

Wound Care

C A N A D A

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THE OFFICIAL PUBLICATION OF WOUNDS CANADA

Virtual Care: Implications for Wound Management

Amputation Prevention:
**Your Role in
Saving Limbs**

Designer Wound Care:
Compounded
Topical Formulations

Nutrition and
Pressure Injury Healing:
Updated Recommendations

Session Summaries
Wounds Canada
Fall 2019 Conference
Part II



A Message from our CEO

Our Commitment to You During the COVID-19 Pandemic

As CEO of Wounds Canada, I want to assure you that Wounds Canada remains committed to you during the uncertainty and challenges of the COVID-19 pandemic. During this time, we are doing everything we can to support our staff and the Canadian wound community.

Our proactive measures have included cancelling all face-to-face meetings and postponing onsite educational events. Our staff members continue to work virtually—as they have always done—to create and distribute essential resources for patients and their families, health-care providers and decision-makers in facilities, agencies and governments.

We understand the stress people are feeling, in part due to the overwhelming and conflicting information on social and mainstream media. To support you with the most accurate information available about COVID-19, we will be holding a series of webinars with an infectious disease expert and frontline clinicians.

For the many other available wound care resources and information Wounds Canada provides, visit our website: www.woundscanada.ca.

I would like to take this opportunity to pass on the team's admiration for the spirit and actions of our fellow Canadians.

We celebrate patients and care partners who are supporting one another and taking the protective measures to physically distance, self-isolate or quarantine to minimize the spread of COVID-19. Every one of these actions helps Canada secure a flattened curve of transmission.

We applaud health-care professionals who are working to battle COVID-19 with courage, compassion and care by serving our patients and the Canadian public. You are the warriors in a fight for health and safety.

We commend leaders in government and industry for making the difficult choice to close businesses, enact preventive measures and take responsibility to protect employees, communities and society. Your actions demonstrate tremendous leadership and resolve to manage this pandemic.

Stay healthy and stay connected with us, as we deliver new resources to help you during this uncertain time. If you have any questions or concerns, please contact us at info@woundscanada.ca.

Sincerely,



Mariam Botros
CEO, Wounds Canada



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Wounds Canada (www.woundscanada.ca) is a non-profit organization of health-care professionals, industry participants, patients and care partners dedicated to the advancement of wound prevention and care in Canada.

Wounds Canada was formed in 1995 as the Canadian Association of Wound Care. The association's efforts are focused on four key areas: education, research, advocacy and awareness, and partnerships.

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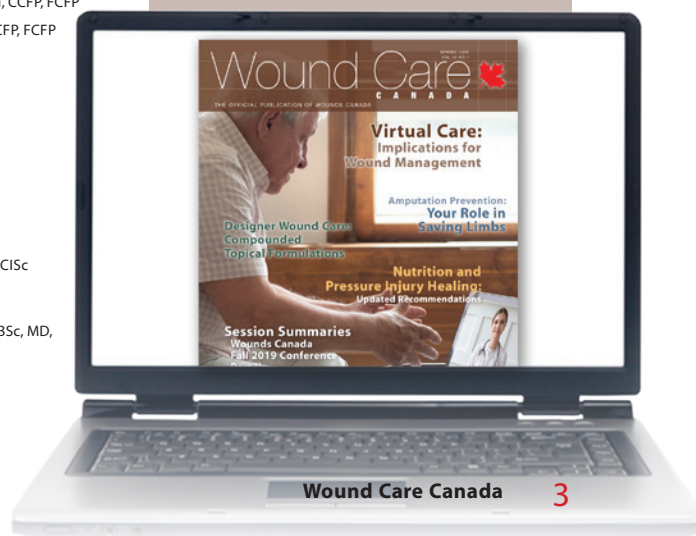
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It's free!





News in Wound Care

Wounds Canada News

Wounds Canada: Advancing Wound Care for 25 Years

2020 marks the 25th anniversary of Wounds Canada. Since 1995, Wounds Canada—which started life as the Canadian Association of Wound Care—has been advancing wound prevention and management across Canada and providing leadership around the world. Since that time, the



organization has grown significantly, from offering one conference aimed at health-care professionals

(HCPs) per year, to using multiple methods to provide education for HCPs, patients and their families, and policy makers, as well as engaging in awareness-raising and advocacy work on behalf of Canadians with wounds or at risk for wounds. Our resources, many of them free, are used by HCPs and patients around the world.

Despite current uncertainty, we are confident the future holds more opportunities, as we leverage new technology to reach more people with

the information they need to effectively prevent and manage wounds of all types.

New Resource Available!

Pratiques exemplaires : La prévention et la gestion des complications des plaies chirurgicales (Best Practice Recommendations for the Prevention and Management of Surgical

Wound Complications) is now available online.

Stay tuned for 2020 releases of two new BPRs: Best Practice Recommendations for the Prevention and Management of Peripheral Arterial Ulcers and Best Practice Recommendations for the Prevention and Management of Moisture-associated Skin Damage.

Wounds Canada Conference in Calgary, Alberta, April 2–3, 2020

Due to the COVID-19 pandemic, Wounds Canada has postponed its spring conference in Calgary, along with all associated activities: Wounds Canada Institute Skills lab for Local Wound Care (A100NWS), April 2; leadership summit, April 2; e-stim workshop, April 3. The Wounds Canada team is working with the leadership from Alberta Health Services and Covenant Health on rescheduling this important event. **Stay tuned for details about an alternative date in the fall.**

We thank you for your continued support and patience in these times.

POSTPONED



Fall Conference in Toronto

Preparations for our fall conference, October 15–18, at the Westin Harbour Castle Hotel in Toronto are ongoing, despite these uncertain times. We will continue to update you on the status of the event through eblasts and the Wounds Canada website. Please continue to check your email inbox for information.



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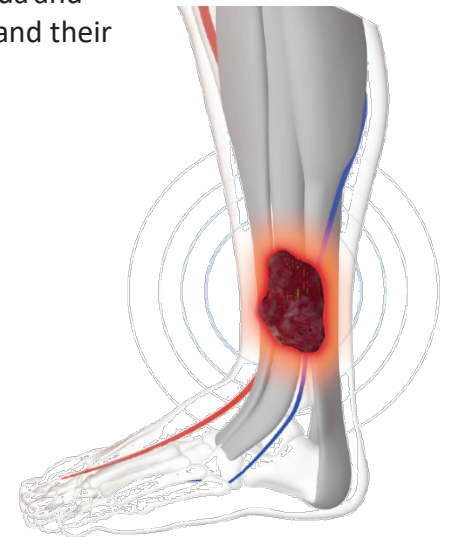
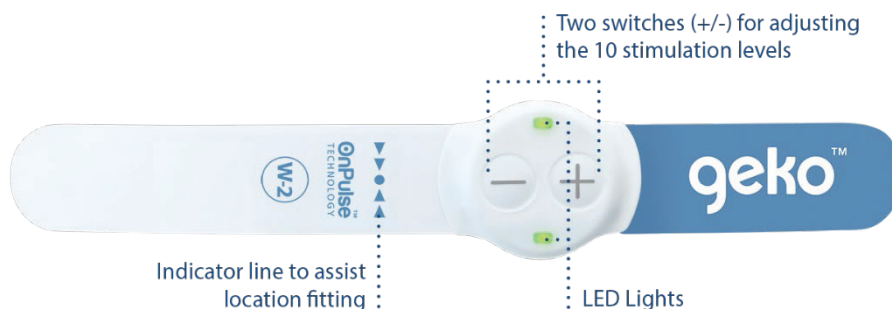
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1. Bowler PG, et al. Parsons, Wound Medicine 14 (2016) 6–11. 2. Metcalf DG et al. J. Wound Care 2016; Vol25, No3. 3. Metcalf DG, et al. Int Wound J 2017; 14: 203–213. 4. Malone M et al. 2017. JWC; 20–25. AQUACEL, Hydrofiber and MORE THAN SILVER are trademarks of ConvaTec Inc. ©2019 ConvaTec Inc. AP-019908-MM
* When compared to AQUACEL™ Ag Extra™ dressing and other silver-only competitor dressings: ACTICOAT™ 7 and SILVERCEL™ Non-Adherent dressings.



Lower Leg Ulcers

Wound management is a considerable burden on health systems, in Canada and elsewhere, significantly impacting health and quality of life of individuals and their families (CIHI Compromised Wounds in Canada, 2013).



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Estimated cost-savings of \$2,500.00 per patient if used as a first-line adjunctive therapy for Venous Leg Ulcers along with best practices (WW LHIN Evaluation 2018 Perfuse Medtec Report)



News from Our Industry Partners

Hydrofera Blue READY-Border™ and READY-Transfer

Hydrofera® is pleased to announce the addition of Hydrofera Blue READY-Border™ and READY-Transfer to our wound care portfolio. The Border dressing offers all the clinical benefits of Hydrofera's polyurethane foam and also features a perforated silicone adhesive border. This border provides a secure fit in difficult-to-dress areas, yet still allows for gentle removal, particularly on sensitive skin. The Transfer dressing has no film backing and is ideal for use under total contact cast and compression therapy.

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In a recent retrospective study of more than 30,000 patients, Hydrofera Blue® combined with an Integrated Care Program resulted in significantly faster healing times and reduced costs (Hurd T. Surg Technol Int. 2019;35:58-66).

Coloplast Continues to Expand its Biatain® Silicone Ag Range

Coloplast continues to expand its Biatain® Silicone Ag range with NEW shapes and sizes. The NEW products are designed specifically to allow health-care professionals to access a full portfolio of Biatain® Silicone Ag products with 3DFit® Technology. These flexible, absorbent foam dressings, featuring a gentle silicone adhesive and a patented silver complex, are intended for use on a broad range of exuding infected wounds or wounds at risk of infection.

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REFERENCES: 1. Edwards K. New twist on an old favorite: gentian violet and methylene blue antibacterial foam dressings. *Adv Wound Care* (New Rochelle). 2016; Jan 1;5(1):11-18. 2. Swan H, Trovella VJ. Case study review: use of an absorbent bacteriostatic dressing for multiple indications. Poster presented at Clinical Symposium on Advances in Skin and Wound Care; September 9-11, 2011; Washington, DC. 3. Weir D, Blakely M. Case review of the clinical use of an antimicrobial PVA foam dressing. Poster presented at Symposium on Advances in Skin and Wound Care; April 18-21, 2012; Atlanta, GA. 4. Corwell P, Mikulski L, Tramontozzi M. A comparison of two antimicrobial PVA foam dressings: a randomized prospective trial comparing PVA foam with two organic pigments to a silver based wound dressing. Poster presented at Symposium on Advanced Wound Care, May 2-5, 2004; Lake Buena Vista, Fla. 5. Malone M, Bjarnsholt T, McBain AJ, et al. The prevalence of biofilms in chronic wounds – a systematic review and meta-analysis of published data. *J Wound Care*. 2017; Jan 2;26(1):20-25. 6. Percival SL, Suleman L. Slough and biofilm: removal of barriers to wound healing by desloughing. *J Wound Care*. 2015; Nov;24(11):498-510. 7. Nakagami G, Schultz G, Gibson DJ, et al. Biofilm detection by wound blotting can predict slough development in pressure ulcers: a prospective observational study. *Wound Rep and Reg*. 2017; 25:131-138. 8. Applewhite AJ, Attar P, Liden B, Stevenson Q. Gentian violet and methylene blue polyvinyl alcohol foam antibacterial dressing as a viable form of autolytic debridement in the wound bed. *Surg Technol Int*. 2015 May; 26:65-70. 9. Hill R. Optimizing the wound bed by removing devitalized tissue and using methylene blue and gentian violet antibacterial foam dressings: a case series. Poster presented at Wounds Canada; May 12-14, 2017; Kamloops, BC. 10. Prest D. Managing challenging chronic wounds in the community setting using an antibacterial PVA foam dressing containing methylene blue and gentian violet. Poster presented at CAWC; October 29 – November 1, 2015; Toronto, ON. 11. Woo KY, Heil J. A prospective evaluation of methylene blue and gentian violet dressing for management of chronic wounds with local infection. *Int Wound J*. 2017; doi: 10.1111/iwj.12753 * Classic Dressings

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031-0919

Wounds Canada Fall 2019 Conference: Driving Change in Wound Care

October 3–6, 2019, Niagara Fallsview Casino, Niagara, Falls, ON



Session Summaries – Part II

Wounds Canada held its fall 2019 conference in Niagara Falls, ON, October 3 to 6. Local volunteers attended sessions and prepared the summaries that follow, which include highlights and practice pearls from expert speakers. These summaries reflect the remaining half of the sessions; the first half was in the Fall 2019 issue of Wound Care Canada.

