcers can lead to high-cost treatments to heal infected ulcers and to amputate limbs.

Three Factors: A Systematic Approach

Three factors lead to diabetic foot infection: immunopathy (e.g., polymorphonuclear dysfunction), angiopathy (e.g., ischemia, impaired healing, poor perfusion of oxygen, nutrients and antibiotics) and neuropathy (i.e., inability to detect trauma, dry or cracked skin, abnormal biomechanics).

Treating these factors requires a systematic approach. It is crucial that surgical treatment be pursued aggressively with careful planning for the whole process of incisions, wound exploration, culture-taking, debridement, reaching hemostasis, lavage, dressing application and medical management. Complex wound reconstruction, debridement and closures should be staged ahead of time. This list is simple to read, but in practice, the preparation is complex. In the case of severe diabetic foot infection, source control with incision and drainage, or guillotine amputation may be required first to prevent overwhelming sepsis.

Managing Infection Versus Managing Ischemia

Clinicians must differentiate between managing infection and managing ischemia. In earlier years,

ischemia was prioritized over infection. It has since been found, however, that infection control should be prioritized before revascularization is considered. Therefore, the health-care team should in most cases consider revascularization before completion and closure in the final stage of an amputation.

When treating infections, the collection and culturing of soft tissue specimens is valuable in identifying which antibiotics to use. But the method with which cultures are taken matters. Blood cultures should be performed for patients with severe infections and systemic illnesses. Swab cultures are considered a poor method but may be the only option for practices not equipped to take tissue cultures. Superficial swab culture collections are not very useful, but samples from deep inside wounds or sinus tracts can be helpful, particularly when taken in the operative room after debridement of the wound site.⁵⁻⁶

In earlier years, ischemia was prioritized over infection. It has since been found, however, that infection control should be prioritized before revascularization is considered.

Imaging methods are also a valuable tool when treating infections. There is a preference toward serial plain film radiographs to evaluate bone changes over time.⁷ MRIs and bone scans can be misleading when trying to diagnose conditions like osteomyelitis in small bone structures.⁷ Though bone biopsies are generally considered the gold standard for diagnosing osteomyelitis, the recent literature provides conflicting viewpoints.

A New Method for Heel Wounds

Vertical contour calcanectomy is a new treatment for heel wounds.⁸ The operation is a modified partial calcanectomy that goes against old teachings about amputations being better for the patient than any method that removes the Achilles tendon. Steinberg, among others, has found that these

traditional beliefs are not necessarily relevant, especially for geriatric patients who are able to keep ambulatory with appropriate footwear. Vertical contour calcanectomies require extensive pre-surgery markings. The procedure involves making a deep enough incision to create two medial/lateral full-thickness tissue flaps along the heel that can be used for primary closure in place of skin grafts. Next, the surgeon excises the entire ulcer, detaches and excises the Achilles tendon and removes 50 to 75% of the calcaneus bone. To facilitate closure, the team ensures patients scar on the operated-on area and can then wear a brace for weight-bearing. After these operations, previously non-closable ulcers can heal successfully.

Vascular Status

Identifying the circulation issues associated with diabetic foot ulcers is a significant factor in the treatment plan. Peripheral arterial disease (PAD) and diabetes are closely connected. Diabetes causes aggressive inflammation of blood vessels that leads to plaque build-up, which in turn leads to stenosis. The diabetic pattern of PAD is particular and can mainly be seen in infrapopliteal and pedal developments. There may also be unique and complex changes occurring at the microcirculatory level that prevent ulcers from healing, even after a patient has been treated for large vessel disease.

Min Lee is a staff physician at Queen Elizabeth Health Sciences Centre. She trained in general surgery at Dalhousie University, vascular surgery at the University of Ottawa, and endovascular surgery at the University of Medicine and Dentistry of New Jersey.

John Steinberg is a professor and full-time faculty member in the department of plastic surgery at Georgetown University School of Medicine in Washington, DC. He is Co-Director of the Center for Wound Healing at MedStar Georgetown University Hospital, where his practice emphasizes multidisciplinary resident and student teaching. He is Program Director for the MedStar Washington Hospital Center Podiatric Residency Program.

The blood vessels of individuals with diabetes also tend to be significantly calcified—the degree and extent are associated with disease severity and poor outcomes, including risk of amputation and all-cause mortality.

The prevalence of diabetes continues to increase. This will have a massive impact on the number of patients with arterial disease that clinicians will be treating in the near future. Diabetes is a major

Upwards of 50% of patients with foot ulcers will have PAD, and 40 to 50% of PAD patients will have diabetes.

risk factor for PAD, with prevalence rates for PAD being 10 and 40% among individuals with diabetes.⁹ A combination of PAD and diabetes has a five-year mortality rate of almost 50%, and a similar two-year mortality rate for such patients who have amputations.¹⁰ Upwards of 50% of patients with foot ulcers will have PAD, and 40 to 50% of PAD patients will have diabetes.¹¹ This emphasizes

the importance of revascularization. It is recommended that all patients with diabetes have an arterial assessment by the age of 50 so that treatment plans can be modified if necessary.¹⁰

The health-care professional should begin the assessment of a patient's vascular status with a physical exam of pulse volume recordings and segmental pressure tests. Calculating a patient's arterial brachial index (ABI) requires taking blood pressure readings from their arms and ankles, then dividing the ankle's systolic pressure by the arm's systolic pressure. In the presence of calcified tibial arteries that are not compressible, toe pressures can be obtained. An ABI less than 0.8 is indicative of peripheral vascular disease, and referral to vascular specialist should be considered (see Table 1).¹² Some blood vessels, like non-compressible tibial vessels, can be compared to lead pipes: difficult to view and not easily diagnosed. It is possible to take transcutaneous oxygen measurements of these vessels, but that method is not widely available in Canada.

Not every diabetic ulcer with associated PAD requires revascularization, however. Conservative

Table 1: Arterial Flow and Perfusion¹³

| Classification | ABPI | Toe Brachial Index | Toe Pressure | Waveforms | TcPO ₂ * (indicating perfusion) |
|-------------------------|----------------------------------------------------------|-----------------------------------------------------|-----------------------------------------------------|---------------|-----------------------------------------------------|
| Non-compressible | > 1.40 Be aware of possible falsely elevated measures | Preferred when non-compressible vessels are present | Preferred when non-compressible vessels are present | | Preferred when non-compressible vessels are present |
| Normal Range | 1.0–1.40 | > 0.7 | > 70 mmHg | triphasic | > 40 mmHg |
| Borderline | 0.91–0.99 | > 0.6 | > 70 mmHg | biphasic/mono | > 40 mmHg |
| Abnormal | < 0.90 | > 0.6 | < 70 mmHg | biphasic/mono | < 40 mmHg |
| Mild | 0.7–0.9 | > 0.4 | > 50 mmHg | biphasic/mono | 30–39 mmHg |
| Moderate | 0.4–0.69 | > 0.2 | > 30 mmHg | biphasic/mono | 20–29 mmHg |
| Severe | < 0.4 Critical limb ischemia | > 0.2 | < 30 mmHg | monophasic | < 20 mmHg |

*Transcutaneous oxygen pressure

treatment is possible if there's an acceptable toe pressure or ABI, but clinicians should regularly reassess the patient's circulation and ensure that everything is optimized medically and biomechanically. In some cases there shouldn't be any vascular intervention, as when a patient has a massive diabetic foot infection that clearly requires amputation.

Barriers

There are several barriers to changing practice, including inadequate training about assessment of vascular status, the need for appropriate offloading, inadequate access to primary care, specialists, or multidisciplinary teams and clinics, inadequate initiation of medical treatment, and patients' socio-economic status. Solutions to these barriers include education through conferences like Wounds Canada's, involvement in policy making and government lobbying to fund multidisciplinary teams, funding for better nutrition, social supports, and national pharmacare and foot care.

The areas of diabetic foot wound care and limb preservation have undergone a huge shift in the last few years. What was previously a miserable and often negative topic has become increasingly positive, as long as treatment is aggressive. ■

References

1. Conte MS, Bradbury AW, Kolh P, White JV, Dick F, Fitts R, et al. Global vascular guidelines on the management of chronic limb-threatening ischemia. *Eur J Vasc Endovasc Surg*. 2019;58(1S):S1–S109.
2. Hingorani A, LaMuraglia GM, Henke P, Meissner MH, Loretz L, Zinszer KM, et al. The management of diabetic foot: A clinical practice guideline by the Society for Vascular Surgery in collaboration with the American Podiatric Medical Association and the Society for Vascular Medicine. *J Vasc Surg*. 2016;63(2 Suppl):3S–21S.
3. Edelson GW, Armstrong DG, Lavery LA, Caicco G. The acutely infected diabetic foot is not adequately evaluated in an inpatient setting. *Arch Intern Med*. 1996;156(20):2373–2378.
4. Tennvall GR, Apelqvist J. Health-economic consequences of diabetic foot lesions. *Clin Infect Dis*. 2004;39(Suppl 2):S132–S139.
5. Lipsky BA, Berendt AR, Deery HG, Embil JM, Joseph WS, Karchmer AW, et al. Infectious Diseases Society of America. Diagnosis and treatment of diabetic foot infections. *Clin Infect Dis*. 2004;39(7):885–910.
6. Slater RA, Lazarovitch T, Boldur I, Ramot Y, Buchs A, Weiss M, et al. Swab cultures accurately identify bacterial pathogens in diabetic foot wounds not involving bone. *Diabet Med*. 2004;21(7):705–709.
7. Meyr AJ, Seo K, Khurana JS, Choksi R, Chakraborty B. Level of agreement with a multi-test approach to the diagnosis of diabetic foot osteomyelitis. *J Foot Ankle Surg*. 2018;57(6):1137–1139.
8. Elmarsafi T, Pierre AJ, Wang K, Evans KK, Attinger CE, Kim PJ, et al. The vertical contour calcanectomy: An alternative surgical technique to the conventional partial calcanectomy. *J Foot Ankle Surg*. 2019;58(2):381–386.
9. American Diabetes Association. Peripheral arterial disease in people with diabetes. *Diabetes Care*. 2003;26(12):3333–3341.
10. Canadian Cardiovascular Society. Peripheral Arterial Disease. Canadian Cardiovascular Society Consensus Conference. 2005. Retrieved from: https://ccs.ca/app/uploads/2020/12/PAD_CC_2005.pdf.
11. Hinchliffe RJ, Forsythe RO, Apelqvist J, Boyko EJ, Fitts R, Hon JP, et al. Guidelines on diagnosis, prognosis, and management of peripheral artery disease in patients with foot ulcers and diabetes (IWGDF 2019 update). *Diabetes Metab Res Rev*. 2020;36(S1):e3276.
12. Beaumier M, Murray BA, Despatis MA, Patry J, Murphy C, Jin S, et al. Best practice recommendations for the prevention and management of peripheral arterial ulcers. In: *Foundations of Best Practice for Skin and Wound Management. A supplement of Wound Care Canada*; 2020. 78 pp. Retrieved from: www.woundscanada.ca/docman/public/health-care-professional/bpr-workshop/1690-wc-bpr-prevention-andmanagement-of-peripheral-arterial-ulcers-1921e-final/file.
13. Canadian Association of Wound Care. *Advances for the Management of Diabetic Foot Complications. Session workbook*. 2016.

The Prevention of Recurrent Ulceration and Amputation

By Amanda Mayo, MD MHS_c FRCPC; Connor Pardy, MSc CPO;
Scott Schumacher, DPM DABPS DABPM FAPWH_c FASPS FACFAS

Patients with recurrent ulceration and amputation can be challenging cases for health-care teams. There are, however, several different approaches that can prevent the recurrence of ulceration and reduce the incidence of amputation. One approach centres on the patient and their supports. It is crucial to remember that wounds are attached to people. To provide optimal care, health-care professionals must look at the whole health picture—patient comorbidities, strength, sensation, foot biomechanics and mental health—and also their housing, occupation, transportation, social supports and caregiving responsibilities.^{1–2} Treatment must take into account the instrumental activities of daily living and the patient's social history.

Offloading Measures

A rehabilitation approach to wound treatment can optimize function and recovery and meet a secondary goal of prevention. During treatment, clinicians must consider the patient's ability to move safely, and remember that offloading measures like casts or crutches may affect balance. They can recommend gait aids, wheelchairs and/or therapy interventions to reduce the chance of falling. While offloading patients, clinicians should try to ensure the contralateral foot does not face any

additional trauma from hopping or carrying extra weight. In patients with an offloaded diabetic foot ulcer, clinicians should watch for pressure injuries in the other foot and coccyx region, since these patients are likely more sedentary. Health-care professionals should also check if the offloading device is causing a leg length discrepancy, which might result in injuries to the contralateral limb and/or back, and increase the risk of falls.¹

Social Determinants

The health-care team should also consider environmental factors. If a patient lives in a multi-storey home, they will have to climb stairs. Within the home, there are hazards such as wet bathroom floors. They may have to drive to and from the hospital or work. Driving puts patients at an especially high risk for recurrence, as it loads the right foot.

Barriers to a rehabilitative approach to care include lack of access to care, and the cost of offloading, footwear and mobility aids. Patients may also be unaware that long-term solutions are needed and may resist or be unable to properly offload or modify their lifestyle—especially if they do not have the resources to adhere to treatment requirements. A multidisciplinary approach to wound care and the integration of social work and community charities can help to overcome these barriers.

Foot Checks and Footwear

Another approach to recurrent ulceration and amputation prevention is the quick foot check, called the Look-Touch-Stand method. This method can help with finding potential mechanical causes of ulceration and determining offloading solutions. When undergoing the foot check, the patient should be in a non-weightbearing position: sitting or on a plinth with their feet out.

The Look step involves a quick scan of the dorsal and plantar surfaces of the feet to check for trophic changes and temperature differences. Trophic changes include skin colour shifts, callus-ing, nailbed or structural change and hair presence. Temperature differences appear as thin dry skin, thickened nails, colour changes and capillary refill.

Another approach to recurrent ulceration and amputation prevention is the quick foot check, called the Look-Touch-Stand method.

The Touch step checks for foot temperature, capillary refill and edema.

The Stand step requires the patient to stand (if possible) so that the clinician can look at the position and motion of the hindfoot and forefoot.

If the Look-Touch-Stand check finds biomechanical foot issues that are correctable, the patient's feet should be put in a neutral position to reduce concentrations of pressure through methods like posting.

Footwear is also key to significantly reducing the development of repetitive pressures. Clinicians

Neuropathy

Neuropathic wounds are another challenging diagnosis and are prone to recurrence. These wounds are primarily caused by a combination of neuropathy and biomechanical forces. Patients lose the ability to feel pressure and shear in or on their lower limbs, and wounds develop. Diabetic neuropathy cannot typically be cured, but the biomechanical forces causing the wounds can be successfully addressed. Approximately 40% of ulcers in patients with neuropathy recur within the first year of closure, and 60% recur within three years.⁴ Neuropathic ulcers are also prone to infection, and one-third of ulcers can become infected within 12 weeks.⁵⁻⁷ Infection often leads to amputation: 20% of diabetic foot ulcers result in amputation.⁸

can test if footwear is safe and healthy through the bend-twist-fold test (Figure 1), which is used to ensure the footwear is stable. Orthotics are also important for offloading. Flat peg orthotics are a start but have minimal long-term success. Multi-density custom orthoses are better for accommodating wounds.³

Surgical Intervention

Surgical offloading with lesser digital ulcers can undo digital contracture. Contracture can be caused by neuropathy and is often seen with pronated feet where muscles—mainly the posterior tibial tendon and flexor digitorum longus (FDL) tendon—have tried to oppose pronation. The FDL tendon can pull obliquely, which pulls digits to their side. This leads to contractures and rolling digits, which in turn leads to pressure and pressure points, and then ulceration at the tip of the

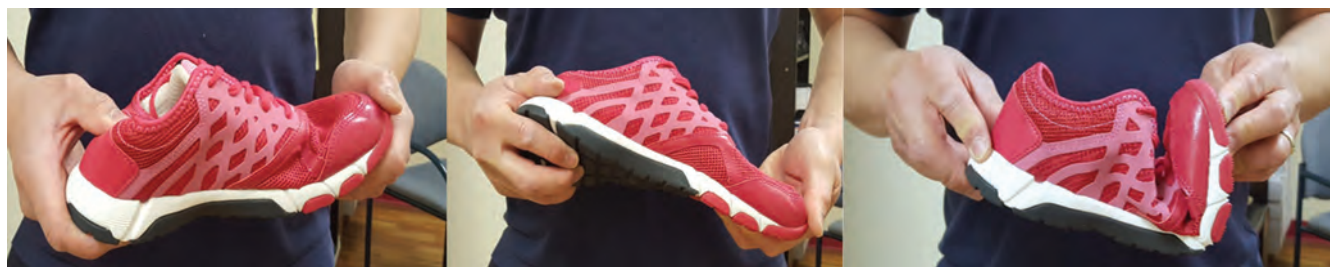


Figure 1: The Bend-Twist-Fold Test.

toes or between the toes. Flexor digitorum longus tenotomy is a simple surgery during which a surgeon goes into the digit from the side and makes an incision into the FDL tendon to release the contracture. A literature reviews indicates that of 324 of these procedures, 320 healed, 29 had recurrences, four did not heal and eight had complications.^{9–15}

If an ulcerated digit cannot be straightened, it may be necessary to remove bone from the toe to achieve correction. This procedure usually resolves the ulcer, and immediate weightbearing is allowed.

Some 24 to 40% of all diabetic foot ulcers are hallux ulcers.^{16–19} The primary cause of hallux ulcer formation is lack of motion in the metatarsophalangeal joint—minor decrease in motion is called hallux limitus, and more significant decrease is hallux rigidus. Both come from functional or structural causes, like a first metatarsal that is slightly ahead of the second metatarsal or foot pro-

nation. While most ulcers have a recurrence rate of 60% within three years, hallux ulcers have a recurrence rate of 83% by 31 months.²⁰ The procedure used to fix this issue, most commonly known as a Keller arthroplasty, or a 1st MTPJ arthroplasty, is to make a cut across the base of the proximal phalanx and remove the entire base, which creates a space between the proximal phalanx and first metatarsal where soft tissues can be interposed to prevent the bones from grinding together.

While most ulcers have a recurrence rate of 60% within three years, hallux ulcers have a recurrence rate of 83% by 31 months.

Ulcers on the first metatarsal are often caused by a stiff or long first ray, which gets stuck in a toe-off position, or a plantarflexed first ray that keeps the first metatarsal lower than the rest so that it takes more force than the others. They are often treated with offloading orthotics. Surgery on patients with diabetic foot disease is often considered a risk, but generally, appropriately selected individuals with diabetes with an A1c of less than eight do not face a significant risk when compared with the rewards of surgery.^{21–25}

Conclusion

Clinicians treating recalcitrant wounds should consider the patient's whole health picture, including issues like comorbidities, biomechanics, social supports and barriers to success. Regular foot checks and offloading are of vital importance and the standard of care for most patients. When conservative care fails, it may be appropriate to consider surgical offloading. ■

Amanda Mayo is a full-time clinician at Sunnybrook Health Sciences Centre, and assistant professor in the Department of Medicine at the University of Toronto. She subspecializes in amputee rehabilitation. Her research and QI focus on improving the continuum of care for individuals with limb loss, and limb preservation.

Connor Pardy has accreditation in both orthotics and prosthetics. For the last five years, he has been working closely with the Zivot Limb Preservation Centre at the Peter Lougheed Hospital, in Calgary, Alberta. He is also President of the Alberta Association of Orthotists and Prosthetists.

Scott Schumacher is a podiatrist with a specialty in neuropathic wounds. He is a board-certified diplomate in foot surgery with the American Board of Foot and Ankle Surgery, a board-certified founder and emeritus diplomate with the American Board of Podiatric Medicine, a certified fellow with the Academy of Physicians in Wound Healing, a member of the Association of Diabetic Foot Surgeons and founder of the Canadian Medical Alliance for the Preservation of the Lower Extremity. He has been in practice in Surrey, British Columbia, since 1991.

References

1. Botros M, Kuhnke J, Embil J, Goettl K, Morin C, Parsons L, et al. Best practice recommendations for the prevention and management of diabetic foot ulcers. In: Foundations of Best Practice for Skin and Wound Management. A supplement of Wound Care Canada; 2017. 68 pp. Retrieved from: www.woundscanada.ca/docman/public/health-care-professional/bpr-workshop/895-wc-bpr-prevention-andmanagement-of-diabetic-foot-ulcers-1573r1e-final/file.
2. Beaumier M, Murray BA, Despatis MA, Patry J, Murphy C, Jin S, et al. Best practice recommendations for the prevention and management of peripheral arterial ulcers. In: Foundations of Best Practice for Skin and Wound Management. A supplement of Wound Care Canada; 2020. 78 pp. Retrieved from: www.woundscanada.ca/docman/public/health-care-professional/bpr-workshop/1690-wc-bpr-prevention-andmanagement-of-peripheral-arterial-ulcers-1921e-final/file.
3. Robinson C, Major MJ, Kuffel C, Hines K, Cole P. Orthotic management of the neuropathic foot: An interdisciplinary care perspective. *Prosthet Orthot Int*. 2015;39(1):73–81.
4. Armstrong D, Boulton A, Bus S. Diabetic foot ulcers and their recurrence. *New Engl J Med*. 2017;376:2367–2375.
5. Lavery LA, Fulmer J, Shebetka KA, Regulski M, Vayser D, Fried D, et al. The efficacy and safety of Grafix® for the treatment of chronic diabetic foot ulcers: Results of a multi-centre, controlled, randomised, blinded, clinical trial. *Int Wound J*. 2014;11(5):554–560.
6. Marston WA, Hanft J, Norwood P, Pollak R. Dermagraft Diabetic Foot Ulcer Study Group. The efficacy and safety of Dermagraft in improving the healing of chronic diabetic foot ulcers: Results of a prospective randomized trial. *Diabetes Care*. 2003;26(6):1701–1705.
7. Veves A, Falanga V, Armstrong DG, Sabolinski ML. Apligraf Diabetic Foot Ulcer Study. Graftskin, a human skin equivalent, is effective in the management of noninfected neuropathic diabetic foot ulcers: A prospective randomized multicenter clinical trial. *Diabetes Care*. 2001;24(2):290–295.
8. Lavery LA, Armstrong DG, Wunderlich RP, Mohler MJ, Wendel CS, Lipsky BA. Risk factors for foot infections in individuals with diabetes. *Diabetes Care*. 2006;29:1288–1293.
9. Rasmussen A, Bjerre-Christensen U, Almdal TP, Holstein P. Percutaneous flexor tenotomy for preventing and treating toe ulcers in people with diabetes mellitus. *J Tissue Viability*. 2013;22(3):68–73.
10. van Netten JJ, Bril A, van Baal JG. The effect of flexor tenotomy on healing and prevention of neuropathic diabetic foot ulcers on the distal end of the toe. *J Foot Ankle Res*. 2013;6(1):3.
11. Kearney TP, Hunt NA, Lavery LA. Safety and effectiveness of flexor tenotomies to heal toe ulcers in persons with diabetes. *Diabetes Res Clin Pract*. 2010;89:224–226.
12. Tamir E, McLaren AM, Gadgil A, Daniels TR. Outpatient percutaneous flexor tenotomies for management of diabetic claw toe deformities with ulcers: A preliminary report. *Can J Surg*. 2008;51(1):41–44.
13. Laborde JM. Neuropathic toe ulcers treated with toe flexor tenotomies. *Foot Ankle Int*. 2007;28:1160–1164.
14. Schepers T, Berendsen HA, Oei IH, Koning J. Functional outcome and patient satisfaction after flexor tenotomy for plantar ulcers of the toes. *J Foot Ankle Surg*. 2010;49(2):119–122.
15. Smith SE, Miller J. The safety and effectiveness of the percutaneous flexor tenotomy in healing neuropathic apical toe ulcers in the outpatient setting. *Foot Ankle Spec*. 2020;13(2):123–131.
16. Birke JA, Sims DS. Plantar sensory threshold in the ulcerative foot. *Lepr Rev*. 1986;57:261–267.
17. Ambegoda ALAMC, Wijesekera JR, Panditharathn KI, Gamage R, Mudalige CS, Ruvini RM. Analysis of severity and anatomical distribution of diabetic foot ulcers: A single unit experience 1 A L A M. *Int J Interdiscip Multidiscip Stud*. 2015;2(2):1–10.
18. Molines-Barroso RJ, Lázaro-Martínez JL, Beneit-Montesinos JV, Álvaro-Afonso FJ, García-Morales E, García-Álvarez Y. Predictors of diabetic foot reulceration beneath the hallux. *J Diabetes Res*. 2019;8: 9038171.
19. Ledoux WR, Shofer JB, Cowley MS, Ahroni JH, Cohen V, Boyko EJ. Diabetic foot ulcer incidence in relation to plantar pressure magnitude and measurement location. *J Diabetes Complications*. 2013;27(6):621–626.
20. Peters EJ, Armstrong DG, Lavery LA. Risk factors for recurrent diabetic foot ulcers: Site matters. *Diabetes Care*. 2007;30(8):2077–2079.
21. Ganesh SP, Pietrobon R, Cecilio WA, Pan D, Lightdale N, Nunley JA. The impact of diabetes on patient outcomes after ankle fractures. *J Bone Joint Surg Am*. 2005;87:1712–1718.
22. Underwood P, Askari R, Hurwitz S, Chamarthi B, Garg R. Preoperative A1c and clinical outcomes in patients with diabetes undergoing major noncardiac surgical procedures. *Diabetes Care*. 2014;37:611–616.
23. Wukich D, Crim B, Frykberg R, Rosario B. Neuropathy and poorly controlled diabetes increase the rate of surgical site infection after foot and ankle surgery. *J Bone Joint Surg Am*. 2014;96:832–839.
24. Armstrong DG, Lavery LA, Stern A, Harkless LB. Is prophylactic diabetic foot surgery dangerous? *J Foot Ankle Surg*. 1996;35:585–589.
25. Wukich DK, Lowery NJ, McMillen RL, Frykberg RG. Postoperative infection rates in foot and ankle surgery: A comparison of patients with and without diabetes mellitus. *J Bone Joint Surg Am*. 2010;92:287–295.

Challenges to and Opportunities for Limb Preservation in Rural and Remote Communities

By Jeremy Caul, RN BScN MCISc AHCP WH CDE; Bijan Najafi, MSc PhD

In the Sioux Lookout Area catchment, in the town of Sioux Lookout, Ontario, which has a population of 5,500, Jeremy Caul serves 33 remote Indigenous communities—28 of which are fly-ins—whose combined populations equal more than 30,000 people (Figure 1). Currently these communities have documented rates of diabetes in close to 25% of the population, which many consider to be a conservative estimate.¹⁻³ The rates of amputation are four to seven times the provincial average,² and the nearest vascular program is in Thunder Bay, a five-hour drive or two-hour flight away. The geographical remoteness of this region presents a challenge.

Caul and his team have worked to identify specific barriers to limb preservation in this region. It is important for all health-care providers to appreciate the opportunities and strengths that Indigenous communities share. Through this appreciation, the health-care team can gain valuable insight as to how barriers can be addressed.

To better understand these conditions and challenges, Caul notes that it is crucial to understand the history of these communities. Indigenous peoples and their communities are wounded by severe intergenerational trauma, which impacts

the ability to self-manage chronic disease and has contributed to a loss of self-determination, both individually and as a population.

History and Experience

Building rapport and trust are essential first steps toward supporting Indigenous peoples' healing.



Figure 1: Sioux Lookout Catchment Area

The current strategy to address limb preservation in Sioux Lookout is to focus on patient self-management of disease, which involves competing priorities and a pattern of negative experiences when attending health services. Programs used to be informal or nonexistent, and there is a lack of equitable access to provincial programs like negative pressure wound therapy (NPWT). While the province states that NPWT is provided, capital equipment is not permitted to leave the health-care site. Many Indigenous patients live 500-plus kilometres away, meaning they have to choose between staying in Sioux Lookout to receive treatment or going home to care for their families and to work. However, co-ordination between care partners is improving slowly.

A strategy used and recommended by Caul focuses on collaboration and comprehension. It is imperative that the health-care team understand the unique history and experiences of Indigenous communities. The team must also include members of the communities as active participants. A comprehensive approach focuses less on recommending dressings and more on overcoming each patient's own barriers to healing, such as access to supply chains, access to advanced wound therapies, treatment for grief and depression, as well as other trauma-focused, culturally safe treatment plans.