THRIVING WITH CHANGE: HOW TO MAKE IT HAPPEN

Reporter: Eliot To, DCh MCISc (Wound Healing) HBSc

Session speaker: Irmajean Bajnok

This session served as a follow-up session to Irmajean Bajnok's previous presentation about change and how to become an agent of change. She began by defining *change agency* and a *change agent*. Change agency relates to the power a group or individual has to make a positive difference. It is about empowering others to influence and make change. A change agent is one

who makes a positive difference through "power, confidence, skills and courage."

She suggested that "change is changing," and stated four different examples of how that is happening: disruptive change, acceleration of connectedness, diminished hierarchal power and change moving to the edge. Change is disruptive, as organizations are moving away from hierarchal structures. It is also disruptive as the model of care moves toward a patient-centred approach. As well, the demographics of care providers and recipients are changing. The pervasive use of technology is another reason for disruptive change.

This led to her next point: the acceleration of connectedness. The use of technology and social media has changed and will continue to change how we live our lives, deliver patient care and promote awareness. She quoted research suggesting that “just 3% of the people in the organization or system typically drive conversation with 90% of other people.” Technology and social media allow us to be more connected, and for information and knowledge to be obtained and shared. She challenged the attendees to think about how to harness such connectedness to our advantage in health care.

Change can be seen in organizations where there is less hierarchal power. She quoted Helen Bevan: “[We] still organize health and care like the tabulating machine company of 1917.” She then mentioned Jeremy Heimes and Henry Timms’ concept of “old power versus new power.” There is a shift from old power to new power, from currency to current, from power held by a few to power held by many, from being pushed down to being pushed in, from commanded to shared, from closed to open, and from transaction to relationship.

She also suggested that change is moving to the edge, meaning that change needs to be led from the actual point of contact, the so called “frontline” workers. Frontline workers should no longer be the last to know of changes but should be the ones to contribute to initiating change. She provided an example of a recent change project, #endPJparalysis, started by nursing professor Brian Dolan. The initiative is based on the idea that patients in pyjamas in the hospital are at higher risk of wounds, loss of muscle mass, falling, boredom and increased length of stay than patients who get dressed and get moving. This initiative went viral on social media, capturing international attention, and was estimated to have saved 710,000 hospital stay days.

She continued her session by providing different models of change, including Lewin, Kotter, Bridges, Canada Health Infoway, Roller Coaster of Change by Haines, the RNAO implementation toolkit, and the IHI psychology of change framework. She also talked about the role of habit in

our lives. We rely on habit to get us through the day and to be efficient. However, change begs us to modify or give up our habits—things that are “tough and scary to do.” She suggested that we need to change people’s mindset, not just their behaviour. They need to see why they need to change, not just what or how to change.

Key Points:

- Change is disruptive.
- Technology and social media accelerate our connectedness.
- There is a move away from the traditional hierarchal models, shifting from “old power” to “new power.”
- Change is moving to the edge, where front-line workers are initiating and contributing to change.
- There are different models of change. “All models are wrong, but some are useful.”

— George Box





SURGICAL WOUND COMPLICATIONS

Reporter: Susan Chandler, RN MCIScWH

Session speakers: Yasser Botros, Karen Cross, Johnny Lau

Karen Cross focused on the basic principles of reconstruction as they relate to skin grafts and flaps. She discussed how to recognize the factors that impact skin graft take and flap infection. She explored skin grafting techniques, types of skin grafts used, and skin graft survival and take. The reconstructive ladder was presented with types of wound closures from secondary intent through to free tissue transfer. Also discussed were complications of skin grafts, types of possible infections and reasons why dressings should be left *in situ* and removed as per surgeon's recommendations.

The presentation by Yasser Botros focused on identifying risk factors and the clinical presentation of surgical mesh infections and how these should be managed. Risk factors for mesh infections are the same for any wound infection.

Johnny Lau led a lively discussion with all three

speakers on orthopedic hardware infections and the treatment or management of infections, using case studies to guide the debate.

Key Points:

- Skin graft survival and how it is achieved need to be fully understood to prevent skin graft failure.
- Skin graft take is influenced by multiple factors: graft, graft bed, environment and the immune system.
- Risk factors for mesh infections are the same for any wound infection.
- Skin flaps can be used as rescue or reconstructive options in infected beds, but they carry inherent risk.

MASD AND SKIN DAMAGE: CURRENT AND EMERGING PRACTICE

Reporter: Tim Murray, RN BScNP

Session speakers: Karen Campbell, Kimberly LeBlanc, Kevin Woo

Kimberly LeBlanc presented a case study of moisture-associated skin damage (MASD), illustrating the importance of skin care. MASD has multiple causes related to ongoing moisture on the skin.

Incontinence-associated dermatitis (IAD) can be misdiagnosed as a pressure injury; it often occurs in skin folds around the buttocks and groin, and patients often complain of itching and burning. Removing the moisture, cleansing effectively and managing incontinence are key in improving IAD. GLOBAID has developed an online categorization tool that is useful in managing IAD.

Pressure injuries can develop as secondary to IAD as the skin becomes more vulnerable when affected by incontinence moisture. Fungal infections can also develop, particularly when moisture-containment products like diapers are used.

Karen Campbell discussed skin tears, focusing on a 2018 clinical update from the International Skin Tear Advisory Panel (ISTAP). Skin tears are defined as traumatic wounds by mechanical force and can be partial- or full-thickness tears involving separation of the epidermis and the dermis.

The most common causes of skin tears are blunt trauma, falls while performing activities of daily living, dressing changes, position transfers, and injury from equipment. The prevalence of skin tears is 4–26% in long-term care, 4.5–20% in community care, 6.2–11.1% in acute care, 3.3–14.3% in palliative care, and 17% in pediatric care. ISTAP classifies skin tears into three categories: type 1, no flap loss; type 2, partial flap loss; and type 3, full flap loss. Management of skin tears includes controlling bleeding, cleansing the wound and approximating wound edges. Appropriate use of dressings to protect the flap is typically necessary.

Kevin Woo discussed common factors in the development of skin tears and MASD using the MINDS acronym: mechanical or moisture, intrinsic factors, noxious substances, drugs, skin allergens.

Skin frailty is a vague concept and needs more clarity. There are many risk factors that contribute to this, including age, hydration and loss of collagen. The exposome, which encompasses the totality of human environmental exposure from conception, is one factor in skin frailty. It includes an individual's genetic background, cognitive stresses, non-cognitive stresses and age-associated diseases.

Artificial intelligence (AI) is being developed to perform skin evaluation using algorithms. This technology uses a rating scale from one to five to assess nine factors. Using this evaluation, it is possible to categorize the frailty of the skin, but more research needs to be done to improve evaluation.

Key Points:

- MASD is often misdiagnosed as pressure injury.
- Moisture associated with MASD or IAD makes pressure injury more likely.
- Almost half of all skin tears are found without any apparent cause.
- There are three main risk factors for skin tears: general health, mobility and skin-related issues.
- More research needs to be done to categorize skin frailty and MASD.

BURNS

Reporter: Veronika Anissimova, RN BMedSc MCIScWH WOCC(C)

Session speakers: Mafalda Concordia, Shahriar Shahrokhi

Mafalda Concordia spoke about prevention, assessment and treatment of people with complex burn wounds. She outlined the priorities of nursing care in the acute, healing and recovery phases of burn management. These priorities include hemodynamic monitoring (sepsis, hypovolemic shock), pain management, management of psychosocial needs, rehabilitation and wound debridement.

She emphasized that the healing trajectory of the wound depends on the depth of the burn and skin involvement. Special attention must be paid to the psychological aspect of rehabilitation of individuals with complex burns. A patient's psychological health before the burn injury is often the best predictor of the mental health symptomology after the burn injury.

Shahriar Shahrokhi noted that an accurate measurement of the percentage of total body surface area (%TBSA) of a burn injury is crucial for calculating the estimated fluid resuscitation, determining the need to transfer to a specialized burn unit and determining the probability of mortality. The currently available methods of %TBSA estimation are inaccurate. Three-dimensional





PEDIATRIC WOUNDS

Reporter: Veronika Anissimova, RN BMedSc MCIScWH WOCC(C)

*Session speakers: Louise Forest-Lalande,
Irene Lara-Corrales, Michelle Lee*

Louise Forest-Lalande discussed epidermolysis bullosa (EB), a group of skin diseases that cause various degrees of skin and mucous membrane fragility. In EB, the skin becomes fragile when proteins essential for skin integrity are absent. This is a complex autoimmune disease requiring management by multiple specialities. Making a diagnosis of EB might not be easy and typically takes time. It is important to recognize that skin fragility in newborns is encountered in conditions other than EB. Although clinicians should consider EB if they see blisters developing in a newborn, a diagnosis cannot be confirmed just by looking at the baby's skin.

She discussed the important role of an NSWOC(C) in caregivers' and hospital staff's instruction in carrying out simple but important tasks such as handling the baby, swabbing, and taking a baby's temperature with an infrared thermometer.

Irene Lara-Corrales discussed classifying vascular anomalies into two different groups: vascular tumours and vascular malformations. Infantile hemangioma is the most common type of vascular tumour; about 10% of newborns have this tumor, and ulcerations happen in 15% of hemangiomas. Early white discolouration of vascular anomalies is a sign of progression of the ulceration. Laser and surgical excision can lead to healing and decreases in pain. One of the main barriers to practice change is the lack of knowledge regarding classification of vascular anomalies.

Michelle Lee discussed medical adhesives and medical-adhesive-related skin injuries (MARSI). She focused on epidemiology, prevention, assessment and treatment of these injuries.

Key Points:

- Caring for children with EB and their families is an ongoing challenge for all: the child, the parents and the interprofessional team.

systems have been developed to improve %TBSA calculation and consequently optimize clinical decision-making.

He discussed enzymatic debridement with a new removal agent as a safe and reliable tool for early eschar removal on the hands, feet and face of adults. It can be applied immediately after initial assessment and wound preparation. Selective debridement is non-surgical, fast and effective, and can be a first-line, minimally invasive therapy in situations of disasters and mass casualty events. This new removal agent is not available in Canada.

The classification of skin substitutes with recommendations to their usage, advantages and disadvantages were discussed.

Key Points:

- Pathophysiology and management of burns are dependent on the depth of the wound.
- Technology has and will continue to improve our ability to assess depth and size of burn. We need to be aware of the options and use them appropriately.
- Enzymatic debridement can be used as a tool in the care of burn patients, especially in mass casualty events.
- Skin substitutes and tissue engineering hold the key to the future of burn surgery.

- Avoid adhesives, hydrocolloids and hypertonic dressings in management of EB.
- Gently cleanse wounds with low-toxicity solutions: saline, water.
- Use pain analgesia before dressing changes.
- Not all vascular anomalies in pediatrics are hemangioma.
- Distinguish between vascular tumours and vascular malformations.
- Proper technique for application and removal of adhesive products should be used to prevent tissue trauma, improve patient safety and quality of life, and reduce health-care costs.