It is imperative that the health-care team understand the unique history and experiences of Indigenous communities.

There has been work toward building capacity in this area, as there are roughly 9,000 people in the Sioux Lookout service region who have diabetes, about 20 of whom undergo amputation each year. More capacity would help understaffed nursing stations, whose registered staff tend to be transient and who thus rely mostly on unregulated or undertrained staff and family members. One integral asset to capacity building is the Indigenous communities themselves. These communities are extremely interconnected, and the problems of any individual are felt across their entire community.

The health-care system in Sioux Lookout is fragmented due to lack of permanent funding and a federally supported population that often has solutions forced upon its communities. The intrusion of uncollaborative solutions has contributed to widening gaps between communities and the services available to them. Each forced solution builds upon a history of taking self-determination from Indigenous peoples. There is also limited data focusing on the North that could help drive outcomes, since research tends to be conducted in urban centres.

To overcome these barriers, Caul recommends engaging with community Chiefs and Elders to learn each community's needs, and to fund permanent solutions that prioritize infrastructure like housing and access to clean water and Internet. The system should be made flexible enough to provide what each community needs while acknowledging the differences among them.

Jeremy Caul is a registered nurse from Northwestern Ontario. He has dedicated his career to advocating for Indigenous populations in his region, where Ontario sees its highest rates of diabetes and amputation. He currently supervises a team of allied health professionals working in a newly developed, mobile primary care team responsible for providing services to the entire Sioux Lookout catchment, including 33 remote First Nations communities, most of which are fly-in. He has education from Lakehead University and Western University, and many CMEs from various institutions for wound healing, foot care and diabetes.

Bijan Najafi is currently serving with the Baylor College of Medicine, Department of Surgery as a tenured Professor and Director of Clinical Research in the Division of Vascular Surgery. His career has focused on developing technologies that improve stability, healing and mobility worldwide. Over the past 20 years, he and his team have created several models, methods, and "smart" wearable technologies that enable objective monitoring mobility, remote patient monitoring, and new digital platforms that have shown enormous promise in preventing limb and life-threatening complications.

Potential Solutions

One emerging opportunity to improve care in remote communities is wearable and mobile health technologies (see box). These technologies, with appropriate funding, might provide a means of improving prevention and putting power in patients' hands to optimize self-care.

Another opportunity to improve care has been gleaned during the COVID-19 pandemic, as health-care providers work to secure alternative ways to deliver timely care to patients. These new methods, which are more and more often including components of virtual care, may lead to positive changes in health care for people with chronic illness, particularly in promoting preventative and personalized care for people at risk for or with diabetic foot ulcers (DFUs).

Challenges and Opportunities in Dealing with COVID-19

While the traditional barriers—reimbursement, patient and provider buy-in, and technology—have always been there, the accelerated pace of the nation's response to the COVID-19 pandemic has allowed providers to jump in and try new solutions to facilitate care delivery to patients with acute or chronic illness, while supporting drastic containment and mitigation measures to limit

... recent advances in wearable and mobile health technologies appear to show promise in measuring and modulating dangerous foot pressure and inflammation ...

spread of COVID-19 and preserve hospital beds for COVID-19 patients.²³ Because of the drastic containment and mitigation measures, other parts of health-care systems are leaving fragile patients, including individuals with diabetes, without necessary services. This is disrupting the best practices for preventing diabetes-related complications, including DFUs. Furthermore, because people with diabetes represent a fragile population that is at increased risk of mortality from COVID-19, it

Medical Management and Technology

Effective clinical preventative strategies to reduce the risk of ulcer recurrence are important to reduce the global burden of diabetic foot disease. About half of people who develop DFUs experience a recurrence within one year.⁴ The increasing development and use of technology in every aspect of our lives represents an opportunity for creative solutions to prevent or better manage diabetic foot problems.⁵

In particular, recent advances in wearable and mobile health technologies appear to show promise in measuring and modulating dangerous foot pressure and inflammation to extend remission and improve the quality of life for the most complex patients. Najafi and his team at Baylor College of Medicine, Houston, Texas, have recently developed and/or tested different technologies that harness wearables, digital health and the internet to improve the management and optimize the prevention of DFUs.⁵⁻²¹

Sensors and wearables have been developed to monitor foot temperature, plantar pressures, glucose, blood pressure and lipids. The monitoring of these risk factors, along with telehealth consultations, has promise as a method for remotely managing people who are at risk of DFUs. This approach can potentially avoid or reduce the need for face-to-face consultations.²² Home foot temperature monitoring, smart wearables (e.g., smart insoles, smart socks, smart offloading, smart shoes), continuous glucose monitoring and telehealth consultations are the approaches for which the most highly developed and user-friendly technology has been developed.^{5,23} The potential for remote use of these technologies is promising for improving care in remote communities.²²

Najafi and his team conducted a number of clinical studies in people at risk of DFUs and demonstrated benefits when using one of these remote monitoring methods.⁵⁻¹³ Further development and evidence are needed for some of the other approaches, such as home plantar pressure and footwear adherence monitoring. As yet, no composite remote management program incorporating remote monitoring and the management of all the key risk factors for DFUs has been developed and implemented. Further research assessing the feasibility and value of combining these remote monitoring approaches as a holistic way of preventing DFUs is required. These gaps could create a great opportunity for engineers and industries to harness these innovations to address current unmet needs in the field.

is recommended to avoid unnecessary diabetes-related hospital admissions to reduce their risk of exposure to COVID-19.

However, health-care providers searching for alternatives to deliver timely care to patients with diabetic foot syndrome may imagine that a post-COVID future will include positive changes in health care for people with chronic illness, particularly in promoting preventative and personalized care for people at risk for or with DFUs. ■

References

1. Chiefs of Ontario. First Nations Regional Health Survey (RHS) Phase 2 (2008/10) Ontario Region Final Report. Toronto: Chiefs of Ontario; 2012. Retrieved from: https://fnigc.ca/wp-content/uploads/2020/09/64c24e814a0095f6431221f520d3ef2b_RHS-Phase-2-Results-HC-presentation-Sept-27-2012-FINAL-FOR-PUBLICATION.pdf.
2. Loewen K, Vigliarolo J, Lance B, Rockley M, Schreiber Y, Kivi C, 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(3):100–107.
3. Reid KS, Garrett M, Martin BD, Embil JM, Trepman E, Duerksen F, et al. Diabetic foot complications in a northern Canadian Aboriginal community. *Foot Ankle Int*. 2017;27(12):1065–1073.
4. Armstrong DG, Boulton AJM, Bus SA. Diabetic foot ulcers and their recurrence. *N Engl J Med*. 2017;376(24):2367–2375.
5. Najafi B, Reeves ND, Armstrong DG. Leveraging smart technologies to improve the management of diabetic foot ulcers and extend ulcer-free days in remission. *Diabetes Metab Res Rev*. 2020;36(Suppl 1):e3239.
6. Najafi B, Ron E, Enriquez A, Marin I, Razjouyan J, Armstrong DG. Smarter sole survival: Will neuropathic patients at high risk for ulceration use a smart insole-based foot protection system? *J Diabetes Sci Technol*. 2017;11(4):702–713.
7. Najafi B, Mohseni H, Grewal GS, Talal TK, Menzies RA, Armstrong DG. An optical-fiber-based smart textile (smart socks) to manage biomechanical risk factors associated with diabetic foot amputation. *J Diabetes Sci Technol*. 2017;11(4):668–677.
8. Najafi B, Grewal GS, Bharara M, Menzies R, Talal TK, Armstrong DG. Can't stand the pressure: The association between unprotected standing, walking, and wound healing in people with diabetes. *J Diabetes Sci Technol*. 2017;11(4):657–667.
9. Najafi B, Armstrong DG, Mohler J. Novel wearable technology for assessing spontaneous daily physical activity and risk of falling in older adults with diabetes. *J Diabetes Sci Technol*. 2013;7(5):1147–1160.
10. Grewal GS, Schwenk M, Lee-Eng J, Parvaneh S, Bharara M, Menzies RA. eSensor-based interactive balance training with visual joint movement feedback for improving postural stability in diabetics with peripheral neuropathy: A randomized controlled trial. *Gerontology*. 2015;61(6):567–574.
11. Basatneh R, Najafi B, Armstrong DG. Health sensors, smart home devices, and the Internet of medical things: An opportunity for dramatic improvement in care for the lower extremity complications of diabetes. *J Diabetes Sci Technol*. 2018;12(3):577–586.
12. Armstrong DG, Najafi B, Shahinpoor M. Potential applications of smart multifunctional wearable materials to gerontology. *Gerontology*. 2017;63(3):287–298.
13. Frykberg RG, Gordon IL, Reyzelman AM, Cazzell SM, Fitzgerald RH, Rothenberg GM, et al. Feasibility and efficacy of a smart mat technology to predict development of diabetic plantar ulcers. *Diabetes Care*. 2017;40(7):973–980.
14. Piaggese A, Läubli S, Bassetto F, Biedermann T, Marques A, Najafi B, et al. Advanced therapies in wound management: Cell and tissue based therapies, physical and bio-physical therapies smart and IT based technologies. *Journal of Wound Care*. 2018;27(Sup6a):S1–S137.
15. Najafi B, Crews RT, Wrobel JS. Importance of time spent standing for those at risk of diabetic foot ulceration. *Diabetes Care*. 2010;33(11):2448–2450.
16. Najafi B, Crews RT, Wrobel JS. A novel plantar stimulation technology for improving protective sensation and postural control in patients with diabetic peripheral neuropathy: A double-blinded, randomized study. *Gerontology*. 2013;59(5):473–480.
17. Zhou H, Al-Ali F, Kang GE, Hamad AI, Ibrahim RA, Talal TK, et al. Application of wearables to facilitate virtually supervised intradialytic exercise for reducing depression symptoms. *Sensors (Basel)*. 2020;20(6).
18. Najafi B, Talal TK, Grewal GS, Menzies R, Armstrong DG, Lavery LA. Using plantar electrical stimulation to improve postural balance and plantar sensation among patients with diabetic peripheral neuropathy: A randomized double blinded study. *J Diabetes Sci Technol*. 2017;11(4):693–701.
19. Razjouyan J, Grewal GS, Talal TK, Armstrong DG, Mills JL, Najafi B. Does physiological stress slow down wound healing in patients with diabetes? *J Diabetes Sci Technol*. 2017;11(4):685–692.
20. Rahemi H, Armstrong DG, Enriquez A, Owl J, Talal TK, Najafi B. Lace up for healthy feet: The impact of shoe closure on plantar stress response. *J Diabetes Sci Technol*. 2017;11(4):678–684.
21. Najafi B, Wrobel JS, Grewal G, Menzies RA, Talal TK, Zirie M, et al. Plantar temperature response to walking in diabetes with and without acute Charcot: The Charcot activity response test. *J Aging Res*. 2012;2012:140968.
22. Najafi B. Post the Pandemic: How will COVID-19 transform diabetic foot disease management? *J Diabetes Sci Technol*. 2020;14(4):764–766.
23. Lazzarini PA, Crews RT, van Netten JJ, Bus SA, Fernando ME, Chadwick PJ, et al. Measuring plantar tissue stress in people with diabetic peripheral neuropathy: A critical concept in diabetic foot management. *J Diabetes Sci Technol*. 2019;13(5):869–880.

REGISTER NOW

There is no limited enrollment period. Students can enroll at any time and complete this intermediate program at their own pace.



WOUNDS CANADA INSTITUTE SUPER PROGRAM #1

SKIN HEALTH ADVOCATE AND RESOURCE PROFESSIONAL

23
MODULES

8
LIVE WEBINARS

21
EXPERTS

42
CREDITS

- Develop the foundational knowledge, critical thinking skills and attitude to care for and support people with or at risk for common chronic and acute wounds
- Program consists of **23 interactive online modules**, **8 live webinars**, **2 robust outcome measures**, and access to an asynchronous discussion forum with interdisciplinary program faculty
- Developed and reviewed by **21 of Canada's top wound care experts and educators** – Chiropractors/Podiatrists, Dietitians, Nurses, Nurse Practitioners, Nurses Specialized in Wound Ostomy and Continence, Occupational Therapists, Podiatrists, Pharmacists, Physicians, Physician Specialists, and Physiotherapists
- Continuing Professional Development, Faculty of Medicine, University of Toronto has awarded the **Wounds Canada Institute Super Program #1** with the following credits:
 - College of Family Physicians of Canada Mainpro+ (1 credit/hour) Group Learning: 42.0
 - Royal College Maintenance of Certification Section 1: 42.0
 - American Medical Association Category 1: 42.0
 - European Union for Medical Specialists UEMS-EACCME®: 42.0
 - Certificate of Completion in Continuing Professional Development (from the University of Toronto and Wounds Canada): 42.0



AMAZING VALUE!

\$1,750⁰⁰ + tax
Only **\$42⁰⁰** per
educational credit!



ACCREDITATION

Each participant should claim only those hours of credit that he/she actually spent participating in the educational program.

College of Family Physicians of Canada – Mainpro+

This one-credit-per-hour Group Learning program meets the certification criteria of the College of Family Physicians of Canada and has been certified by Continuing Professional Development, Faculty of Medicine, University of Toronto for up to 42.0 Mainpro+ credits.

Royal College of Physicians and Surgeons of Canada – Section 1

This event is an Accredited Group Learning Activity (Section 1) as defined by the Maintenance of Certification Program of the Royal College of Physicians and Surgeons of Canada, approved by Continuing Professional Development, Faculty of Medicine, University of Toronto. You may claim a maximum of 42.0 hours (credits are automatically calculated).

The American Medical Association – AMA PRA Category 1

Through an agreement between the Royal College of Physicians and Surgeons of Canada and the American Medical Association, physicians may convert Royal College MOC credits to AMA PRA Category 1 Credits™. Information on the process to convert Royal College MOC credit to AMA credit can be found at <https://edhub.ama-assn.org/pages/applications>.

European Union for Medical Specialists (UEMS) ECMEC

Live educational activities, occurring in Canada, recognized by the Royal College of Physicians and Surgeons of Canada as Accredited Group Learning Activities (Section 1) are deemed by the European Union of Medical Specialists (UEMS) eligible for ECMEC®.