GRAND ROUNDS

Reporter: Crystal McCallum, BScN MCISC-WH

Session speakers: Zareen Ahmad, Stephanie Furtado, James Smith

After defining Raynaud's phenomenon, describing its typical presentation and the pathophysiology of the disease, and differentiating between primary and secondary disease, Zareen Ahmad used a series of compelling images and a case study to demonstrate the assessment, diagnosis and treatment of patients who present to her with Raynaud's phenomenon. In addition to traditional pharmacological methods to treat patients presenting with Raynaud's phenomenon and digital ulcers (e.g., calcium-channel blockers), she suggested keeping the whole body warm, having the patient wear mittens (not gloves), using electric hand warmers and space heaters, supporting smoking cessation and avoiding sympathomimetic drugs like decongestants, amphetamines and ephedra. She also advised asking patients about photosensitivity, mucosal ulcers, sicca, clotting, spontaneous abortion, joint swelling and cytopenia, as up to 37% of those with Raynaud's phenomenon may develop (or have) a connective tissue disease, requiring further assessment and a referral to a rheumatologist.

James Smith followed with a description of external beam radiation therapy and how it damages the basal cells of the epidermis, reduces

production of new cells and induces an inflammatory response, with peak damage occurring seven to 10 days post treatment. He discussed intrinsic and extrinsic factors that place patients at increased risk for radiation dermatitis (the most common side effect of radiation therapy), and locations of the body at highest risk (inframammary folds, axilla folds, groin/perineum/gluteal area and neck folds). Using images and case studies, he described the common presentation of radiation dermatitis and discussed the Radiation Therapy Oncology Group (RTOG) grading tool and Radiation Induced Skin Reaction Assessment Scale (RISRAS), each used to measure and describe the spectrum of radiation dermatitis. He then discussed treatment, suggesting bathing using gentle skin products, applying a moisturizer with a dimethicone component twice daily, avoiding extremes of heat and cold, and avoiding hot tubs, pools and lakes. He also stated that there have been some recent clinical trials using cyanoacrylates and silicone film-forming gel (separately, not together) to delay and reduce the severity of radiation dermatitis.

Rounding out the session, Stephanie Furtado used audience polling to work through a series of complex case studies involving neonatal and pediatric patients with multiple stomas or severe peristomal skin breakdown. She suggested that, because there is limited research to support decision making for this population, creativity and



an interdisciplinary team approach are required, and a positive outcome depends on clear and frequent communication with the health-care providers involved and the patient's parents.

Key Points:

- Manage most patients who present with Raynaud's phenomenon and have primary disease with warming and use of calcium-channel blockers.
- As there is little research on the prevention and treatment of radiation dermatitis, and as current best practice guidelines are largely based on expert opinion, approach the management of radiation dermatitis using the concept of moist wound healing.
- Build a team and find creative solutions to meet the emotional and physical needs of neonates and children with ostomies and peristomal complications.

PRESSURE INJURIES: CURRENT AND EMERGING PRACTICE

Reporter: Tim Murray, RN BScNP

Session speakers: Barbara Bates-Jensen, Chester Ho, Ellen Mackay

Currently there is no standardized mapping system and thus great difficulty in performing objective pressure mapping over time. When collecting data for pressure mapping, there is an overwhelming amount of data collection that occurs manually. Therefore, machine learning may be a solution to help predict patterns and trends through algorithms. Chester Ho discussed the developing role of pressure mapping devices that use machine learning in pressure injury prevention. Research is underway, and there is a proposal that uses machine learning to more accurately monitor and predict risks for developing pressure injuries. The machine learns how to recognize body parts and assess the duration and actual pressure exerted so that a particular body part can be analyzed over time. The computer produces optical data and can estimate the body's pose/posture and make calculations about risk.

Ellen Mackay discussed the challenges of performing nutrition-focused research. Malnutrition is one of the biggest risk factors for pressure injuries; however, there is not a universally agreed upon definition. Forty-five percent of Canadians admitted to hospital are thought to have a nutritional deficiency. Many factors contribute to this, including patients' ability to feed themselves.

There are three main etiologies of malnutrition: starvation-related, chronic-disease-related and acute-disease/injury-related. A new white paper by the National Pressure Injury Advisory Panel (NPIAP), the European Pressure Ulcer Advisory Panel (EPUAP) and the Pan Pacific Pressure Injury Alliance (PPPIA) focusing on malnutrition has just been released.

Extra arginine is needed when the body is under stress from episodes like trauma to the skin. The recommendation is 1.25–1.5 grams per kilogram of protein per day. There is no evidence to suggest that any rate of protein over 2 grams per kilogram per day is beneficial.

Barbara Bates-Jensen discussed the biophysical measures for detecting pressure injuries, including using surface capacitance methods and temperature/thermography. Surface electrical capacitance (SEC) uses electromagnetic waves to read inflammatory responses and predict tissue damage. This device is useful to gain an objective and metric measure to assess for damage. Often, individuals with darker skin pigment are more difficult to assess for tissue damage. Early recognition of damage is beneficial. The sub-epidermal moisture (SEM) scanner does this type of scanning and is available commercially. A moisture meter is one more device that can be used to assess for tissue damage. This is not new technology—it has been used in other areas such as burn severity and lower limb edema—and it is better at assessing damage than an expert using visual assessment measures. When comparing SEM with ultrasound and thermography, research literature supports the use of SEM, as ultrasound is often impractical.

Skin temperature is higher in patients with erythema or stage 1 pressure damage. However, this can also be difficult to measure. There is early evidence that cooling areas of erythema and pres-

sure injury can have a protective effect on the tissues. Thermography has some practical use; however, these are the early days, and the technology and practicality still have room to develop.

Key Points:

- Machine-driven pressure mapping is an emerging science that is useful for PI risk assessment.
- Address malnutrition early, and assume individuals are malnourished unless proven otherwise.
- Think about long-term preservation of muscle mass.
- Supplementation is not the “magic bullet.” Increased and optimized food intake is the best option when treating pressure injuries.
- Thermography has a budding relationship with pressure injury treatment, and it is improving and becoming more practical over time.

WHAT ELSE DO WE NEED TO KNOW?

Reporter: Susan Chandler, RN MCIScWH

Session speakers: Guy Chamberland, Karen Cross, Kimberly LeBlanc, Michael Stacey, Kevin Woo

This session discussed current and emerging practices (with evidence) related to the use of swabs, biopsies and diagnostic imaging to guide wound treatment. Speakers discussed how regenerative medicine is changing the ability to regenerate skin and tissue phenotypes. They also identified the current and emerging non-opioid strategies to effectively manage wound pain and the evidence to support safety and effectiveness.

The primary role of tests in relation to wound management is to determine the etiology and select the appropriate therapy. Re-evaluation during treatment of non-healing wounds is important to identify additional factors that are causing the wound to stall and to ensure optimal plans of care are followed for the underlying diagnosis.

Advances in regenerative medicine include gene therapy, the complete restoration of the skin's anatomy and physiology, and automated and robotic fabrication of engineered tissue, including the 3D printing of skin. Point-of-care



diagnostics assist in the quantitative evaluation of wounds.

Management of ischemic pain requires a multifaceted approach that can include heat therapy, offloading footwear, combined dietary nitrate and exercise intervention, extracorporeal shock-wave therapy, growth factors for angiogenesis, functional electrical stimulation, transcutaneous electrical nerve stimulation and blood pressure-lowering medication.

Key Points:

- Re-evaluate the wound and treatment course if the wound size has not changed or has gotten larger.
- Despite the existence of several proven traditional wound therapies, there is a lack of scientific standardization and validation.
- Botanical formulations can be effective for pain relief if administered at an adequate dosage.
- There is no evidence supporting the use of oral cannabis products for pain relief.



FOOD IS HEALING

Reporter: Sue Rosenthal, BA MA

Session speaker: Ellen Mackay

What we eat matters. Wounds are hungry and thirsty; they need a constant supply of nutrients, no matter what type of wound is present. Poor nutrition can prolong wound healing and can impact the immune system, making individuals more susceptible to infection. It is difficult to quantify the impact of nutrition care in terms of cost savings, but nutrition is a key component of care and should be considered by every member of the multidisciplinary team.

Malnutrition has many definitions, but essentially is caused by a reduced intake relative to the patient's need, which leads to poor physical and cognitive function. Insufficient energy intake, weight loss, loss of muscle mass, loss of subcutaneous fat, fluid accumulation and diminished functional status all put an individual at risk of becoming malnourished. About 45% of individuals admitted to hospital are considered malnourished. Screening for malnutrition can be done by anyone, as long as they are using a validated screening tool. Some tools are designed for specific populations such as people in acute care, or older adults (see page 25 for examples). Following assessment, a dietitian should be brought in to assess and create a plan for intervention.

A person loses about 1% of lean body mass

every year, especially between the ages of 40 and 60, making them more vulnerable to wounds. Exercise is the best way to reduce this loss of muscle mass. If a patient has a wound, clinicians should put weight loss programs on hold, even if the patient is obese. High body-mass index is associated with poor wound healing, so engaging a dietitian is key to optimize this aspect of care.

Several key nutrients are needed for optimal wound healing. Water helps deliver nutrients and removes waste. Sometimes, patients restrict water so they don't need to use the washroom often; clinicians need to ensure patients are getting adequate hydration. Calories are required to enable protein to be used in wound healing. Clinicians can consider adding snacks rather than more food at mealtimes to fulfill caloric needs. Fat is needed to spare protein and to help the body to absorb vitamins and metformin. Protein is essential for wound healing but is often one of the first nutrients to be avoided when chewing or swallowing is impacted. Vitamins and minerals, including zinc, iron, vitamin A, vitamin C and vitamin D, are also important and can be added through food or with a low-dose multivitamin.

Key Points:

- Wound care needs an integrated team; enlist a dietitian.
- Use validated screening tools to assess risk for malnutrition.
- Protein is needed for all phases of healing.
- Set up a hydration station in your unit or clinic.
- Equip wheelchairs with cup holders.
- Patients often have protein only at dinner; if protein need is high, spread it out to other meals and snacks.
- Offer foods first; supplement only if the patient needs it.
- Honour "protected" mealtime (don't schedule tests or appointments that interfere with meals).
- Food is medicine; patients need to know that they must eat, even if they aren't hungry.
- Eating alone is not fun; encourage family to show up at mealtimes.
- Advocate for nutrition and identify malnutrition early. 🍴



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Endoform 101

Endoform is an extracellular matrix (ECM) that supports all the phases of wound healing. Endoform is a collagen dressing that promotes healing in acute and chronic wounds and is widely accessible to wound care clinicians. This primer will introduce clinicians to the science behind Endoform and will provide information about its use to help clinicians determine whether this product can benefit their patients' healing outcomes.

Q1: What is an extracellular matrix (ECM) and what does it do?

An ECM is a network of biomolecules that provides structure for cells and gives tissues strength, elasticity and other physical properties. In some wounds, the ECM is damaged, meaning it is unable to support the healing process. In wounds that are stalled or healing slowly, protease activity destroys ECM at a rate that exceeds its ability to self-repair.¹

Studies in regenerative medicine have shown that using a functional ECM to supplement the chronic wound environment is a key strategy for moving stalled wounds into the proliferative stage of healing.¹ Advanced ECM technology means it is now possible to replace a patient's ECM with a dressing that works as a provisional ECM to support and guide cells. Endoform is one

such dressing that treats the pathology of wounds themselves rather than their symptoms.

Q2: What is Endoform?

Endoform is an ECM, derived from the stomach of sheep, that supports all phases of healing (Figure 1). Ovine cells are selectively removed while the composition and structure of the ECM is preserved. Endoform contains more than 150 unique matrix proteins, making its compositional complexity similar to native ECM.²⁻³ Endoform's porous structure allows cells to adhere, migrate and proliferate naturally.

The composition of Endoform's ECM enables it to interact with patients' cells during the phases of healing. Endoform is 85% collagen and 15% secondary molecules (Figure 2). By utilizing a diverse array of secondary molecules, Endoform imitates functional tissue ECM and supports wound healing and tissue growth.

Q3: How can Endoform change practice?

Endoform is indicated for the management of partial- and full-thickness wounds, pressure injuries, venous ulcers, diabetic ulcers, chronic vascular ulcers, tunneled/undermined wounds, surgical wounds, traumatic wounds and draining wounds.

By applying an ECM like Endoform, clinicians can see the wound moving through the various phases of wound healing. Using Endoform in the inflammatory phase helps prevent biofilm formation and guards against a broad range of organisms. In the chronic wound environment, wound proteases destroy ECM, leading to stalled status. Endoform is also damaged by elevated protease levels, a phenomenon that is visible, providing a simple, effective way to observe wound status (Figure 3).⁴⁻⁶ Once inflammation is controlled, epithelial and fibroblast cells adhere to the

Figure 1. Endoform®'s Role in Wound Healing

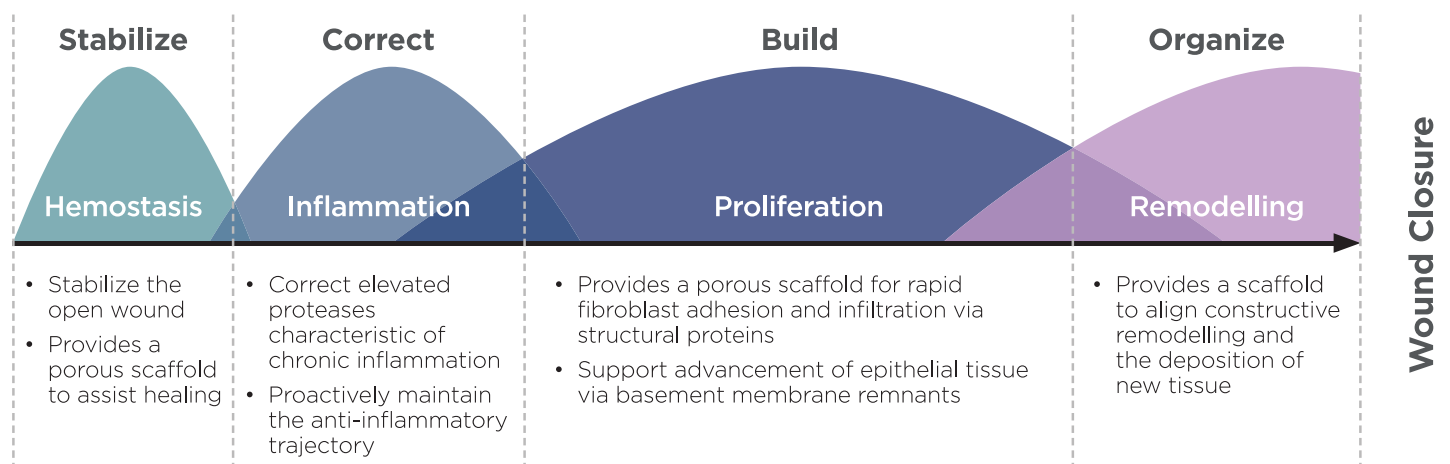
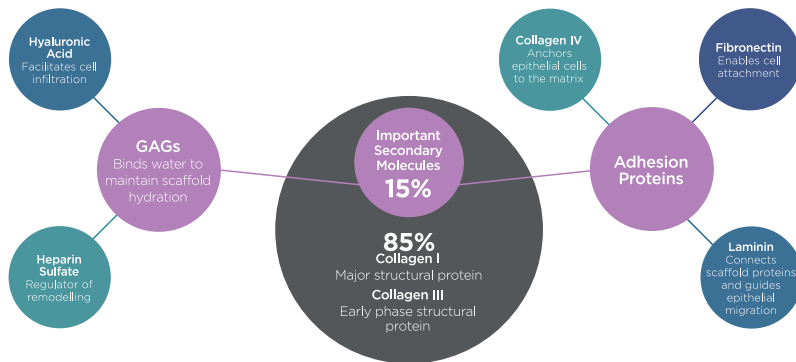


Figure 2. Composition of Endoform®

scaffold and begin to build new granulation tissue. At this point, residual Endoform will be observed in the wound at the subsequent dressing changes. It is important that the residual Endoform not be debrided, as this will remove

healed tissue; it can be left in place and rehydrated. Over time, Endoform is incorporated into the wound as new tissue is laid down.

Conclusion

ECM technologies such as Endoform have shifted modern wound care from managing the symptoms of chronic wounds to actively addressing their underlying pathology: missing or damaged ECM.

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Endoform acts as a visual indicator of wound healing. Wounds stalled in the inflammatory phase have high levels of proteases, which can't be seen. Seeing the presence or absence of residual Endoform is an important clinical tool.

Figure 3. Endoform® Consumption in the Wound

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Nutrition and Pressure Injury Healing: Updated Recommendations

By Ellen Mackay, RD MSc CDE

Pressure injuries are caused by sustained pressure, usually over a bony prominence, that impairs circulation and prevents oxygen and nutrients from reaching the skin. This results in tissue damage and skin breakdown. Pressure injuries cause pain and discomfort and have a significant negative impact on quality of life. Recent Canadian prevalence data are scarce; however, in 2003 the prevalence of pressure injuries across all health-care settings in Canada was estimated at 26%.¹ The economic burden of pressure injuries on health-care systems is high; pressure injuries result in prolonged hospital stays, high re-admission rates, intensive nursing care and infections.²⁻⁴ Pressure injuries are largely preventable, and prevention efforts must be considered for all individuals at risk.

Malnutrition is strongly associated with increased risk of developing a pressure injury and preventing pressure injury healing.⁵ Nutrients are required at all stages of the wound healing cascade and are vital to preserve skin integrity. Poor nutrition can contribute to wound chronicity and severity and can increase risk of infection.⁶⁻⁷ Read [Malnutrition in Wound Healing](#) for more information on malnutrition and wound healing.

Nutrition Research and Pressure Injury Treatment

Much of our understanding of the role of nutrition and wound healing comes from nutrition research involving pressure injury treatment.² In November 2019, the third edition of the International Clinical Practice Guidelines for the Prevention and Treatment of Pressure Ulcers/Injuries was released.³ These guidelines are a collaboration among the European Pressure



Ulcer Advisory Panel, the National Pressure Injury Advisory Panel and the Pan Pacific Pressure Injury Alliance, and include contributions from 14 wound organizations around the world, including Wounds Canada.

These guidelines provide updated, evidence-based nutrition recommendations to help in the prevention or treatment of pressure injuries for those with malnutrition or at risk of malnutrition. Each recommendation has an associated strength of evidence and strength of recommendation, providing the health-care practitioner with the confidence to implement nutrition strategies

to improve care and positively impact wound healing and skin integrity. This article focuses on the updated nutrition recommendations. While neonates' and children's needs are reviewed in the guidelines, the focus of this article will be on adults.

Nutrition Screening and Assessment

Early identification of those at risk for, or with, overt malnutrition is of the utmost importance. Screening for malnutrition in adults has become more streamlined with the use of several valid-

Table 1: Validated Nutrition Screening Tools⁸

Screening Tool	Population
Mini Nutritional Assessment (MNA®)	Identifies adults 65 year or older who are malnourished or at risk for malnutrition (long-term care or community dwelling)
Malnutrition Universal Screening Tool (MUST)	Identifies adults who are underweight and at risk of malnutrition (acute or long-term care, community dwelling)
Malnutrition Screening Tool (MST)	Identifies adults who are at risk of malnutrition (acute or ambulatory care)
Canadian Nutrition Screening Tool (CNST)	Identifies adult patients at risk of malnutrition (acute care)
Short Nutritional Assessment Questionnaire (SNAQ)	Identifies adults who are underweight and at risk of malnutrition (acute and residential care)
Nutri eSCREEN®	Used for self-screening for older adults in the community (online)

ated screening tools (see Table 1) and can be completed by any member of the health-care team. Regular use of screening tools has been shown to expedite nutrition intervention and subsequently reduce pressure injury rates by 50%, shorten hospital length of stay and reduce health-care expenses.⁴ To date, only the Mini Nutritional Assessment (MNA®) screening tool has been validated for patients with or at risk for pressure injuries.²

Once a patient is identified as being at risk, screening should trigger a referral for a comprehensive nutritional assessment by a registered dietitian (RD). The RD follows standards of practice to systematically review markers of nutritional status to create a nutrition care plan with the patient.³ Individualized plans need to incorporate the patient's goals, culture, preferences and any pre-existing comorbidities. The Nutrition Assessment sidebar identifies some considerations when performing a nutritional assessment. In the recent guidelines, there is a move away from including some previous biomarkers (protein, albumin, prealbumin), as their sensitivity in establishing nutritional status can be impaired by inflammation, hydration or other disease states.

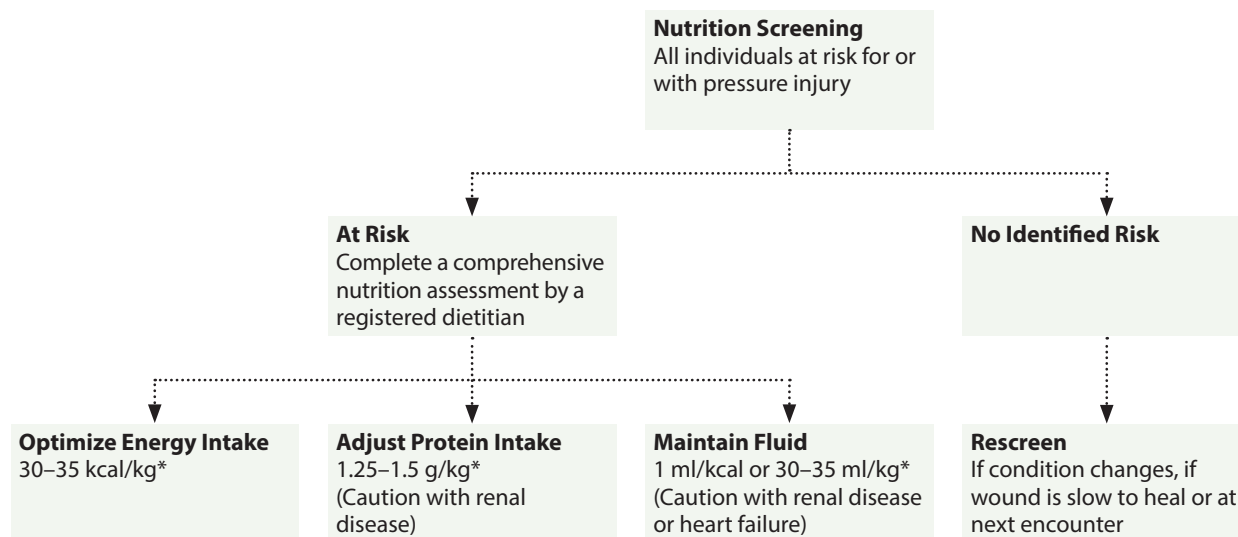
Nutrition Assessment: Considerations for Implementation³

- Food history and adequacy of nutritional intake
- Anthropometric measures (height, weight, body mass index)
- Weight history
- Biochemical data
- Medical tests and procedures
- Nutrition-focused physical assessment (muscle wasting, edema, micronutrient deficiencies and functional status [e.g., hand grip])
- Ability to eat independently

For the At-risk Patient: Optimize Diet

When a patient is identified as being at risk of developing a pressure injury and is malnourished or at risk of malnutrition, the nutritional focus is on optimizing energy, protein and fluid intake (see Figure 1). The nutritional approach is to ensure a balanced diet, include energy-dense foods, liberalize diet restrictions and correct suspected or confirmed nutritional deficiencies through vitamin or mineral supplementation. Where possible, nutrient needs are best met through a balanced diet before offering fortified foods or supplements. Individual

Figure 1: Summary of Nutrition Recommendations for Adults with, or at Risk for, Pressure Injuries³



*Recommendation for those with a pressure injury who are malnourished or at risk of malnutrition.

energy needs are based on degree of weight loss or level of obesity. Protein and fluid needs will be impacted by renal function and other comorbidities.