WWW.WOUNDCANADA.CA/WCI-HOME

Implementing Best Practice in Alberta: A Diabetes Foot Care Clinical Pathway

By Kathy Dmytruk, RD CDE; Petra O'Connell, BSc MHSA

Background

Our team found significant variations in foot screening practices in Alberta. Despite best practice guidelines,¹ many primary care providers do not perform the recommended annual foot examination on their patients with diabetes. Reasons cited include lack of time; insufficient knowledge, resources and skill; and a false assumption that good glycemic management automatically ensures healthy feet. This information highlighted the need for a systematic approach to increase screening practice across Alberta.

Pathway Development

To address this need, a clinical pathway was created with tools and resources for screening and preventative care guidelines to reduce diabetic foot ulcers. Clinical pathways are tools used to enhance uptake of clinical practice guidelines. Broad engagement with stakeholders from a variety of health disciplines and from across health-care sectors informed the development of this clinical pathway.

The goal of developing and implementing this pathway was to increase screening rates in Alberta with a focus on primary care, and to provide the resources and supports necessary for preventative care. Providers and patients were interviewed to

identify current gaps, after which our team documented both the current and ideal state of foot screening practices. The clinical pathway content was defined and adapted for the regional needs across the province and was piloted in 2015 in three communities: two urban and one rural. The results were then evaluated and used to inform future spread and scale strategies.

- To access the clinical pathway, click [here](#).
- For the complete Pathway Toolkit, click [here](#).

The pathway includes five steps: screening, assessing risk, referring patients, treatment and follow-up guidelines. The clinical pathway aligns with Wounds Canada's Wound Prevention and Management Cycle.² Specifically, the pathway follows the six steps of assessment, setting goals of care, team assembly, the establishment and implementation of a care plan, the evaluation of outcomes, and follow-up and reassessment.

The pathway also includes specific follow-up guidelines depending on the patient's risk level. Additional tools and resources were developed to assist health-care providers in screening, including:

- Awareness posters for health-care providers to display in waiting rooms to encourage patients to inquire about foot screenings and self-care
- E-learning modules to assist nurses in foot screening and high-risk foot teams

Implementation

Pathway implementation targeted primary care providers through broad communication measures including newsletters, in-person education sessions for chronic disease management nurses and family physicians, webinars and educational symposiums on how to implement the pathway and how to assess and treat high-risk foot problems.

The team developed an implementation guide to support primary care that included a complete inventory of local foot care specialists for referral of patients with high-risk foot problems, and a guide on how to embed pathway activities into primary care clinical workflows.

Seven high-risk foot teams were established across Alberta communities to ensure timely access for patients with high-risk foot problems. These multidisciplinary teams work with patients who are at a high risk for developing ulcers and those who have existing foot ulcers. The teams provide wound care, vascular assessments and therapeutic footwear, and co-ordinate referrals to other specialists. It is recommended that each high-risk foot team have at least two different disciplines, such as a nurse practitioner or physician, RN, LPN, occupational therapist or physiotherapist.³

Evaluation and Results

Our team evaluated the clinical pathway by conducting pre- and post-implementation surveys to learn about present screening practices, and, in 2019, to learn about the results of the pathway implementation. Primary, home and long-term care settings demonstrated an increase in screening in the 2019 survey. The results also indicated a significant increase in screening across all health-care provider groups.⁴

In addition, we surveyed the uptake of the pathway in the primary care setting. Surveys sent to key clinical leaders in 2019 to better understand

screening in primary care found that a majority of the primary care foot screenings were completed by chronic disease management nurses. Some 88% were using a foot screening tool and 62% were using the DON SCN foot screening tool; 74% had accessed resources or information on the website, and 66% of respondents reported an increase in the number of foot screens they performed on patients with diabetes.

Respondents attributed the increased number of foot screens they performed to several factors:

- Education (specifically from two symposia)
- Improved awareness (identified by both patients and providers)
- Embedding screening in the clinical workflow

Kathy Dymtruk is a registered dietitian and certified diabetes educator who practised in the area of diabetes from 1999 to 2004 at the University of Alberta Hospital. Since 2004, she has worked as a project lead in the areas of diabetes and obesity. She has led several diabetes quality improvement projects and gained a greater understanding of the gaps and opportunities to improve service for Albertans with diabetes. Currently she is Senior Advisor for the Diabetes, Obesity & Nutrition Strategic Clinical Network and has led the development of the insulin pump program and the diabetes foot and eye care clinical pathways in Alberta.

Petra O'Connell is Senior Provincial Director of the Diabetes, Obesity and Nutrition and the Neurosciences, Rehabilitation & Vision Strategic Clinical Networks™ at Alberta Health Services. She is responsible for implementation and evaluation of initiatives that improve the quality and delivery of health-care services in these clinical areas across Alberta. She has extensive experience in strategic and operational planning and evaluation across health care settings and clinical service areas. She has held senior management positions in strategic and hospital facilities planning, hospital support services operations and ambulatory care management in Alberta. She has a BSc in medical laboratory sciences and a master's degree in health services administration from the University of Alberta.

- The use of an electronic medical record, which helped providers track initial and follow-up screenings

In 2019, a return on investment study was also conducted.⁵ A large cohort of patients who had been screened and a cohort who had not been screened were matched both geographically and demographically and then observed. Researchers noted significant reductions in the screening group in terms of hospitalization rates, length of in-patient stays, and outpatient and physician visits. The average cost avoided per patient was \$3,500 per year, mainly a result of fewer hospital visits.

Barriers to Implementation

Barriers to full implementation of the pathway included access to treatment, travel costs and wait times, especially in rural communities. Barriers surrounding access to treatment were the result of travel limitations, cost of foot care in the community and limited access to prescribed footwear.

Additional Findings

The use of this pathway was reported to have improved co-ordination of care and access to limb preservation services.

Several keys for sustainability were identified, including:

- The presence of a provider to champion the use of the pathway in clinical and primary care settings
- The building of the pathway into the clinical workflow
- Ongoing education, both in-person and virtually, which is important for sustainability
- The ability to document and track foot screening in the electronic record

Discussion and Next Steps

When analyzing the effectiveness of the clinical pathway, it is important to note that there is

not consistent reporting of foot ulcer data. As a result, our team relied on lower limb amputation data. The team discovered the rate of lower limb amputations has been flattening over time, and a major shift has taken place in the type of amputations being performed. There are now fewer major amputations, which include the ankle and above, and a shift to minor amputations, such as the toe. This shift can be attributed to an increase of screening practices, more foot-care programs, co-ordination between home care and primary care, and improved co-ordination for referrals.

The next steps include continuing to implement the pathway across Alberta, increasing the number of high-risk foot care teams, integrating virtual health practices and developing standardized vascular referral guidelines across Alberta. We would like to increase the number of high-risk teams, especially in Indigenous communities. In addition, we hope to integrate screening practices into virtual health settings to improve access in rural areas.

For more information, email DON.SCN@AHS.ca or visit www.ahs.ca/footcare. ■

References

1. Diabetes Canada. 2018 Clinical practice guidelines for the prevention and management of diabetes in Canada. *Can J Diabetes*. 2018;42:S222–S227.
2. Wounds Canada. QRG: Quick Reference Guide: Wound Prevention and Management Cycle. 2017. Retrieved from: www.woundscanada.ca/docman/public/health-care-professional/575-wound-management-bpr-qrg/file.
3. Alberta Health Services. Roles and responsibilities of a high-risk foot team. Edmonton: Alberta Health Services; 2020. Retrieved from: www.albertahealthservices.ca/assets/about/scn/ahs-scn-don-diabetes-foot-care-clinical-pathway-roles-and-responsibilities-high-risk-foot-teams.pdf.
4. Chan CB, Dymtruk 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).
5. Thanh NX, Dymtruk K, O'Connell P, Thompson C, Nhan J, Wasylak T. Return on investment of the diabetes foot care clinical pathway implementation in Alberta, Canada. *Diabetes Res Clin Pract*. 2020;165:108241.



Don't just use a collagen, apply an extracellular matrix

Endoform®'s unique extracellular matrix technology can help wounds **escape the inflammatory phase earlier** and build new tissue

AVAILABLE
NOW

Endoform® helps to advance healing by:

- Providing a natural scaffold and important secondary molecules to help build new tissue
- Endoform Antimicrobial version provides broad-spectrum antimicrobial activity in the dressing for up to 7 days and helps prevent biofilm formation

Used to help manage 4 million wounds worldwide and **now available in Canada.**

Experience the difference with **Endoform®** today. Available in **Natural** and **Antimicrobial** formats.



Endoform® Antimicrobial

Natural extracellular matrix plus silver

Ideal for use in wounds at risk of infection or stalled in the inflammatory phase



Endoform® Natural

100% natural extracellular matrix

Suitable for all wounds in all phases of healing

www.endoform.com

For **Endoform®** samples, please call your Appulse representative today or **phone 1-877-627-6224**.
Endoform® can also be ordered from Stevens. Visit www.stevens.ca to contact your local Stevens distributor.



Endoform® Antimicrobial and Endoform® Natural are marketed in Canada by Appulse.
Endoform® is a registered trademark of Aroa Biosurgery Limited.

MKT 1534.00 | September 2019

Building the Framework: Developing an Ontario Strategy for Lower-limb Preservation

By Mike Setterfield, MSc; Emma Jowett, HBA

The notion that lower-limb amputation is a devastating complication of diabetes and peripheral vascular disease (PVD) is not new. Nor is the idea that many individuals with diabetes or PVD live in fear of having a toe, foot or limb amputated. It has been documented that almost 85% of lower-limb amputations are preceded by a diabetic foot ulcer and that up to 80% of major lower-limb amputations are preventable.¹⁻² Recent International Working Group on the Diabetic Foot (IWGDF) guidelines recommend the following five key elements to prevent foot ulcers:³

1. Identify the patient with an at-risk foot
2. Regularly inspect and examine the patient and their at-risk foot
3. Educate the patient, family and health-care professionals
4. Ensure routine wearing of appropriate footwear
5. Treat risk factors for ulceration

Preventing amputations results in significant benefits for patients and their families and also saves health-care system dollars and resources.⁴⁻⁶

In Ontario, Canada (population 14.73 million), there are approximately 40 major lower-limb

amputations every week related to diabetes and PVD,⁷ with direct health-care costs of \$140 million annually.⁸⁻⁹ Recent publications of health administrative data from Ontario describe a wide range of lower-limb amputation rates in populations with diabetes and peripheral artery disease across 14 health regions (Local Health Integration Networks), with the highest rates in Northern Ontario regions.¹⁰ In addition, amputation rates provincially have increased over the last decade, leading to a hypothesis that the current Ontario landscape would benefit from integrated regional amputation prevention efforts.¹⁰⁻¹¹ Moreover, the average lower-limb amputation rate in Ontario is twice as high as in other high-income jurisdictions with publicly funded health-care systems (see Figure 1),^{10,12} adding evidence to the hypothesis that the Ontario health-care system needs to focus on lower-limb preservation. Furthermore, regional amputation prevention efforts have been implemented in other Canadian provinces, which can provide lessons learned and serve as models to inform efforts in Ontario. (See page 26 for information on how Alberta has addressed this issue.)

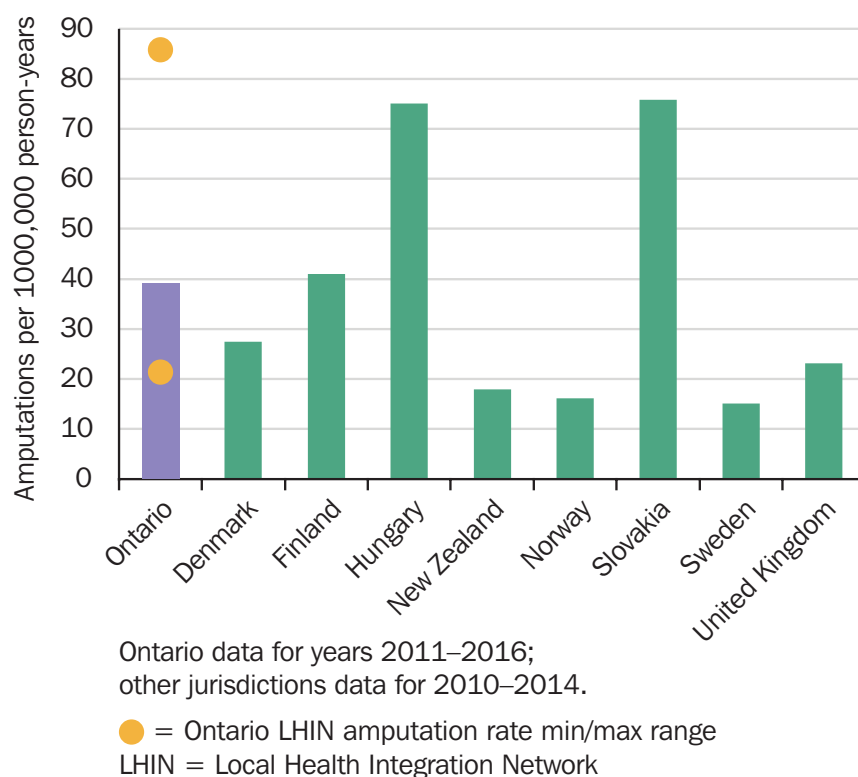


Figure 1: Major and Minor Lower Limb Amputation Rates Among Patients with Diabetes or PAD in Ontario and Other Jurisdictions with Publicly Funded Health-care Systems

Developing a Strategy

A key adviser to the Ministry of Health, CorHealth Ontario (CorHealth) provides overall leadership and strategic direction to support the planning and delivery of high-quality cardiac, stroke and vascular care in the province. CorHealth, together with a provincial advisory committee of vascular and wound care experts, primary and community care providers, and patient and family advisers, chaired by Dr. Ahmed Kayssi, is developing a multi-year Ontario lower-limb preservation strategy (the Strategy). The breadth and depth of expertise of the advisory committee is amplified by members working in smaller interprofessional workstreams before bringing components to the large group for validation. This approach allows the committee to focus on a patient-centred, evidence-based strategy. The Strategy's goal is to reduce avoidable, non-traumatic major lower-limb amputations in Ontario through improved early identification of patients

with at-risk feet and complications, and access to integrated vascular lower-limb wound and diabetic foot care.

A significant Strategy resource currently in development is a practical framework that will provide a roadmap for regional adoption and delivery of evidence-based lower-limb preservation care and services in Ontario. The framework, built on foundational patient care pathways for the prevention and management of diabetic foot complications and for the prevention and management of vascular wounds, will include:

- Minimum best-practice care requirements
- Essential elements of care delivery, including virtual care
- A model of care that can be adapted to unique regional environments

Key performance measures and funding policy recommendations will be integrated. An important component of the Strategy is curating resource toolkits for health-care providers and to support

patient education and self-management. The framework's implementation will be tested through demonstration programs across the province. These programs will be encouraged to include relevant stakeholders from across the continuum of care—such as primary care, home care, wound care, acute care and, importantly, patients and family members—in shaping implementation.

The new system of Ontario Health Teams is a logical structure to support the framework vision of integrated care for at-risk individuals.

Key learnings will be incorporated into the Ontario Framework for Lower-Limb Preservation, creating a co-designed product to support successful provincial implementation and adoption.

CorHealth recognizes the importance of this work, the unwavering commitment of our advisory committee, and the tireless efforts of our provincial stakeholders who are passionate about improving outcomes and quality-of-life for individuals living with diabetes and peripheral vascular disease. Together we will continue to improve

Emma Jowett is a senior strategist in stakeholder engagement, strategy and communications at CorHealth Ontario (CorHealth) in Toronto, Ontario. She joined CorHealth in 2017 to provide stakeholder engagement, communications and operational strategy expertise in the delivery of cardiac, stroke and vascular initiatives. Prior to joining CorHealth, she focused on providing communications, strategic and operational expertise to organizations in the healthcare, finance and consumer packaged goods industries.

Mike Setterfield is a senior strategist (clinical) at CorHealth Ontario (CorHealth) with responsibilities for the vascular portfolio. He joined CorHealth (previously the Cardiac Care Network of Ontario) in 2011 to develop A Vascular Services Quality Strategy for Ontario, resulting in the expansion of the Cardiac Care Network's mandate to include vascular services in addition to its focus on cardiac services in Ontario. Prior to joining CorHealth, he spent several years working in the pharmaceutical and biotechnology industry holding positions in clinical research and medical affairs.

access to high-quality best-practice early screening and integrated vascular lower-limb wound and diabetic foot care, and reduce avoidable, non-traumatic major lower-limb amputations in Ontario.

To learn more about the Strategy, please contact Mike Setterfield at mike.setterfield@corhealthontario.ca. ■

References

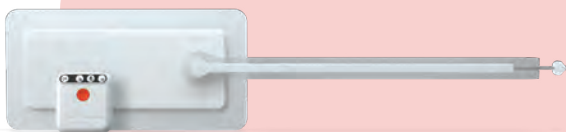
1. Pendsey SP. Understanding diabetic foot. *Int J Diabetes Dev Countries*. 2010;30(2):75–79.
2. Driver V, Madsen J, Goodman R. Reducing amputation rates in patients with diabetes at a military medical center. *Diabetes Care*. 2005;28(2):248–253.
3. Schaper NC, van Netten JJ, Apelqvist J, Bus SA, Hinchliffe RJ, Lipsky BA, IWGDF Editorial Board. Practical guidelines on the prevention and management of diabetic foot disease (IWGDF 2019 update). *Diabetes Metab Res Rev*. 2020;36(S1):e3266.
4. Ramsey SD, Newton K, Bough D, McCulloch DK, Sandhu N, Reiber GE, Wagner EH. Incidence, outcomes, and cost of foot ulcers in patients with diabetes. *Diabetes Care*. 1999;22:382–387.
5. Pedras S, Carvalho R, Pereira MG. Quality of life in Portuguese patients with diabetic foot ulcer before and after an amputation surgery. *Int J Behav Med*. 2016;23(6):714–721.
6. Diabetes Action Canada. Diabetes Foot Inpatient Cost Analysis in Toronto. Toronto: Diabetes Action Canada; 2021. Retrieved from: <https://diabetesaction.ca/diabetic-foot-inpatient-cost-analysis-in-toronto>.
7. Canadian Institute for Health Information, Discharge Abstract Database, unpublished data.
8. Statistics Canada. Table 17-10-0009-01: Population Estimates, Quarterly. Ottawa: Statistics Canada; 2021. Retrieved from: www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1710000901.
9. Registered Nurses' Association of Ontario. Low-cost Interventions Could Save People's Limbs, Lives and Millions of Ontario's Health-care Dollars. Toronto: Registered Nurses' Association of Ontario; 2016. Retrieved from: <https://rnao.ca/fr/news/media-releases/2016/04/12/low-cost-interventions-could-save-peoples-limbs-lives-and-millions>.
10. Hussain MA, Al-Omran M, Salata K, Sivaswamy A, Verma S, Forbes TL, et al. A call for integrated foot care and amputation prevention pathways for patients with diabetes and peripheral artery disease across Canada. *Can J Public Health*. 2019;110(2):253–255.
11. Hussain MA, Al-Omran M, Salata K, Sivaswamy A, Forbes TL, Sattar N, et al. Population-based secular trends in lower-extremity amputation for diabetes and peripheral artery disease. *CMAJ*. 2019;191(35):E955–E961.
12. Behrendt CA, Sigvant B, Szeberin Z, Beiles B, Eldrup N, Thomson I, et al. International variations in amputation practice: A VASCUNET report. *Eur J Vasc Endovasc Surg*. 2018;56:391–399.

+ 51% more closed wounds^{1*}

PICO® sNPWT[†] has been shown to significantly reduce wound area and depth when compared with tNPWT[‡] in patients with VLU and DFUs over 12 weeks.¹

Turn around wound healing trajectory more effectively than standard dressings and tNPWT with PICO.²

Smith+Nephew



PICO[◇] 14

Single Use Negative Pressure Wound Therapy System

Helping you get **CLOSER TO ZERO[◇]**
delay in wound healing
smith-nephew.com/pico

References: 1. Kirsner R, Dove C, Reyzelman A, Vayser D, Jaimes H. A prospective, randomized, controlled clinical trial on the efficacy of a single-use negative pressure wound therapy system, compared to traditional negative pressure wound therapy in the treatment of chronic ulcers of the lower extremities. *Wound Rep Regen.* 2019. May 14 <https://doi.org/10.1111/wrr.12727>. 2. Dowsett C, et al. Use of PICO® to improve clinical and economic outcomes in hard-to-heal wounds. *Wounds International.* 2017;8, p53–58. *45 vs 22%; p=0.002; ITT population. † Single Use Negative Pressure Wound Therapy (sNPWT). ‡ Traditional Negative Pressure Wound Therapy (tNPWT). ◇Trademark of Smith & Nephew. All Trademarks acknowledged. ©October 2019 Smith & Nephew. AWM-AWD-20619 | CA48405 03/21



How to Convince Decision Makers to Invest in Limb Preservation

By Venita Chandra, MD FACS; Karim Manji, DPM FACFAS;
Richard Neville, MD FACS DMSVS

Limb preservation is a multifactorial challenge that is often limited by financial resources. Those deciding where to invest financial resources within health systems need to be made aware of the importance of adequately funding limb preservation activities and supports.

There is a growing need for wound care due to the aging population and rising rates of diabetes, chronic disease and obesity. Each of these factors interplay and raise the rates of non-healing wounds. In the United States alone, 5 to 7 million chronic wounds account for more than US\$25 billion a year spent on direct and indirect wound care.¹ Most patients live for years if not decades with the implications resulting from non-healing wounds. Amputations can cost US\$43,000 to \$63,000, and patients who undergo such operations have less than a 50% chance of returning to independent mobilization.² This can have a major psychosocial impact, placing the patient at a higher risk for both mental and physical health challenges.

Many researchers have discussed how to improve limb preservation, with the major commonality centring around building multidisciplinary teams like Mills, et al.'s "Toe and Flow" program.³ Mills's program looked at the impact of pairing podiatric surgery with a vascular surgical hospital-based limb preservation service and found a significantly

decreased major amputation rate and increased number of vascular and non-vascular procedures. The Zivot Limb Preservation Centre was the first Toe and Flow team in Canada, and this approach demonstrated a 42% reduction in major amputation rates.¹ However, multidisciplinary teams are primarily located in in-patient programs and often do not provide outreach to communities.

A key factor in limb preservation success is systematic wound care (Figure 1). This involves implementing holistic evaluations of patients, including assessing for risks and comorbidities. Additionally, weekly standardized wound care is ideal and can include debridement, offloading and edema and fluid management. These efforts, however, can be costly. Financial limitations can restrict access to limb-saving care and significantly alter the course of treatment.

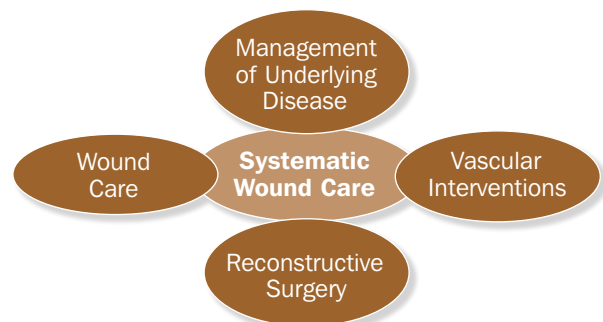


Figure 1: Systematic Wound Care.

A Successful Model

In 2014, Chandra and her team formed a wound centre that referred patients to a tertiary vascular surgery practice. This tertiary practice could then send patients who presented with wound-care-related issues to a wound centre. Prior to the opening of the centre, limb preservation patients were juggled

Venita Chandra earned her BS in genetics and cell biology from the University of Minnesota in 1999. In 2004, she received her medical degree from the University of Chicago's Pritzker School of Medicine. She completed her general surgery residency at Stanford in 2011 and is a graduate of the Stanford Biodesign program. She continued on to complete the Stanford Vascular Surgery Fellowship. She is double boarded in general and vascular surgery. She is currently a clinical associate professor of surgery in the division of vascular surgery at Stanford. She is medical director of the Stanford Advanced Wound Center and program director of the Vascular Surgery Training Program and is the founder of the Stanford Extremity Preservation Program (StEPP).

Karim Manji is Director of the Zivot Limb Preservation Centre and President of the Association of Alberta Podiatric Surgeons. He is board-certified by the American Board of Foot and Ankle Surgeons. He has an interest in the diabetic foot, particularly ulcers and wound care. He is currently involved in research surrounding the impact of technology and its ability to improve healing times for diabetic foot ulcers, and to reduce rates of re-ulceration. He is also interested in tendon releases in the foot and ankle to help treat diabetic foot ulcers.

Richard Neville is Chairman of Surgery at INOVA Fairfax Medical Campus, Associate Director of the INOVA Heart and Vascular Institute and Vice-Chairman in the Department of Surgery. His prior positions include Professor of Surgery and Ludwig Chief of the Division of Vascular Surgery at George Washington University, and Chief of Vascular Surgery at Georgetown University. He completed medical school at the University of Maryland and a general surgery residency at Georgetown University before moving on to a fellowship at the National Institutes of Health in endovascular device development. He then completed a vascular surgery fellowship under the direction of Dr Robert Hobson.

among a number of care providers in a fragmented, lengthy and costly process. The result of Chandra's team approach was a marked improvement in patient care before and after the facility opened:

- A 20% increase in the total volume of cases over three years
- A 64% increase in lower extremity interventions
- An increased number of wound cases as a result of patients having access to specialized care
- A relative decrease in patients treated for claudication compared with diabetic foot ulcers
- Minor amputations increased while major amputations decreased⁴

In the long-term, overall amputations decreased significantly. Only 35% of patients went from the wound centre to the vascular surgery practice, but 65% of patients in the vascular surgery practice were sent to the wound care centre. Compared with other surgery practices, this centre had one of the shortest stays, the lowest mortality index and a dramatically lower 30-day readmittance rate.

The research from the wound care clinic has suggested that systematic care as recommended by best practices is an important component of any limb preservation program. The opening of an outpatient wound centre had a significant positive impact on its affiliated vascular surgery practice. Peripheral interventions increased, amputations decreased, and there were more positive inpatient outcomes. Patients were able to access the necessary care in a more timely and effective manner, thus reducing the overall strain on inpatient health-care centres. ■

References

1. Basiri R, Haverstock BD, Petrusek PF, Manji K. Reduction in diabetes-related major amputation rates after implementation of a multidisciplinary model: An evaluation in Alberta, Canada. *J Am Podiatr Med Assoc*. 2019.
2. Wong KL, Nather A, Liang S, Chang Z, Wong TTC, Lim CT. Clinical outcomes of below knee amputations in diabetic foot patients. *Ann Acad Med Singapore*. 2013;42(8):388–394.
3. Rogers LC, Andros G, Caporusso J, Harkless LB, Mills JL Sr, Armstrong DG. Toe and flow: Essential components and structure of the amputation prevention team. *J Vasc Surg*. 2010 Sep;52(3 Suppl):23S–27S.
4. Flores AM, Mell MW, Dalman RL, Chandra V. Clinical impact of a wound care center on a vascular surgery practice. *J Vasc Surg*. 2018;67(6):E88–89.

Membership Has Its Privileges



Become a Wounds Canada Member Today!

Wounds Canada is excited to launch its revamped members portal, which will give all members exclusive access to the following **NEW** features:

- **An Image Bank:** view and download images for personal or educational use
- **Conference Sessions Gallery:** view scientific presentations from the Wounds Canada conferences
- **Webinar Gallery:** access engaging on-demand webinars with leading wound care specialists

Members will continue to have exclusive access to:

- Discounted registration fees for all conferences
- Quarterly member newsletters
- Discounts on wound care tools and resources available through our eBoutique

Being a member also gives you the opportunity to apply to sit on the Wounds Canada Board of Directors to let your voice be heard!

How do I join?

Visit www.woundscanada.ca/become-a-member today to take your wound care knowledge to the next level!

- Individual Annual Membership: \$100.00 CDN
- Student/Retiree/Patient/Lay Caregiver Membership: \$50.00 CDN

Find out more about us at www.woundscanada.ca.

Register today to take full advantage of these exclusive benefits!