For the Pressure-injury Patient: Nutrition Recommendations

In the presence of a pressure injury, specific nutrition recommendations can enhance healing. A summary of nutrition requirements for adults is presented in Figure 1. As wound healing is an anabolic event, energy (calories) from carbohydrates and fat are needed to “spare” the protein, to allow the protein to be used for wound healing and preserving skin integrity. Liberalizing the diet and offering nutrient-dense foods, fortified foods and supplements can help boost nutrition intake.

*“Regular monitoring of
nutrition status ... is strongly
encouraged to evaluate
interventions ...”*

When possible, calculate energy requirements using indirect calorimetry to estimate energy needs. Without this, which is often the case outside the acute or research setting, the recommendation is to target 30 to 35 kcal per kg of body weight daily, individualized for degree of underweight or obesity. Protein needs are estimated at 1.25 to 1.5 g/kg body weight to ensure adequate amino acids to support wound healing. Caution is advised with elevated protein intakes when renal or liver disease is present. Protein intake should be tapered to normal levels (1.0 to 1.2 g/kg/d) once the pressure injury has fully healed.

Dehydration can impact blood volume and circulation, resulting in reduced delivery of nutrients to the wound bed and elimination of wastes. This may contribute to impaired wound healing and risk of further skin breakdown. Evidence-based guidelines recommend that water requirements be calculated as 1 ml per calorie (kcal) per

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day or 30 ml per kilogram body weight per day. Additional fluid may be required in the presence of highly exuding wounds, fever, dehydration, diarrhea, vomiting or any other condition that results in fluid loss. High protein intakes may also increase requirements for fluid. Meeting fluid needs must be consistent with patient's goals and comorbidities. Fluid volume may need to be reduced for patients with renal or cardiac disease.

“While nutrition intervention, including the cost of supplements, may initially be seen as an additional expense, these costs are more than offset by reduced direct medical costs.”

For individuals who cannot meet nutrition recommendations, oral intake can be enhanced by offering nutrient-dense foods, fortified foods and/or high-energy oral nutrition supplements. Meeting the nutrition recommendations is not always feasible in the frail elderly, or patients at the end of life. When oral intake remains sub-optimal despite best efforts, the health-care team should discuss the risks and benefits of enteral or parenteral nutrition support, which may be initiated to help meet the individual's high energy and protein demands. Enteral and parenteral support is not without risks, however, and must be consistent with the patient's or care partner's goals and preferences.

Regular monitoring of nutrition status, including measuring body weight weekly, is strongly encouraged to evaluate interventions and modify as needed to improve or sustain nutritional intake.

Nutrition Supplementation

Offering oral nutrition supplements (ONS) between meals can optimize energy and protein intake. ONS vary widely in the amount of protein, carbohydrate, fat, vitamins, minerals and amino acids they supply. It is unclear if high-energy ONS can reduce the development of pressure injuries in susceptible individuals; however, overall nutrition status may improve, shortening length of hospital stays.⁹ Recent evidence supports use of supplement formulas that include arginine, zinc and antioxidants in adults when pressure injury is present (Category/Stage II or greater), as healing has been shown to be enhanced.¹⁰⁻¹¹ For greatest efficacy, supplementation should continue for a minimum of four weeks.³

Many studies have looked at individual vitamin or mineral supplementation and the effect on wound healing. While correcting known deficiencies is essential, single vitamin supplementation has not shown benefit beyond the consumption of a balanced diet.^{2,12}

Arginine is a dispensable amino acid that becomes indispensable in times of stress, such as when a patient is wounded or septic. Arginine plays an important role in wound repair, stimulating insulin secretion, promoting the transport of amino acids into tissue cells and supporting the synthesis of protein and collagen in the cells. Supplemental arginine (in doses ranging from 4.5 g to 9 g/d) has been explored, with the sug-

gestion of accelerated pressure injury healing.¹³⁻¹⁵

An RD can help navigate the types of ONS available locally. Currently there are few wound-specific ONS available in Canada, and there has been limited use of supplemental arginine.

Nutrition Saves Money

Nutrition intervention directly enhances the wound healing process. Nutrition support can also prevent the development of pressure injuries for those at risk and is less costly than pressure injury treatment.¹⁶ In addition to helping individuals heal, timely and adequate nutrition support can reduce health-care costs.¹⁷ While nutrition intervention, including the cost of supplements, may initially be seen as an additional expense, these costs are more than offset by the reduced direct medical costs, such as nursing time, medical tests, dressing material, medications and hospital length of stay.^{9,13,17} Individuals with pressure injuries also indicate that it is a priority for them to have access to nutrition guidance.³

Conclusion

Wound healing and nutrition are closely linked. While not all wounds are equal, nutrition is often a common denominator in the treatment of individuals with or at risk for pressure injuries. Early identification and diagnosis of malnutrition, and swift nutritional intervention by a Registered Dietitian and nutrition care team has the potential to reduce pressure injury prevalence rates in Canada, improve the quality of life of those in our care and reduce health-care costs. 🇨🇦

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WCI Spotlight

Focus on the Prevention and Management of Pressure Injuries: Knowledge (A102MWN)

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The program starts with an overview of the critical components needed to identify and prevent pressure injuries in at-risk patients and then provides a case-based scenario in which students critically apply the Wound Prevention and Management Cycle.

After completing the online modules and having an opportunity to practise their new knowledge in their workplace, students are then invited to attend the webinar component of this program, where they are encouraged to discuss how they have been able, or unable, to implement the knowledge and skills learned during this program. The webinar is designed to be informal, with strategies and challenges discussed by all participants. Through peer learning and support, under the guidance of the expert moderator, all partici-

pating students are helped in moving forward towards best practice. One recent participant, Maureen F., commented, "Most sharing in the webinar was from long-term-care staff, which I

What Programs Are Right for You?

To find out more about the Focus on the Prevention and Management of Pressure Injuries: Knowledge program and other WCI programs, visit the WCI website at www.woundscanadainstitute.ca.





was able to relate to, and the implementations some others have put in place would also be beneficial for my workplace. I will put forth suggestions related to combining tools to simplify assessments. Thank you to all those participants.”

Program graduate Alysha C. stated that the most useful

takeaway that will enhance her professional practice is “the use of validated tools to assess wounds and patients that are at risk for pressure ulcers or skin breakdown.” As a result of taking the Focus on the Prevention and Management of Pressure Injuries: Knowledge program, another student indicated that

she can now “improve [her] assessment skills for the patient as a whole and not just their wound as its own entity.”

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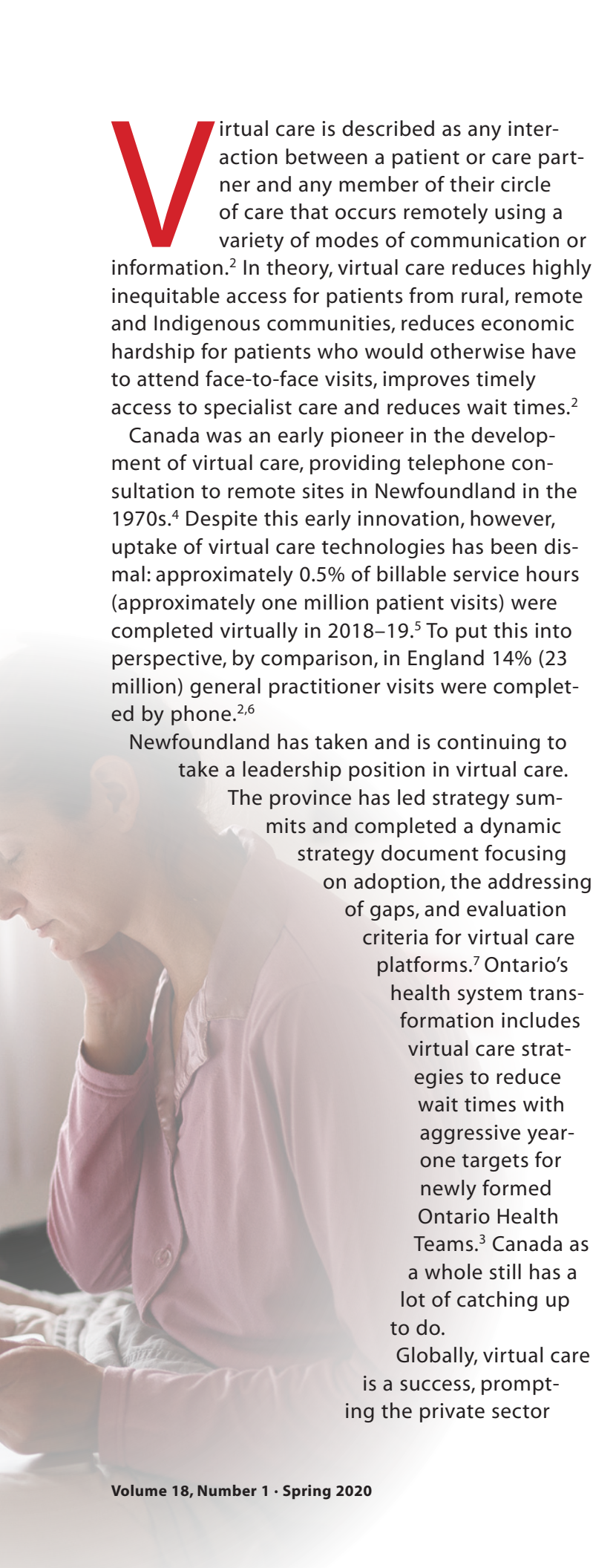
Virtual Care: Policy and Practice Implications for Wound Management

By Karen Laforet, MCISc-WH RN CCHN(C) VA-B CVAA(C) IIWCC

“In a chronically leaking boat, energy devoted to changing vessels is likely to be more productive than energy devoted to patching leaks.” —Warren Buffet

The shortage of health-care professionals (HCPs), the high cost of care and the demand for overall cost efficiencies have helped drive the development and use of health technologies. The ability to integrate and analyze data and effect policy change remains a challenge for HCPs and funders. Patients, funders and HCPs are desperately looking for a new (and better) boat! Health technologies offer HCPs the ability to access timely, comprehensive, accurate and real-time patient information.¹

Health technology, telemedicine, eHealth, telehealth, virtual care, medical informatics, mHealth and health informatics—these are terms used over the last 50 years to describe the field of digital health.² Today, the umbrella term digital health encompasses the evolving range of devices and equipment, data analytics, artificial intelligence and diagnostic treatment services that are changing the way health care is delivered.^{1,3} This article will focus specifically on virtual care—a key initiative for improving access to care.



Virtual care is described as any interaction between a patient or care partner and any member of their circle of care that occurs remotely using a variety of modes of communication or information.² In theory, virtual care reduces highly inequitable access for patients from rural, remote and Indigenous communities, reduces economic hardship for patients who would otherwise have to attend face-to-face visits, improves timely access to specialist care and reduces wait times.²

Canada was an early pioneer in the development of virtual care, providing telephone consultation to remote sites in Newfoundland in the 1970s.⁴ Despite this early innovation, however, uptake of virtual care technologies has been dismal: approximately 0.5% of billable service hours (approximately one million patient visits) were completed virtually in 2018–19.⁵ To put this into perspective, by comparison, in England 14% (23 million) general practitioner visits were completed by phone.^{2,6}

Newfoundland has taken and is continuing to take a leadership position in virtual care.