Find us on social media



The Diabetes Foot Care Facebook Group Study

By Helen Ngozichukwuka Obilor MSc (Nursing) RN PhD Candidate; Kevin Woo, RN PhD

Globally, diabetic foot ulcers (DFUs) are a serious diabetes complication linked to excess disability and morbidity. To prevent foot complications, people with diabetes benefit from lifelong behavioural modifications, including meticulous foot care, dietary changes, smoking cessation and stringent blood glucose control.¹ However, adherence to preventative foot self-care recommendations is suboptimal.² Continuous patient education is critical to improving adherence.³ Available patient education programs often require patients to attend one to two in-person community- or hospital-based sessions with health-care professionals, but emerging evidence has shown its effectiveness to be transitory and tenuous.⁴

Alternative methods of patient education that could sustain lifelong self-care adherence are urgently needed to improve health outcomes. Social media could potentially serve as the platform for ongoing individual learning and motivation. Despite the limited number of studies examining the effect of social-media-based interventions on chronic disease self-management, the results indicate a positive impact.⁵ Specific to diabetes foot care, previous studies have shown that social

media sites such as Facebook and YouTube offer helpful patient information, but their impact on patients' foot health outcomes is unknown.⁶⁻⁷

In collaboration with Wounds Canada, we, the authors, are conducting a research study to explore the feasibility of using social media to engage individuals with diabetes in preventing foot ulcers.

The research adopts Brewin and Bradley's partially randomized preference trial design, which involves the combination of a) randomization of willing participants to either the experimental or control group and b) the option for participants to choose their preferred study group.



Participants in the experimental group will be invited to join a virtual community through a Facebook Group platform. These participants will receive continuous education based on components of the Wounds Canada Diabetes, Healthy Feet and You Program, using a variety of text, videos, photos and weblinks to promote user engagement and provide support. A trained peer leader (a person with diabetes) will co-moderate the Facebook Group alongside the principal investigator (Obilor) to help participants problem solve and identify realistic goals. The control group participants will not be enrolled in the Facebook

Group but will continue with their routine care. The study outcomes are mean changes in participants' baseline and three-month post-intervention self-reported foot self-care behaviour, foot health status (measured using the Foot Health Status Questionnaire, items 9 and 13), confidence and quality of life (assessed using MOS-SF 12). Also, qualitative data collected through a telephone interview and thematic analysis will explore the participants' perspective on how the Facebook Group has helped them with self-management.

The study findings will assist researchers in gaining insight into the feasibility of Facebook Group support in preventing foot ulcers and possibly inform recommendations for its integration into diabetes self-management programs.

We . . . solicit all health-care providers' support to share information about our study with their patients and request their participation.

We are currently recruiting participants and, therefore, solicit all health-care providers' support to share information about our study with their patients and request their participation.

To be eligible, patients must (a) be age 18 years or over with the diagnosis of diabetes, (b) reside in Canada, (c) own or be willing to create a Facebook account, (d) have access to the Internet, computer/smartphone and email; and (e) speak and write in the English language.

The privacy of participants is of utmost priority. The Facebook Group is private and closely monitored, and only approved members can see who is in the group and what they post.

Ethics clearance is approved by Queen's University Health Sciences and the Affiliated Teaching Hospitals Research Ethics Board.

To contact us regarding the study, please call Helen Obilor at 343-333-8226 or email 15hno@queensu.ca. More information on the study can be found at www.woundscanada.ca/patient-or-caregiver/diabetic-footcare-facebook-group-study. ■

References

1. Hingorani A, LaMuraglia GM, Henke P, Meissner MH, Loretz L, Zinszer KM, et al. The management of diabetic foot: A clinical practice guideline by the Society for Vascular Surgery in collaboration with the American Podiatric Medical Association and the Society for Vascular Medicine. *J Vasc Surg*. 2016;63(2 Suppl):3s–21s.
2. Matricciani L, Jones S. Who cares about foot care? Barriers and enablers of foot self-care practices among non-institutionalized older adults diagnosed with diabetes: An integrative review. *Diabetes Educ*. 2014;41(1):106–17.
3. Schaper NC, van Netten JJ, Apelqvist J, Bus SA, Hinchliffe RJ, Lipsky BA. IWGDF Practical Guidelines on the Prevention and Management of Diabetic Foot Disease. The International Working Group on the Diabetic Foot; 2019. Retrieved from: <https://iwgdfguidelines.org/wp-content/uploads/2019/05/01-IWGDF-practical-guidelines-2019.pdf>.
4. Dorresteijn JAN, Kriegsman DMW, Assendelft WJJ, Valk GD. Patient education for preventing diabetic foot ulceration. *Cochrane Database Syst Rev*. 2014;12(CD001488).
5. Merolli M, Gray K, Martin-Sanchez F. Health outcomes and related effects of using social media in chronic disease management: A literature review and analysis of affordances. *J Biomed Inform*. 2013;46(6):957–69.
6. Abedin T, Ahmed S, Al Mamun M, Ahmed SW, Newaz S, Rumana N, et al. YouTube as a source of useful information on diabetes foot care. *Diabetes Res Clin Pract*. 2015;110(1):e1–e4.
7. Abedin T, Al Mamun M, Lasker MAA, Ahmed SW, Shommu N, Rumana N, et al. Social media as a platform for information about diabetes foot care: A study of Facebook groups. *Can J Diabetes*. 2017;41(1):97–101.

Helen Ngozichukwuka Obilor is a Ph.D. candidate at the School of Nursing, Queen's University, under the supervision of Dr. Kevin Woo. She is a registered nurse and a lecturer at the Department of Nursing, University of Ibadan, Nigeria. Her research interests are wound care, chronic disease management and health promotion.

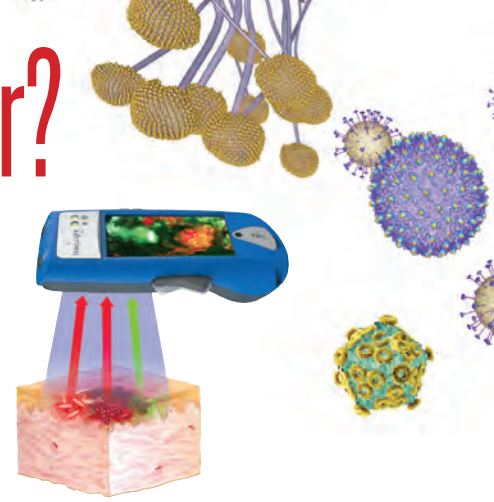
Kevin Woo is an associate professor at Queen's University, School of Nursing, School of Rehabilitation Therapy in Kingston, Ontario. He is the North American regional director and chair of the research committee for the International Skin Tear Advisory Panel (ISTAP). He is the web editor for the *Advances in Skin and Wound Care* website. He maintains his clinical expertise and functions as an advanced wound consultant.

How effective is your wound cleanser?

An evaluation using bacterial fluorescence imaging



By Rosemary Hill BSN CWOCN WCCC (C)



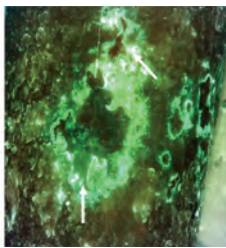
INTRODUCTION

- Wound cleansing to remove surface bacteria is an essential component of wound bed preparation.¹
- It is challenging for clinicians to objectively assess at the point of care the effectiveness of a wound cleanser in removing the surface bacteria.
- Most cleansers are cytotoxic, therefore the provincial health authority of British Columbia, Canada mandated that only normal saline be used.²
- Two novel, non cytotoxic and tissue compatible wound cleansers were identified by the provincial authority to improve the removal of surface bacteria: a hypochlorous acid solution and a modified sodium hypochlorite solution.
- This study aimed to objectively evaluate and compare the effectiveness of the two novel wound cleansers to substantiate selecting a specific cleanser and switching from normal saline as best practice.

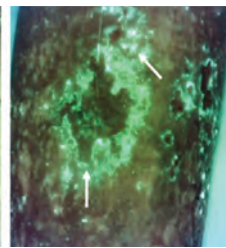
Fluorescence Images



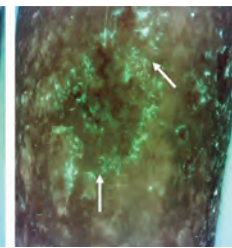
Standard Image



Post Saline
Cleanse



Post Hypochlorous
Acid Soak



Post Modified Sodium
Hypochlorite Cleanse
(Anasept® Antimicrobial
Skin & Wound Cleanser)

METHODS

Bacterial Fluorescence Imaging (MolecuLight i:X)

- When excited by 405 nm violet light, tissues fluoresce green while bacteria fluoresce red (porphyrin-producers, e.g. *Staphylococcus aureus*) or cyan (pyoverdine-producing *Pseudomonas aeruginosa*)
- This enables real time, point of care detection and localization of bacteria at loads of moderate to heavy within and around wounds³⁻⁵

COMPARISON STUDY

- Wounds (n=15) were cleansed with normal saline, as per best practice, after which a fluorescence image was acquired to visualize any concerning levels of bacteria remaining within and around the wound.
- Wounds were next soaked with the hypochlorous acid for a minimum of five minutes (per manufacturer guidelines), scrubbed and then re-imaged.
- Wounds were lastly sprayed with sodium hypochlorite solution and immediately scrubbed and re-imaged.

PRODUCT USED IN EVALUATIONS:

- 1) Saline - 0.9% Sodium Chloride (Isotonic) Solution
- 2) Hypochlorous acid
- 3) Modified sodium hypochlorite:

Anasept® Antimicrobial Skin & Wound Cleanser (Anasept® is a registered trademark of Anacapa Technologies, Inc.)



CONCLUSIONS

- Saline cleansing, according to best practice, left behind widespread bioburden in all wounds.
- Heavy bioburden in and around wounds can be identified from the fluorescence images and fluorescence images provide an objective method of evaluating the effectiveness of cleansing and performing targeted cleansing at the point of care.
- The evaluation found that sodium hypochlorite solution was superior to both normal saline and the competitor hypochlorous solution in removing *Pseudomonas* and other bacteria.
- Based on the results, the provincial authority now recommend that wounds exhibiting heavy bioburden be cleansed with sodium hypochlorite solution.



800.489.2591 anacapa-tech.net

Anasept® is a registered trademark of Anacapa Technologies, Inc

REFERENCES

1. Pilcher M. Wound cleansing: a key player in the implementation of the TIME paradigm. J Wound Care (2016)
2. British Columbia Provincial Nursing Skin & Wound Committee Procedure: Wound Cleansing (2017)
3. DaCosta RS et al. Point of Care Auto fluorescence Imaging for Real Time Sampling and Treatment Guidance of Bioburden in Chronic Wounds: First in Human Results, PLoS ONE 10(3), 2015.

4. Wu YC et al. Handheld fluorescence imaging device detects subclinical wound infection in an asymptomatic patient with chronic diabetic foot ulcer: a case report. International Wound Journal, 2015.
 5. Ottolino Perry et al. Improved detection of wound bacteria using autofluorescence image guided wound sampling in diabetic foot ulcers. International Wound Journal (In revisions).
- The MolecuLight i:X is manufactured by MolecuLight, Inc. 425 University Avenue, Suite 700 Toronto, ON, M5G 1T6 Canada

Recommended Reading

Diabetic foot problems during the COVID-19 pandemic in a tertiary care center: The emergency among the emergencies.

Read it: <https://care.diabetesjournals.org/content/diacare/43/10/e123.full.pdf>.

The interruption of preventative education, early treatment and early diagnosis caused by the COVID-19 lockdown may have led to increased hospitalization of patients with severe DFUs who are at high risk of amputation. Caruso et al. report an increased proportion of patients being admitted for emergency care and a decreased proportion of patients in regular, outpatient care among those admitted after the restrictive measures of the pandemic began. The increased risk for amputation during COVID-19 lockdown supports the need for appropriate and timely management of patients with DFUs to prevent reduced quality of life and increased morbidity and mortality.

Caruso P, Longo M, Signoriello S, Gicchino M, Maiorino MI, Bellastella G, et al. Diabetic foot problems during the COVID-19 pandemic in a tertiary care center: The emergency among the emergencies. Diabetes Care. 2020;43(10):e123–e124.

Reviewer: Maryse Beaumier, RN, PhD

Impact of the COVID-19 lockdown strategy on vascular surgery practice: More major amputations than usual.

Read it: www.ncbi.nlm.nih.gov/pmc/articles/PMC7402273/pdf/main.pdf.

This study suggests that the lockdown during the COVID-19 pandemic has resulted in a significant increase in the number of major amputations, which may have a large impact on functional outcomes of care and patient quality of life. Patients with limb ischemia are a vulnerable group of patients whose outcomes are negatively affected if the standard of care is compromised. It is important that during future pandemics, regular medical care should continue for these patients, with referrals in time for revascularization.

Schuijvens PM, Buijs M, Boonman-de Winter L, Veen EJ, de Groot HG, Buimer TG, et al. Impact of the COVID-19 lockdown strategy on vascular surgery practice: More major amputations than usual. Annals of Vascular Surgery. 2020;69:74–79.

Reviewer: Maryse Beaumier, RN, PhD

Building a scalable diabetic limb preservation program: Four steps to success.

Read it: www.ncbi.nlm.nih.gov/pmc/articles/PMC5912709/pdf/zdfa-9-1452513.pdf.

This article outlines and describes four key components for developing a successful limb preservation program: 1) establishing a “hot foot line” for urgent referral; 2) developing a wound-healing clinic to address outpatient care; 3) delivering diabetic foot care for patients in remission to maximize ulcer-free days; 4) implementing screening clinics to identify and triage patients for appropriate therapeutic and surveillance programs for prevention, healing and remission.

Khan T, Shin L, Woelfel S, Rowe V, Wilson BL, Armstrong DG. Building a scalable diabetic limb preservation program: Four steps to success. Diabetic Foot & Ankle. 2018;9(1):1452513.

Reviewer: Tom Weisz, BA, DCh, IIWCC





40th National Conference

PLUGGED IN & CHARGED UP

eWOC Educational Summit
May 12-15, 2021

Register Now!

www.nswoc.ca/conference2021



LEARN, LEAD, AND BE INSPIRED!

GET "PLUGGED IN AND CHARGED UP AT THE NSWOC 40TH NATIONAL CONFERENCE.

Our eWOC Educational Summit sets the standard in the virtual delivery of specialized wound, ostomy and continence education.

Who should attend?