The province has led strategy summits and completed a dynamic strategy document focusing on adoption, the addressing of gaps, and evaluation criteria for virtual care platforms.⁷ Ontario's health system transformation includes virtual care strategies to reduce wait times with aggressive year-one targets for newly formed Ontario Health Teams.³ Canada as a whole still has a lot of catching up to do.

Globally, virtual care is a success, prompting the private sector

to make available a number of virtual options. In Canada, a number of companies provide services in this sector. These online services require user fees, and private health insurers are starting to offer partial coverage. But patients with low socio-economic status or those without third-party health insurance may not be able to access these services. And, unfortunately, wound care is not a focus for any of the currently available programs.

A recent survey shows that two-thirds of Canadians are interested in more choices in how they interact with their health-care systems, including visits through a virtual platform and easier access to health-care providers.⁸ Digital capabilities are critical to system integration, information sharing and seamless care provision and are discussed in more detail below. Virtual care eliminates barriers to access—especially the negative economic impact of the current systems, resulting in improved patient and caregiver adherence.⁹

What are the barriers to increasing virtual care usage?

Implementing technology involves changes at the organization level (meso) and at the HPC and patient/care-partner levels (micro).¹⁰ According to Watson (2010), any digital health strategy is much more complex and time-consuming than anticipated.¹¹ With that in mind, the brief list of barriers and facilitators discussed below touches on the complexity of integrating virtual care into Canada's publicly funded health-care systems:

- **Connectivity for all health-care delivery access points** (e.g., lab/diagnostic test facilities, pharmacy, home care, public health, specialists, most responsible physician, hospital): The current methods of sharing patient information have numerous challenges and gaps. For example, information is shared by fax, email, paper exchange, phone, or not at all. A shared electronic health record is a necessary component for connectivity across all care delivery access points. Without a way to provide communication and information, there will continue

to be flow fragmentation and uneven access to care delivery. Said a different way, shared electronic patient records are required to make virtual care work.¹

- **Physician and nurse practitioner compensation:**

The Canada Health Act approves coverage only for emergency care out of province. Any other treatment needs must be pre-approved in order to be paid. Provincial/territory payment systems are based on a “personal encounter.” Despite changes made to incorporate telemedicine visits, generally if the patient is not seen in person, the physician doesn’t get paid. Licensure variability across Canada limits where physicians can work. With the pending physician shortage, a change from a provincial to a national licence (similar to that in Australia) would facilitate virtual care adoption.³

- **Access for rural and remote locations:**

Virtual care meets the needs of those most difficult to reach; therefore, parameters for rural/remote care delivery must meet the unique requirements, including access to equipment (e.g., connectivity, data, smart phone, laptop) and supplies (e.g., products) to reduce or eliminate economic hardship for those living in these areas.

- **Education and training:** Digital health platforms and technologies must be incorporated into all HCP course curricula, core competencies and ongoing professional development to ensure effective virtual care.¹²

- **Protection of personal health information:** Protection of personal information, including sharing of information, security of transmission, and data governance, is beyond the scope of this paper. It is important, however, to keep privacy in the forefront when developing virtual care policies.

What are the benefits and challenges for patients with wounds using virtual care?

The scope of this article precludes a detailed discussion on the benefits and multiple challenges Canadian health-care systems face in implementing virtual care. Table 1 contains some this author believes impact patients dealing with chronic wounds.

Benefits

- **Timely access to wound specialists and interdisciplinary teams:** There continue to be prolonged wait times for access to the right treatment by the appropriate health-care professionals specializing in wound care. Virtual care has the potential to reduce wait times and expedite specialized care.
- **Access to personal health records for patients and HCPs:** Ready access for ALL members of the circle of care will enhance timely communication, expedite care and improve access across all care settings.



Table 1: Virtual Care Benefits and Challenges

Benefits	Challenges
Timely access to wound specialists and interdisciplinary teams	Lack of access to shared electronic health record for all members of patient’s circle of care
Access to personal health records for patients and HCPs	Differences in digital health literacy across patients and care partners
Improved access through digital health technology	Inequitable access to technology, irrespective of income

- **Improved access through digital health technology:** Electronic appointment scheduling, secure emails and video calls will improve patient access to HCPs. Currently less than 10% of physicians offer these services.² Improvement in this area will reduce delays in treatment, improve communication, and increase physician and other health-care professionals' productivity. For example, using virtual care, England showed an 80% increase in patient follow-up visits without requiring additional support staff.²

Challenges

- **Shard electronic health record for all members of patient's circle of care:** Patient records currently have multiple redundancies (each organization having their own patient record), delayed information (information shared by fax or mail) and limited access to a patient's own health information. A shared electronic health record that provides information across and within health-care sectors continues to be a challenge in many areas across Canada (e.g., data access, urban, rural, remote geography, organizational readiness).
- **Digital health literacy:** Digital health literacy may present a new challenge for patients—especially for those with low health literacy. Similar skills are needed to use technology to navigate the health-care system. Individuals with low health literacy levels are more likely to encounter issues when attempting to use any health technology, particularly patient self-management applications. Any effective digital health project must offer alternatives for these patients.
- **Equitable access irrespective of income:** User fees, co-pays, or the need to provide one's own mobile device will perpetuate inequitable access. Patient adherence is directly dependent on access to treatment and security of resources. Requiring co-pay for equipment and products has been shown to increase patient length of stay, delay wound closure rates and increase risk of complications.¹³

Conclusion: A Window of Opportunity

Virtual health, one of many technologies within the digital health platform, has a history of successful implementation. The benefits for Canada's rural and remote communities and patients with complex wounds cannot be overstated. However, the current model is not working. A window of opportunity exists to align with the Canadian Medical Association's task force to increase adoption of virtual care across the continuum of care in Canada. It is time to change boats. 🚢

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RECOGNIZING HS

DO YOU RECOGNIZE PATIENTS WITH HIDRADENITIS SUPPURATIVA (HS)?



DR. NEIL SHEAR

Head of Dermatology, Sunnybrook Hospital

"People with HS come to the emergency room in severe pain and discomfort requiring assistance with the draining of the boils during a flare-up. It's not unusual for patients to go home undiagnosed."



DR. RALPH GEORGE

Associate Professor, University of Toronto,
Division of General Surgery



DR. VU KIET TRAN

ER physician at University Health Network

"HS is a chronic, painful, inflammatory skin disease that affects 1-4% of the general adult population. It is characterized by boils usually occurring where certain sweat glands are located, such as under the breasts, buttocks, and inner thighs."

"There is currently no cure for HS. Early diagnosis and proper management is important for a patient's quality of life. The first step for those with HS is to speak to their dermatologist to get an accurate diagnosis."

To learn more about HS from these specialists, go to www.RecognizingHS.com/HS10

WHEN YOU SEE THESE LESIONS, DO YOU SUSPECT HS? DO YOU ASK ABOUT RECURRENCE?



Photo compliments of Dr. Afsaneh Alavi.



Photo compliments of Dr. Marc Bourcier.

ASSESSING PATIENTS WITH RECURRENT BOILS

Most HS cases can be recognized with high reliability by the presence of 3 main features:¹⁻³

1. **Typical lesions:** nodules, sinus tracts, abscesses, scarring
2. **Typical anatomical location:** axilla, groin, genitals, under the breasts, others (perianal, neck, abdomen, buttocks)
3. **Relapses and chronicity:** ≥ 2 times per 6 months

Questions to ask your patients with suspected HS:²

1. Have you had outbreaks of boils during the last 6 months?
2. Where were the boils and how many did you have?

To confirm an HS diagnosis,
please refer your patient to a dermatologist.

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Advocating for Wound Patients in Ontario

By Amanda Thambirajah, BA MA

Wounds Canada's mandate is to advance wound prevention and management across Canada. This involves increasing awareness about wounds, providing education and resources for health-care professionals and the general public, and doing advocacy work on the highest priority issues. Various members of the organization are connecting with government decision makers in their provinces to advocate for policies and funding that will improve the lives of Canadians. Recently, Wounds Canada added Amanda Thambirajah to the team as Director of Government Relations to help move its advocacy work to the next level by setting strategy, arranging meetings and creating events with government decision makers across the country.

One of the areas Amanda is currently focusing on is Ontario. In this article she explores the state of wound prevention and management in the province and outlines some of the recommendations Wounds Canada has been or will be presenting to Ontario's government over the next year.

The State of Wound Care in Ontario

In Ontario, wound care costs the health-care system \$1.5 billion annually in direct costs. While most wounds heal normally with little or no intervention from a health-care professional (HCP), the health status or other circumstances of some patients interfere with normal healing. The social and financial costs of these slow- and non-healing wounds are significant. By the time a patient with a stalled wound sees an HCP, they are often far along a path of disability and risk for further problems. Is this a care problem or a system problem?

Every four hours in Ontario someone loses a lower limb due to a diabetic foot ulcer that did not heal properly. In 2017, the Government of Ontario announced \$8 million in funding over three years for offloading devices—a good start for addressing the issue of diabetic foot ulcers. More needs to be done, however, including funding education for HCPs, patients and care partners, imple-



menting wound care pathways in all settings, and improving access to wound care experts.

In Ontario, pressure injuries are relatively well-tracked in long-term care homes, but not in acute and community care. Is this a policy or practice issue?

Balancing Priorities

Despite the high prevalence of wounds throughout health-care systems, wound care is treated as an afterthought in most care settings. With a system based on existing symptoms rather than risk, prevention is not considered a priority. Primary care struggles with early identification and evidence-based management and prevention of complications. The result: wounds (such as diabetic foot ulcers, pressure injuries and surgical site infections) are not prevented, are not identified early enough to prevent complications, and are not treated using best practices to ensure quick healing and prevent recurrence. Despite the best efforts of frontline HCPs, barriers to care remain, due to limited knowledge on wound management, lack of understanding of the causes of poor wound healing—especially when chronic disease or, in many cases, multiple

morbidities are present—and little access to expertise and resources.

Ontario needs a strategy that both addresses primary prevention of wounds in primary care and addresses secondary prevention linked to primary care. For example, a primary care practitioner needs to have the knowledge and resources to be able to identify a diabetic foot ulcer, and know where and to whom to send the patient to receive timely and appropriate care in order to reduce the risk of complications or amputation.

The implementation of standardized wound prevention and care pathways, which are lacking in Ontario, would improve patient care and reduce the rate of preventable wounds. HCPs would

have a referral strategy for all patients who need specialized diagnostics, care and appropriate follow-up.

Another systemic barrier to prevention is illustrated in the reimbursement method for home care. Home care in Ontario currently uses a fee-for-service model. Once the patient heals, they are discharged. Therefore, home care is not incentivized to have a prevention strategy; it is there to treat the active condition.

Data Collection

A significant impediment to understanding the scope of problems in the area of wound prevention and management is the lack and quality of publicly shared

Introducing Amanda Thambirajah

Amanda leads the national government relations strategy for Wounds Canada, helping the organization and its volunteers advocate for patients and their families, implement best practices for wound care and improve access to education programs for health-care professionals. Her professional background spans Ontario politics, the B.C. civil service, and the not-for-profit and for-profit sectors in public affairs and government relations.



data. The tracking of wound data has not been standardized—not just provincially, but within regions and even within facilities and agencies. Gaining access to what data there is has been problematic for decades. Ministries of health across the country must ensure data collection is properly coded and produces meaningful results. They need to make access to the data readily available to relevant stakeholders. Only then can more effective wound prevention and management strategies be developed and implemented.