- **Nurses Specialized in Wound, Ostomy and Continence (NSWOCs)**
- **Skin Wellness Associate Nurses (SWANs)**
- **Allied healthcare professionals** including physicians, RNs, LPNs/RPNs working from hospital to community

How is our eWOC Educational Summit Unique?

- Includes a French Education Program with expert international speakers
- Global experts in wound, ostomy and continence to deliver English
- A "Seminar Day" that provides a deep-dive into key topics
- An interactive Virtual Exhibit Hall
- An educational scavenger hunt with amazing prizes
- The NSWOC Annual Members Meeting where members voices will be heard
- A fun 40th NSWOC Anniversary Virtual Cook-a-Long
- Virtual networking - *together we are stronger!*

Be a part of the NSWOC Standard of Excellence!

EXPERT SPEAKERS WILL DISCUSS IMPORTANT TOPICS

Debridement International Debate: Who should do it?

- **Dr. Kimberly LeBlanc, PhD, RN, NSWOC, WOC(C), IIWCC, FCAN;**
- **Corey Heerschap, MScCH, BScN, RN, NSWOC, WOC(C), IIWCC;**
- **Dot Weir, RN, CWON, CWS (USA)**
- **Julia Bresnai-Harris, BN, RN, NSWOC, TVN (England)**

Raising the Standard of Indigenous Wound, Ostomy, and Continence Health

- **Brenda Moodie, BScN, RN, NSWOC;**
- **Heather Wright, MCI(WH), BScN, RN, NSWOC, WOC(C)**

Enterocutaneous/Enteratmospheric Fistula Seminar

- **Lina Martins, MScN, BScN, RN, NSWOC, WOC(C);**
- **Karen Edwards, MSS, BSN, RN, CWOCN (USA)**

Pilonidal Disease: Bascom & GIPS Procedure

- **Dr. Luigi Basso, General Surgeon/Proctologist (Italy)**

The Great Commonwealth Debate: UK & Canada Infection Control in Wound Management Panel

- **Jillian Brooke, MCISc(WH), BSc(hons), RN, NSWOC, WOC(C);**
- **Madeleine Ashcroft, MHS, BScN, RN, CIC, FAPIC;**
- **Vayla Weston, Lead Infection Control Nurse, Alder Hey Children's NHS Foundation Trust (England)**

Pandemic Practices Across the NSWOC Continuum & COVID-19 Panel

- **Michelle Buffalo, RN, BScN, NSWOC;**
- **Nicholas Joachimides, MN, RN, NSWOC, WOC(C);**
- **Tarik Alam, MCISc(WH), BScN, RN, NSWOC;**
- **Misty Stephens, BScN, RN, NSWOC,**
- **Eileen Emmott, BScN, RN, NSWOC, WOC(C), IIWCC**

and so many more exciting presentations...

Nurses Specialized in Wound, Ostomy and Continence Canada (NSWOCC)

66 Leopolds Drive, Ottawa, ON K1V 7E3 | office@nswoc.ca | 1-888-739-5072

Diabetes, Healthy Feet and You – Train-the-Trainer: A Quality Improvement Inquiry

By Janet L. Kuhnke, BScN MS NSWOC DrPsych; M. Gail Woodbury, BScPT PhD

Background to the Study

Diabetic self-management education focused on foot care and footwear, when provided in an organized and structured manner, is a cornerstone of preventing foot problems such as ulceration and other types of skin breakdown.¹ This is important because, as the global burden of diabetes increases, diabetic foot disease is of great concern to the health-care community. The number of adults living with diabetes worldwide has increased from 4.7% (1980) to 8.5% (2014).² In Canada, the prevalence of diabetes was 9.3% in 2015 and is estimated to rise to 12.1% by 2025 (one in three Canadians were living with diabetes or prediabetes in 2019).³ Particularly worrying are the diabetes rates among Canadian Indigenous peoples, who are three to five times more likely to have diabetes than those in the general population.⁴

Foot complications lead to significant changes to an individual's quality of life; and for adults living with diabetes, foot ulceration is one of the most feared complications.⁵ Overall, the economic costs of diabetic foot ulcers, or recurrence of a foot ulcer, pose a significant global burden to health-care systems.^{6–8} In Canada, the estimated direct costs to the health-care system are \$3.8 billion, and are estimated to increase to \$4.9 billion by 2030.^{9–10}

What is Diabetes, Healthy Feet and You?

Diabetes, Healthy Feet and You (DHFY) is an innovative education program developed to address the learning needs of patients and their families/care partners around self-management of diabetes mellitus, foot care, footwear and prevention of foot ulcers and amputations.^{11–12} Previously known as PEP Talk (“Peer-led Education Program” Talk), this community-based initiative was developed in 2013 and evaluated with funding from the Public Health Agency of Canada. DHFY is available via health regions/authorities, who license the program from Wounds Canada.^{13–15} The program provides these regions with training, resources and ongoing support.

This article describes the Diabetes, Healthy Feet and You program (2014, 2017) and its associated Train-the-Trainer workshop and workbook. The aim of the quality improvement inquiry was to focus on the trainers using the workshop materials in a training event,* and the results are reported here.

**As a result of the COVID-19 pandemic, the live components of the program are not currently being delivered. Wounds Canada plans to create a version of the program that can be delivered virtually, but with no changes to content.*

How Diabetes, Healthy Feet and You Works

Three Types of Trainers

To ensure the program maintains robust core integrity based on international best practice as well as meaning at the local level, the program was designed to have three levels of dispersal.

Level 1: Wounds Canada provides two-person teams to instruct potential community-based DHFY trainers. The Wounds Canada training team includes a person living with diabetes and a health-care professional, both of whom are experienced facilitators and knowledgeable and passionate about prevention of foot complications. This team delivers day-long instructional Train-the-Trainer workshops to health-care professionals who have been selected by their health-regions to deliver the program locally.

Level 2: The regional health-care trainers then deliver the program via a day-long workshop to selected individuals within the community, who will then be equipped to deliver the program to persons with diabetes and their families/care partners. These trainers also co-ordinate the scheduling and promotion of the 2.5-hour community DHFY workshops using training strategies and materials provided by Wounds Canada.

Level 3: The community-based trainers then provide the direct link to the community through 2.5-hour workshops attended by persons with diabetes and their families/care partners. These community-based trainers also work in teams of two: one person living with diabetes and one health-care professional.

About the Workshop

During the Train-the-Trainer (Level 1) workshop, participants learned how to plan, implement and evaluate the eight-hour Level 2 workshop. The workshop is delivered using various teaching and training media (hardcopy, electronic) and in three components:

- How to effectively deliver a Level 2 community workshop. This includes having participants deliver sections of a “mock” workshop.

- Discussion and practice in the art and science of group facilitation
- Discussion on how to conduct community follow-up and evaluation of the community-based DHFY workshops

Participants use the following training materials:

- DHFY Train-the-Trainer Workbook
- Community Workshop Workbook
- Online DHFY resources
- Wounds Canada’s Wound Prevention and Management Cycle
- Inlow’s 60-Second Diabetic Foot Screen tool
- Daily Commitment Foot Care Card

Group discussions include the following topics:

- Adult education principles
- Communication strategies to improve patients’ self-efficacy or an individual’s belief in one’s capacity to carry out behaviours necessary to produce specific performance attainments¹⁶
- Empowerment principles
- Strategies to deal with conflict
- Strategies to increase daily foot-checking behaviour in persons with diabetes

As well, participants discuss the steps needed to implement a 2.5-hour community-based DHFY (Level 3) workshop.

Janet L. Kuhnke is an assistant professor of Baccalaureate of Nursing at Cape Breton University and an NSWOC with a strong background in community practice. Her recent studies include qualitative studies related to community members living with diabetes mellitus and being at risk for foot ulcerations. She is focusing on barriers and inequities in delivering best practices in skin and wound care in rural and remote communities. She is studying narrative inquiry and reflexive practice.

M. Gail Woodbury has retired from her adjunct position in the School of Rehabilitation Therapy at Queen’s University, Kingston, Ontario. Previously, she participated with wound colleagues in quantitative and qualitative wound care research studies.

How the DHFY Program Addresses the Prevention of Foot Complications

The DHFY program offers patients and their families and care partners information and tools to help them maintain healthy feet and prevent foot complications. Proper self-management improves patient well-being, lowers direct health-care costs and reduces many of the negative societal impacts that often accompany chronic disease.

The program offers the following:

- Access to workshops in communities in each province
- Training using Wounds Canada resources to help trainers teach patients and their care partners how to prevent complication and manage day-to-day foot care issues
- Emailed foot care tips and information for community participants

The DHFY program is based on the Train-the-Trainer approach.^{17–18} In a workshop, participants discuss and engage in activities that aid in understanding the role of adult education principles, facilitation strategies, conducting a training workshop in the community, communication strategies, giving and receiving feedback, and facilitating evaluation.

To implement the program, a health region or authority establishes licensing and fidelity agreements. Diabetes and chronic disease teams then recruit and enroll health-care professionals into the Wounds Canada DHFY Train-the-Trainer workshops (Level 1). Participants develop the knowledge and skills to train, in a Level 2 workshop, their own community-based teams to implement the DHFY program. Community workshops (Level 3) are then scheduled and delivered to persons with diabetes and their families and care partners.

The DHFY program targets and supports change for individuals living with diabetes who are at risk for foot ulceration and amputation. The underlying belief is that these education efforts will be effective if community-based health promotion activities are valued and supported by leaders, which is reflective of a population-health approach.¹⁹

Research on the original peer-led education program indicated that participants changed their behaviour as a result of having attended a DHFY workshop.¹²

Methodology

Quality Improvement Approach

Wounds Canada undertook a quality improvement initiative in 2017 to study the effectiveness of the program to develop DHFY trainers. An ethics review was completed by Cape Breton University Ethics Review Board. Utilization-focused evaluation (UFE) guided the qualitative evaluation.^{20–21} Patton's (2014) work in quality improvement and evaluation reminds us that UFE begins with the understanding that the users of a program can give practical feedback based on the utility and use of the product being evaluated.²⁰ The PEP Talk: DHFY Train-the-Trainer (2014, V. 1.2) program operated for three years (2014–2017).²² Wounds Canada updated the training materials in 2017, and they were therefore in need of evaluation.²³ The revised DHFY training program (V. 2.0) materials were tested in two training workshops, and feedback was obtained. Qualitative thematic analysis was used to generate key themes from the study feedback, which focused on the four evaluative components (listed on page 45).²⁴

Participants

Participants (n = 20) were health-care professionals attending the DHFY Train-the-Trainer workshops hosted by Wounds Canada. Participants attended a full-day (eight hours) DHFY Train-the-Trainer workshop, offered in two Canadian cities. The research letter of information and ethics were reviewed, quality improvement program evaluation processes were explained, and participants gave verbal and written consent. Workshop participants could choose to withdraw from the evaluation if they did not wish to participate.

How the Workshop Was Evaluated

The DHFY workshop and Train-the-Trainer approach are based on Knowles's framework of adult learning (andragogy).²⁵ Bastable and

Myers state professionals, as adult learners, move from being dependent to independent learners. Professionals benefit from development of skills, knowledge and attitude through reading, listening, observing and role-modelling.²⁶ For this reason, we asked participants to actively engage in the Train-the-Trainer workshop activities and to pay attention to their individual and group experience. Participants were asked to provide feedback using qualitative open-ended surveys. They were asked to give feedback on the following:

1. The overall Train-the-Trainer workshop experience
2. Their experiences when delivering part of a mock DHFY workshop
3. Group facilitation and communication with technology, online and print materials
4. Answering diabetic foot knowledge questions pre- and post-workshop

Study Results

Participants in the Train-the-Trainer workshop were registered nurses and licensed practical nurses, diabetes educators and program co-ordinators. Of the 24 participants, 20 completed the evaluation surveys. The researcher kept field notes, and thematic analysis was used to develop the four themes.

1. Growing Knowledge in Foot Screening

The two eight-hour training workshops were well-received by the participants. They discussed growing knowledge of the monofilament test and the role of foot screens as part of a holistic assessment. Written feedback from the participants included the following comments: “It was good to learn the clinical facts about diabetic foot ulcers being preventable”; “It was good to learn about loss of protective sensation (LOPS) that patients experience”; “It was good to learn about *not* soaking feet of persons with diabetes”; and “Learning about how to [draw] a patient’s foot and shoe as a teaching tool for prevention of foot ulcers” was worthwhile.

Two participants stated that before the Train-the-Trainer workshop, they were not aware that the monofilament test was only one part

of a complete foot assessment. After being taught a comprehensive foot assessment using a reliable screening tool, they described feeling more informed.

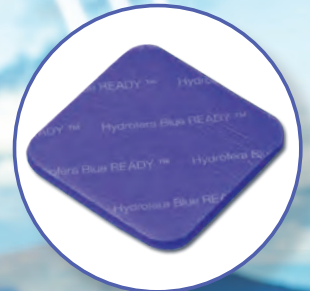
Overall, participants reported feeling excitement about being able to offer the DHFY preventative foot care training program in their communities. Participants recognized that to implement a DHFY program they needed to have permission from and to collaborate with the health region or authority DHFY co-ordinator. One participant stated, “It has been an honour to be part of this program; I am very excited to get this program started at my clinic, to educate our patients and to help others become educated about diabetic foot, and to share it with others.”

2. Engaging in Mock Workshop Training and Receiving Feedback

As part of the Train-the-Trainer workshop, participants had an opportunity to engage in a facilitated mock DHFY workshop. Participants described the benefits of practising a mock workshop during which time they received feedback from peer participants and the DHFY workshop facilitators. Participants stated: “Before this training workshop, I did not know how to use presentation software slides to educate”; “Being able to practise using workbooks and slides in a safe environment increased my confidence level.” Two participants stated that “watching a mock presentation modelled by the DHFY trainers helped [me] to understand how to operationalize a DHFY community workshop” and “learning from peers in the workshop was helpful.” Several stated they learned by watching the DHFY trainers role-model the mock workshop, including how to manage time in a workshop and how to adhere to an agenda.

3. Group Facilitation and Communication with Technology, Online and Print Materials

Participants discussed the benefits of reviewing adult education principles and teaching skills in a facilitated, safe learning environment. Two



Hydrofera Blue.
The healing circle is complete.



From onset to outcome, the Hydrofera Blue suite of wound dressings powerfully treats any type of chronic or non-healing wound.