In Ontario, improved data collection and tracking of wounds are needed for all care settings. Currently most of the data exist within home care, and those data are limited and non-standardized. The full extent of the issue of wounds is unknown. What is known is this: patients with wounds are everywhere—from primary care to acute care to long-term care. The Province of Ontario needs a comprehensive strategy that addresses this fact, as opposed to continuing to offer only fragmented care between settings and a wound care strategy housed only within home care.

Wounds Canada does more than address existing wounds; it places a strong emphasis on wound prevention. This includes primary prevention (of an initial injury), secondary prevention (of recurrence after wound healing) and tertiary prevention (to reduce active



pathology). To be effective in promoting prevention, we need to look at prevalence and incidence—broken down by wound type—complication, hospitalizations and readmissions. Due to the lack of data collected, however, it is difficult to assess the success of both prevention and treatment interventions.

Ontario Health could improve its data collection in order to help with analyzing trends in wound management. The relevant databases in the current Ontario Health collection are the Discharge Abstract Database (DAD) and the National Ambulatory Care Reporting System (NACRS). DAD collects data on admitted patients; and unless wounds are the specific reason for admission, the data on wound management are usually

difficult to find. NACRS is mostly Emergency Visit data, and, again, wound management is often lost in the shuffle unless it is the main reason for the visit. Granular data would be needed to determine the location, treatment strategy and post-discharge plan.

Given that the bulk of wound care provision in Ontario is delivered by wound care agencies, access to their databases would be useful in carrying out an analysis into how wounds are treated in the province. The hospital databases are very limited, even for studying in-patient wounds.

Finding Efficiencies

More efficient use of money and staff time is another area where improvements can be made. For example:

Bulk purchasing: Because Ontario loses its bulk purchasing advantage when every Local Health Integration Network (LHIN) or local health authority negotiates its own purchasing of products, the product purchasing system should be remade so there is one formulary for the province.

Duplication of effort:

Multiple health organizations and agencies are currently aiming to create diabetic foot ulcer care pathways and educational materials from scratch. Internationally and nationally recognized versions of these materials and pro-



grams already exist. The Ministry of Health and Ontario Health could help to focus health-care organizations and agencies by ensuring they do not repeat work already completed, but instead build on the existing, recognized body of work and implement them appropriately.

Other Recommendations

Wounds Canada continues to meet with politicians, civil servants and others in the Government of Ontario to prioritize wound care, ensuring that patient care is equitable, timely, non-fragmented and accessible across the province. Our specific recommendations to the government to improve patient care, reduce hospitalizations and lower spending on

wounds include:

- **Prevention:** Implement policies that prevent wounds such as pressure injuries, infected surgical and other wounds, and diabetic foot ulcers.
- **Products and technology:** Provide access to wound care products and technology that are evidence-based and improve patient outcomes.
- **Education for all:** Increase support for wound-related education for health-care providers, decision makers, patients and families.
- **Higher priority for wounds:** Ensure that all interprofessional health teams include wound experts.
- **Best practice pathways:** Implement wound care pathways that take patients from

hospitals to home, long-term care and community care with set measurables, monitoring and evaluation.

Conclusion

Ultimately, Wounds Canada's aim is to raise awareness and influence change to support timely prevention and expedited treatment of active wounds to reduce the high morbidity and mortality associated with wounds. Our work in Ontario is a reflection of the type of activity we carry out in other provinces as well. We are encouraged by the good work the people in the health systems in Ontario and other provinces are already doing and will continue to support their ongoing efforts to improve patient outcomes. 🇨🇦

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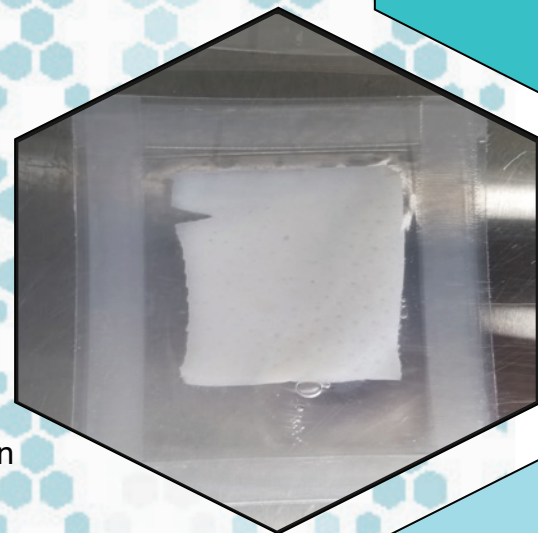
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Designer Wound Care: Compounded Topical Formulations

By Elise Rodd, BScN RN ETN and Greg Oksanen, BScPharm RPh

Compounding is the formulation of a personalized medication designed to meet individual patient needs. The process changes the form (powder to liquid), dose, taste or texture of a medication, and/or combines medications. Compounding was a historical part of the pharmacist's role until large-scale production and commercialization of medications began in the 1950s as a result of increasing regulations. It is now gaining increased popularity, because it meets the growing demand for customization of medications. Podiatry, specialized pain clinics, hospice, oncology, dermatology, dental practices, veterinary medicine and others regularly prescribe compounded formulations to meet patients' needs.

Compounded wound formulations allow for innovative approaches and can fill the niche when commercial products do not suffice. Prescribed by clinicians and designed and prepared by compounding pharmacists, these formulations consist of one or more medications combined in a carrier or base applied directly to the wound. The advantages of this single-product treatment option include addressing patient quality-of-life

concerns, treating underlying impediments to wound healing and providing novel options for challenging wounds.

Compounding in Wound Care

Many of the formulations have been used for decades, and literature on the use of compounding creams for wound care dates back to before the 1990s.¹ While success has been noted anecdotally, until recently, evidence supporting the effectiveness of compounding in wound care has been limited to animal models and case studies. The gains made in healing and addressing patient-driven concerns have begun to pave the way for more robust studies.

Compounded topical wound formulas can address several needs in one formulation and can deliver medications directly to wounds in much smaller effective doses than are required orally.² The medications do not need to permeate across the epidermis and dermis, as in the case of topical medications, because wounds by definition are defects below these layers. Bases or carriers used for compounded formulations include creams, ointments, gels, powders and sprays.

The pediatric population is another group well



served by compounded formulations. Creating formulations with small or micro-doses of locally applied medications, with choices in carriers or bases, provides options that go beyond commercially available products.

Addressing Quality-of-life Concerns

Pain

Topical pain relief is safer than oral options in individuals with acute and chronic wounds, in particular in the aging population, where alterations in opiate pharmacokinetics that occur with normal physiologic aging can lead to an increased risk of falls, sedation and constipation.³⁻⁴ Research has shown that opioid receptors are present in peripheral tissues, and it is suspected that the effectiveness of topical opioids may be greater in the presence of inflammation.⁵ When applied to the wound, opioid medications are delivered directly to the pain receptors and bypass the first-pass metabolism in the liver; as such, smaller doses suffice as compared with oral administration.^{2,6}

A number of randomized controlled studies conducted on patients with wounds in pallia-

tive care support the analgesic effectiveness of topical opioids on wounds.⁵ A lack of effectiveness of topical analgesics in some wounds may be the result of a lack of inflammation in some long-standing wounds, or a limited number of functional opioid receptors in ischemic leg ulcers,⁷ as these factors appear to be essential for pain relief efficacy.

There is little to no systemic absorption of opioids; studies have reported pain relief lasting from 4 to 8 hours.¹ Opioids can be compounded with

Why use a compound?

Compounded formulations for wounds are able to address:

- Managing pain
- Accessing hard-to-treat areas
- Treating rare and uncommon wounds
- Trying emerging treatments options
- Minimizing systemic exposure to medications
- Minimizing drug interactions
- Allergies to commercial products
- Administering medications in those for whom the oral route is precluded

other pain modulators to create a multi-pronged (“gun-shot”) approach to addressing local and neuropathic pain by targeting the various pain mechanisms proposed in the literature, with a potential for longer-lasting pain relief.⁸ A small study supported the use of lidocaine for reducing incidental pain related to negative pressure wound therapy dressing changes.⁹ The use of oral amitriptyline is a first-line treatment option for chronic neuropathic pain,¹⁰ and it works well, although it may not be effective in all cases of neuropathic pain.¹¹ Topical amitriptyline in wounds is an option for pain relief, and an animal study supported that it does not impede wound healing.¹² Formulations specifically designed for comfort can alleviate persistent wound pain or incidental pain experienced with dressing changes.

Studies have shown that topical ketamine, a high potency N-methyl-d-aspartate (NMDA) antagonist, is safe and effective in patients experiencing neuropathic pain.¹³ Low doses of ketamine have minimal adverse effects on the cardiovascular or respiratory functions.¹³ Alone or in combination with gabapentin, amitriptyline, clonidine, lidocaine or ibuprofen, this non-narcotic, non-addictive medication relieves neuropathic and chronic pain by blocking the NMDA receptors in the spine.¹ Pharmacists also suggest applying the pain-relieving compounded cream to the corresponding dorsal horn of the dermatome involved in order to address both the peripheral and central mechanisms of pain.¹³

What can be used in a compound?

Topical compounded drug options for wound pain include:

- Clonidine
- Gabapentin
- Amitriptyline
- Non-steroidal anti-inflammatories (NSAIDs) including magnesium
- Ketamine
- Lidocaine
- Narcotics (morphine, hydromorphone, cocaine)

Secure Dressings

Dressings and ostomy appliances that fall off are of concern to both patients and wound care providers, putting the patient at risk of infection, wound desiccation, further injury, and drainage leaks on clothing, bedding or furniture. To address difficult-to-treat areas such as mucosal surfaces, and other areas where moisture and/or body topography prevent the adherence of traditional dressings (e.g., pilonidal sinuses, anal regions, pyoderma gangrenosum beneath an ostomy appliance), compounded formulations can be made using mucoadhesive polymers as a base. Designed to adhere to moist surfaces, these products can prolong the retention of medications at the wound site, promoting healing and protecting the wound from exogenous harms.¹⁴ When removed, these formulations do not disturb new tissue growth.¹⁴

Malodorous and/or Sanguinous Wounds

Patients with fungating necrotic tumours and other palliative wounds are deeply affected by malodours. To effectively reduce odour and purulent exudates, clinicians can consider using a combination of the antifungal metronidazole and the antibiotic chloramphenicol or ciprofloxacin powdered and insufflated generously onto the wound and covered with a loose dressing.¹ Thrombin, ferric subsalicylate (Monsel’s solution), and tranexamic acid can be added to this formulation to control a sanguinating tumour.¹⁵

Addressing the Causes of Non-healing Wounds

The observation that children developed overgrowth of gingival tissue with long-term use of phenytoin, an anti-epileptic drug, led to the use of this tissue-stimulating medication in wounds, including pressure ulcers, vascular leg wounds





and those of other etiologies.¹ This medication works to stimulate fibroblast proliferation, enhances tissue granulation, inhibits collagenase activity, promotes collagen deposition and decreases wound exudate production.¹⁶ Wounds stalled at the granulation phase may respond to phenytoin in a compounded topical formulation,¹⁶ although the evidence has been deemed

inconclusive due to research flaws.¹⁷ Phenytoin alone can be insufflated to a moistened wound¹ or combined with other medications to meet a broader range of needs.