Hydrofera Blue

CLASSIC®
READY®
READY®-Transfer
READY®-Border™

For product questions and samples, please click
here to email us. dianne@hydrof.com

Find natural balance in *blue.*

Hydrofera®

Hydrofera Dressings manufactured by: Hydrofera, LLC,
340 Progress Drive Manchester, CT 06042 USA
www.hydrofera.com

Hydrofera Blue and the Hydrofera Blue logo are trademarks of Hydrofera, LLC. ©2021
084-0121
MADE IN USA

HydroferaBLUE®

participants stated, “It was good to see how to be interactive in a group setting without putting participants on the spot” and “The trainers were knowledgeable and respectful and helped make the training fun—this made learning easier.”

Participants indicated the benefit of learning how to work with difficult or challenging participants. “Learning how to work with clients that are talkative or disruptive was helpful.” Another stated that learning how to respect “patients that may be quiet in a group setting or speak with an accent” was useful, and “I learned a great deal from the suggestions of the other nurses and co-ordinators in the workshop.”

4. Experiencing Pre- and Post-Workshop Knowledge Questions

To support the mock DHFY workshop, participants were asked to complete DHFY pre- and post-workshop foot care questions.^{26–28}

This was purposeful, as it gave participants an opportunity to answer the same questions they would ask participants in a community-based DHFY workshop to answer. Twenty participants completed pre- and post-workshop foot care knowledge questions. Overall, the participants said they appreciated being offered this opportunity.

Discussion

The results of this quality improvement study provided evidence that revisions made to the DHFY Train-the-Trainer manual (V. 2.0), training materials and delivery of the training workshop were effective. Feedback from the 20 participants has since been embedded in the DHFY workshop training materials. Engaging in a quality improvement initiative reinforced the importance of embedding regular program evaluation strategies in educative training workshops and programs.^{20–21} Patton states that evaluators, or users, of a training program are in a strong position to give feedback.²⁰ As the DHFY training workshops were being planned, the UFE processes were identified for use at the training workshops to collect feed-

back; it was effective to plan the evaluations while planning workshops.

Overall, participants responded positively to the eight-hour training workshop. They indicated that the information shared there increased their knowledge of diabetes-related foot complications, foot risk screening,²⁹ and the role of shoes and insoles.³⁰ They benefited from practice teaching using presentation slides and a presentation clicker to move slides forward and back.^{16,30} Participants, though initially uncertain, were able to participate in a small group activity and conduct a mock workshop together. As well, they benefited from having their technology device in hand and learning to access the Wounds Canada education materials online.

Participants recorded their opinions on the importance of observing a modelled, mock workshop and how to implement a DHFY training workshop. They indicated the value of role-playing and observing role-modelling as an instructional method.^{16,31} By rehearsing and playing an assigned role in a mock workshop, participants experienced how it feels to function in that role. Participants described valuing the use of wide-ranging DHFY training materials (written, verbal, audio, visual) and various media types.

Participants described learning about themselves as speakers and future educators. They experienced speaking in front of a group, and presenting to a group of peers using media tools. In addition, participants stated they enjoyed the discussion on how to manage time during the workshop, use agendas, present as a group and work as a team. Fitzgerald states workshop participants are in a good position to identify further educational opportunities,¹⁶ and this was evident from the feedback when participants identified the need for ongoing educative opportunities to continue to practise these skills.

For some participants, understanding principles of adult education was not new, yet for others this was part of a growing information base. Finally, participants readily shared with their peers what they knew about working with adults and identified what knowledge they had yet to learn.

Participants spoke to the workshop facilitators about feeling educative pressures to be current in their clinical knowledge of diabetes-related foot care and footwear. Giving educators current and relevant education resources is an important part of adult training. Trainers must be aware of the need to participate in self-learning activities. Participants were encouraged to access resources from Wounds Canada and Diabetes Canada.

Participants discussed the need to communicate in several languages and to be aware of specific cultural settings. Currently Wounds Canada offers the DHFY resources in Arabic, Chinese, English, French, Gujarati, Hindi, Japanese, Punjabi, Spanish, Tamil, Urdu and Vietnamese.³² Participants shared how they developed translator resource lists to meet the need in each community. Finally, they discussed the importance of being part of cultural sensitivity training on a regular basis. They identified this as essential when recruiting community members and health-care professionals.

Next Steps

This quality improvement initiative provided constructive information that has been used to improve the DHFY Train-the-Trainer program and DHFY resources available online.³² Future DHFY training could include a greater focus on the role of public speaking, use of technology (such as presentation software) and communication with health managers and directors.

We are grateful to the participants for their rich feedback and support of this quality improvement initiative. ■

References

1. International Working Group on the Diabetic Foot. IWGDF Guidelines on the Prevention and Management of Diabetic Foot Disease. IWGDF Guidelines. IWGDF; 2019. 194 pp. Retrieved from: <https://iwgdfguidelines.org/wp-content/uploads/2019/05/IWGDF-Guidelines-2019.pdf>.
2. World Health Organization. Diabetes: Key facts. Geneva: World Health Organization; 2020. Retrieved from: www.who.int/news-room/fact-sheets/detail/diabetes.
3. Diabetes Canada. One in Three Canadians is Living with Diabetes or Pre-diabetes, yet Knowledge of Risk and Complications of Disease Remains Low. Toronto: Diabetes Canada; 2019. Retrieved from: www.diabetes.ca/media-room/press-releases/one-in-three-canadians-is-living-with-diabetes-or-prediabetes,-yet-knowledge-of-risk-and-complications.
4. Canadian Diabetes Association Clinical Practice Guidelines Expert Committee. Canadian Diabetes Association 2018 clinical practice guidelines for the prevention and management of diabetes in Canada. *Can J Diabetes*. 2018;42(Suppl 1):A1–S342.
5. Boulton AJ, Vileikyte L, Ragnarson-Tennvall G, Apelqvist J. The global burden of diabetic foot disease. *Lancet*. 2005;366(9498):1719–1724.
6. Hopkins RB, Burke N, Hartlock J, Jathishinie J, Goeree R. Economic burden of illness associated with diabetic foot ulcers in Canada. *BMC Central Health Services Research*. 2015;15:1–9.
7. Boulton AJ, Vileikyte L, Ragnarson-Tennvall G, Apelqvist J. The global burden of diabetic foot disease. *Lancet*. 2005;366(9498):1719–1724.
8. Bus SA, van Netten JJ, Lavery LA, Monteiro-Soares M, Rasmussen A, Jubiz, Price PE, et al. IWGDF guidance on the prevention of foot ulcers in at-risk patients with diabetes. *Diabetes Metab Res Rev*. 2016;32(Suppl 1):16–24.
9. Diabetes Canada. Diabetes in Canada: Background. Toronto: Diabetes Canada; 2020. 6 pp.
10. Hopkins RB, Burke N, Hartlock J, Jathishinie J, Goeree R. Economic burden of illness associated with diabetic foot ulcers in Canada. *BMC Central Health Services Research*. 2015;15:1–9.
11. Botros M, Woodbury MG, Kuhnke JL, Despaix M. Saving diabetic limbs in Canada: Partnership between the Public Health Agency of Canada and the Canadian Association of Wound Care. *Int Wound J*. 2012;9(3):231–233.
12. Woodbury MG, Botros M, Kuhnke JL, Greene J. Evaluation of a peer-led self-management education programme PEP talk: Diabetes, Healthy Feet and You. *Int Wound J*. 2013;10(6):703–711.
13. Kuhnke JL, Rosenthal S. Peer-to-peer education: The PEP Talk Diabetes, Healthy Feet and You program in Canada. *J Wound Ostomy Continence Nurs*. 2015;42(4):321–323.
14. Kuhnke JL, Peerzada S, Farrell K, Macdonald K. Perspectives from a peer leader and regional self-management program leaders: PEP Talk: Diabetes, Healthy Feet and You in action. *Wound Care Canada*. 2015;13(1):12–16.
15. Kuhnke JL, Woodbury MG, Botros M. Make a difference in your community to save limbs: Peer leaders' perspectives in the PEP Talk: Diabetes, Healthy Feet and You program. *Diabetic Foot Canada*. 2014;2(1):6–14.

16. Fitzgerald K, Keyes K. Instructional methods and settings. In: Bastable SB. Nurse as Educator: Principles of Teaching and Learning for Nursing Practice. New York, NY: Jones & Bartlett Learning; 2013. pp. 470–515.
17. Diabetic Foot Canada. Diabetes, Healthy Feet and You. Training Manual. Version 1.3. Toronto: Wounds Canada; 2017.
18. American Psychological Association. Self-efficacy. Worcester, MA (Clark University): APA; 2019. Retrieved from: www.apa.org/pi/aids/resources/education/self-efficacy.
19. Tang TS, Funnell M, Sinco B, Piatt G, Palmisano G, Spencer MS, et al. Comparative effectiveness of peer leaders and community health workers in diabetes self-management support: Results of a randomized controlled trial. *Diabetes Care*. 2014;37(6):1525–1534.
20. Patton MQ. Evaluation Flash Cards: Embedding Evaluative Thinking in Organizational Culture. St. Paul, MN: Otto Bremer Foundation; 2014. pp. 1–25.
21. Miles MB, Huberman AM, Saldana J. *Qualitative Data Analysis: A Methods Sourcebook*. Los Angeles: Sage; 2014.
22. Diabetic Foot Canada. PEP Talk: CAWC Peer Education Program. Program Manual. Version 1.2. Toronto: Diabetic Foot Canada; 2014. pp. 1–100.
23. Wounds Canada. Diabetes, Healthy Feet and You: Resource Binder. Version 2.0. Toronto: Wounds Canada; 2017. pp. 1–111.
24. Morse JM. *Qualitative Health Research*. Walnut Creek, CA: Left Coast Press; 2012.
25. Pappas C. The adult learning theory - andragogy of Malcolm Knowles. eLearning Industry. 2013. Retrieved from: <https://elearningindustry.com/the-adult-learning-theory-andragogy-of-malcolm-knowles>.
26. Bastable SB, Myers GM. Developmental states of the learner. In: Bastable SB. Nurse as Educator: Principles of Teaching and Learning for Nursing Practice. Burlington, MA: Jones & Bartlett Learning; 2014. pp. 165–216.
27. Wounds Canada. Peer Leader Training Workshop: Pre-workshop Questions. Toronto: Wounds Canada; 2017.
28. Wounds Canada. Peer Leader Training Workshop: Post-workshop Questions. Toronto: Wounds Canada; 2017.
29. Murphy CA, Laforet K, Da Rosa P, Tabamo F, Woodbury MG. Reliability and predictive validity of Inlow's 60-second Diabetic Foot Screen Tool. *Adv Skin Wound Care*. 2013;25(6):261–266.
30. Ulbrecht JS, Cavanagh PR. Shoes and insoles for at-risk people with diabetes. In: Armstrong DG, Lavery LA. *Clinical Care of the Diabetic Foot*. 3rd ed. American Diabetes Association. Arlington County, VA: The American Diabetes Association; 2016. pp. 15–26.
31. Worral P. Evaluation in health care education. In: Bastable SB. Nurse as Educator: Principles of Teaching and Learning for Nursing Practice. Burlington, MA: Jones & Bartlett Learning; 2014. pp. 601–635.
32. Wounds Canada. Diabetes, Healthy Feet and You. Toronto: Wounds Canada; 2021. Retrieved from: www.woundscanada.ca/docman/public/diabetes-healthy-feet-and-you.

Smith+Nephew

Collagenase
SANTYL[®]

Ointment 250 units/gram



Debridement that delivers more

SANTYL Ointment is an approved prescription that removes dead tissue from wounds so they can start to heal. Healthcare professionals have prescribed SANTYL Ointment for more than 50 years to help clean many types of wounds, including chronic dermal ulcers (such as pressure injuries, diabetic ulcers, and venous ulcers) and severely burned areas.

While all forms of debridement play an important role in wound bed preparation by removing barriers to healing,¹ only SANTYL Ointment features a unique enzymatic mechanism of action that signals changes in the wound environment that are conducive to wound closure²⁻⁵ while also offering patients convenient, at-home application.

SANTYL Ointment is covered by most public drug benefit programs†

1. Enoch S, Harding K. Wound bed preparation: the science behind the removal of barriers to healing. *Wounds*. 2003;15:213-229 2. Herman, I. Stimulation of human keratinocyte migration and proliferation in vitro: insights into the cellular responses to injury and wound healing. *Wounds*. 1996; 8:33-40. 3. Riley et al. Collagenase promotes the cellular responses to injury and wound healing in vivo. *J Burns Wounds*. 2005; 4:112-124. 4. Shi et al. Degradation of human collagen isoforms by Clostridium collagenase and the effects of degradation products on cell migration. *Int Wound J*. 2010; 7: 87-95. 5. Sheets AR, Demidova-Rice TN, Shi L, Ronfard V, Grover KV, Herman IM (2016) Identification and Characterization of Novel Matrix-Derived Bioactive Peptides: A Role for Collagenase from Santyl® Ointment in Post-Debridement Wound Healing? *PLoS ONE* 11(7): e0159598. †Public Drug Coverage will vary in each province. Private insurance coverage will vary depending on individual's private plan. SANTYL Collagenase Ointment - DIN 02063670. CA14874 03/21

Wounds Canada 2021
Click To Enter

Hurry!
EARLY BIRD
UNTIL APRIL 16th!

**ONE LOW
REGISTRATION FEE for**

3

**VIRTUAL
CONFERENCES:**

1) Limb Preservation Symposium

May 28

**2) National Conference
with French Symposium**

October 21–24

3) Pressure Injury Symposium

November 18

REGISTER AT

www.woundscanada2021.ca

- **Early Bird Registration and
Wounds Canada Membership: \$100 + tax**
(combined savings of \$65!)
- **Early Bird (Wounds Canada Members):**
\$50 + tax
- **Early Bird (Non-member):**
\$65 + tax

MAY 28, 2021

**LIMB
PRESERVATION
SYMPOSIUM**



**PRESSURE
INJURY
SYMPOSIUM**

**NOVEMBER
18, 2021**

**NATIONAL
CONFERENCE**

**OCTOBER
21–23, 2021**



**CONFÉRENCE
NATIONALE**

**24 OCTOBRE
2021**

INFORMATION