For patients with diabetic wounds with vascular compromise refractory to standard treatments, nifedipine, propranolol, verapamil and diltiazem are calcium channel blockers that, when used topically in compounded formulations, can increase local vascular perfusion by relaxing local blood vessels.^{16,18-19} A synergistic effect occurs when pentoxifylline is compounded with these calcium channel blockers, resulting in increased blood viscosity, and increased blood flow and oxygen delivery to the wound.¹⁶

Inflammation and Infection

To treat localized bacterial infections and speed healing, a number of antibiotics alone or in combination can be incorporated into compounded formulations. Topical compounded antibiotic formulations have been found to be non-cytotoxic and tissue compatible, easy to apply and remove, and cost effective.²⁰ They can result in decreased time to heal and reduction of biofilms.¹⁶ Selections are based on culture and sensitivity results and can include metronidazole, clindamycin, aminoglycosides, vancomycin and rifampin.^{16,21} Wounds with fungal infections can be successfully treated with compounded clotrimazole.¹⁸

Misoprostol is a synthetic prostaglandin that

stimulates and modulates inflammation in wounds stalled in the inflammatory phase, inhibits IL-1 and tumour necrosis factors (TNFs) and promotes collagen synthesis.¹⁶ It can likewise be added to a compounded wound formulation.

Compounding enables the use of over-the-counter (OTC) products that may have medicinal properties and have the capability and ability to interact with other components. Essential oils such as tea tree oil, St. John's Wort, lavender and oregano oil, for example, can be and are used at the request of some providers.²² Other compoundable over-the-counter products with bioactive medicinal properties that may influence wound healing include zinc oxide, green propolis extract, alkaloids, flavonoids, tannins, terpenoids, saponins, aloe vera and phenolic compounds.²³⁻²⁴ Aloe vera was shown to have effects on wound healing and pain reduction in a small randomized, blind, placebo-control trial.²⁵

Rare and Challenging Wounds

Pyoderma gangrenosum typically poses a challenge to wound care professionals and patients. Sometimes found in difficult-to-heal areas such as those adjacent to ostomy stomas, it presents further challenges. There is evidence that supports the use of the tumour necrosis factor alpha (TNF- α) inhibitor infliximab compounded in a sterile aqueous gel or as a solution for treatment-refractory chronic wounds.²⁶ In a small study by Streit and colleagues, its use was based on the observation that TNF- α was present in high levels in chronic wounds and decreased as wounds heal.²⁶ Results showed 12 out of 14 four-month-old ulcers in the study responded to the treatment with infliximab, some with 50% reduction in wound surface in four weeks.²⁶

Wounds in patients with connective tissue diseases such as scleroderma and dermatomyositis can be complicated by the deposition of calcium deposits in the wound. These calcium nodules are extremely painful and cannot be debrided. A compounding pharmacist can formulate a 10% sodium thiosulfate solution, shown to be effective as an initial intervention in this type of rare wound.²⁷

Common Formulations

Examples of compounded wound formulations include:¹⁶

- Phenytoin: promotes granulation tissue formation
- Misoprostol: accelerates wound healing
- Metronidazole: exerts antimicrobial effects
- Nifedipine and pentoxifylline: increases local vascular perfusion
- Lidocaine: provides pain relief

Financial Considerations

Clinicians must consider the financial implications of using compounded formulations for wound care. Most formulations will need a secondary dressing to secure the product in place and protect the wound. In addition, more frequent dressing changes may be necessary to renew the product as it is absorbed into the wound; and in the case of pain compounds, this will need to be tailored to individual patient response.

In most provinces, third-party payors such as insurance companies and provincial drug plans will not cover the cost of compounded medications, even when the individual medications are found on formularies. There may be provincial exceptions for palliative patients with wounds.


How to Choose a Compounding Pharmacy

The use of compounded products requires a prescription, and clinicians are advised to consult and work with the compounding pharmacist as part of a multidisciplinary wound care team. Compounding pharmacists work with prescribers to design and formulate topical treatments to meet the unique needs of the patient. In formulating combinations of medications, they consider drug interactions, secondary effects of topical medications that can be mitigated with additional products, and underlying comorbidities such as end-stage renal failure. Pharmacists can also assist by doing a specific patient pharmacological review for medications that are known to have

an inhibiting effect on wound healing, or that may be complicating a wound presentation with a drug-induced skin reaction, and will advise on substitutions in these cases. They are a critical part of any team-based approach to holistic patient care.

The compounding pharmacy chosen must have access to the appropriate resources to meet patient and clinician needs. Canadian pharmacists can opt for membership to the Professional Compounding Centres of America (PCCA), which can provide helpful resources. The PCCA provides members with a Pharmacy Consulting Department, an extensive database of compounded formulas, and accredited courses and continuing education for pharmacists and prescribers (www.pccarx.com).

Conclusion

The use of compounded topical treatments can provide treatment options when commercially available products have not met the needs of patients with wounds. Making a compounding pharmacist part of a multidisciplinary wound care team serves to capitalize on the knowledge and skills of a professional with the expertise to create solutions to unique and individualized problems. 

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Amputation Prevention:

Your Role in Saving Limbs of Persons Living with Diabetic Foot Complications

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Introduction

Amputations are one of the most feared diabetes-related complications. The cascade of diabetes-related foot problems typically begins as calluses, then may progress to ulcers, infections, complicated wounds, amputations and even death. They may result in more days in hospital than all the other diabetes-related complications combined.¹

Across Canada, 14 diabetes-related amputations are performed every day (over 5,000 amputations a year).² The five-year mortality rate following an amputation is 45–80%.^{3–4} Complicating this situation, 40% of patients with diabetes are reported to not be aware of or able to recognize risk factors or practise self-care behaviours that can help prevent diabetic foot complications.⁵ As well,

comorbid depression affects 20–40% of those living with diabetes.⁶ Williams et al. (2010) reported that within a patient population that lived with major depressive disorders, there was a two-fold increased risk for developing a foot ulcer over four years.⁷

In a recent population-based study in Ontario, Hussain and colleagues (2019) noted the decline in diabetes-related complications, including acute myocardial infarction, stroke, end-stage renal disease and hyperglycemia crisis, over the last 20 years, but highlighted an *increase* in amputations over the

past 10 years.⁹ Reasons for the growing number of amputations include the increasing prevalence of diabetes and peripheral artery disease, and poorly co-ordinated foot and wound care.

These statistics can be discouraging, but according to the International Working Group on the Diabetic Foot (2019), well-organized diabetic foot care teams, limb preservation teams and well-informed self-care practices by patients can reduce amputations.¹⁰ This article reviews the roles of the patient, clinician and policy maker in preventing diabetes-related amputations.

D.C., a person living with diabetic foot disease, describes neuropathy as being “like no other health indicator. There is no pain or discomfort. It is the absence of symptoms. That means our body’s early-warning signals are useless. We have to think and not feel!”⁸



Patient:

What Can I Do?



Primary Prevention

If you have diabetes, be proactive about your care. Each time you see your doctor, nurse practitioner, certified diabetes educator or health-care professional, ask them to assess and discuss with you your risk level for developing a foot ulcer or other complication. The sooner these issues are identified, the sooner they can be addressed. While some of the recommendations below may seem difficult or inconvenient to carry out, they will greatly reduce your risk of foot complications that may lead to an amputation.

A Healthy Lifestyle

Be aware that your smoking habits, alcohol use, cholesterol level and blood glucose levels are all factors that affect your risk of developing diabetic foot complications. Setting realistic and practical goals to support healthy lifestyle changes is an essential step in reducing your risk of developing diabetes-related foot complications.

Look at Your Feet—Every Day!

More than most people, you should also take an active role in daily foot, nail and skin care. Here are some key elements for looking after your feet to prevent problems:

- Perform daily foot inspections (use a mirror or have a care partner assist). See box for details.
- Wear appropriate footwear, and check and shake out your shoes before putting them on—every time.
- Learn to recognize the signs of complications and know where to go for assistance.

How to Perform a Daily Foot Exam

- 🔍 Examine the area between the toes and on the sides and bottom of the foot for broken skin, cuts, bruises, cracks, blisters, redness, ulcers, and anything else that looks new or unusual. Use a mirror, if you need to, to examine the bottoms of your feet.
- 🔍 Examine nails for tears, irregular edges, colour changes in the nail bed, bruising or trauma.
- 🔍 Know who your foot care and footwear providers are, keep their contact information handy, and don't hesitate to contact them if you notice symptoms that concern you.
- 🔍 Consider measuring the temperature of your feet (thermometry testing) using a personal infrared thermometer to detect signs of temperature change that can alert you to early signs of complication.¹¹ Infrared thermometers can be found in many places, including some automotive stores, as they are used to monitor the temperature of car engines.

For an informative video on what to look for, [click here](#).



Active Pathology, or Foot Complications

When a person with diabetes develops a foot complication, the main goal of treatment is usually to achieve healing, something with which a health-care team can help. If you do develop a foot complication such as an ulcer, seek help *as soon as possible* to prevent the complication from progressing further and placing your foot or leg at greater risk of infection and amputation.

In treating a diabetic foot ulcer (DFU), you should expect your health-care team to do the following:

- Assess the ulcer.
- Rule out and/or treat infection(s).
- Assess the blood flow to your legs and feet to rule out arterial disease.
- Make sure pressure is redistributed from your foot through offloading.

Offloading is a method whereby your body's weight is transferred to another part of your foot or taken off the affected foot completely to allow healing to occur. It can involve the wearing of specialized casting or the use of a wheelchair or crutches.¹² These devices will reduce pressure and speed the healing process. If you have been prescribed offloading to help you heal, be consistent and be sure to wear your offloading device at home. This means at night if you go to the

bathroom, the device needs to be put on again. Refrain from going barefoot, as even one step can undo the healing that may have occurred. Your role is to work with your health-care team to set achievable goals and accomplish the goals.

Know, too, that your other foot is at risk of complications. Continue with your daily foot inspections to both feet. This is essential for preventing additional ulceration.

Remind your health-care clinician about regular foot screening, inquire about their findings and discuss with them your plan of care. One way to be sure this occurs is to take your shoes and socks off to have your feet inspected when visiting your physician.



Keep Informed

- Follow the [Patient or Caregiver section](#) of Wounds Canada's website.
- Attend a Diabetes Healthy Feet and You workshop.
- Participate in a Diabetes Healthy Feet and You support group.
- Sign up online for [monthly foot care tips](#).

A Healthier Body

Managing blood glucose (sugar) levels is also important for both prevention of complications and healing of wounds such as foot ulcers. It's best if you work closely and regularly with your diabetes educator, physician (family doctor, endocrinologist), nurse practitioner or whoever is handling the diabetes portion of your health care, to manage your blood glucose and maintain your general health.

Wound healing takes time and depends on many factors, including your overall health, the wound size and location, pressure on the wound from activity and walking, circulation, blood glucose levels, wound care and pressure offloading. Do the following to care for yourself:

- Manage blood glucose levels.
- Seek medical attention when you notice any changes in your skin or nails.
- Consistently check and wear appropriate footwear.
- Perform daily foot examinations to both feet.
- Quit smoking.

Preventing Recurrence

Once a foot ulcer has healed, the new tissue is only about 85% as strong as the original. The chances are fairly high, therefore, that it will open again (called recurrence), and you will develop another wound. The best thing you can do to prevent recurrence is maintain the healthy lifestyle that helped the ulcer heal in the first place:

- Perform daily foot exams.
- Manage blood glucose, blood pressure and cholesterol levels.
- Select and wear professionally fitted shoes, and check them before putting them on.
- Eat a healthy, balanced diet.
- Perform daily foot, nail and skin care, or seek professional foot care.
- Seek help when complications arise.

Know your risk level so you can schedule a foot assessment every one to three months, or as determined by your health-care provider.

Managing diabetes can be very stressful. If you are experiencing diabetes-related burnout, talk to your health-care professionals about support services that can help you.¹³

B.J.: "I just thought this was something that happened to someone else in my family, not me. It was my wife that encouraged me to ask for a foot assessment, she keeps me on track."
(private communication)

What is diabetes burnout?

Dealing with diabetes is a lot of work.¹⁴ Over time, the stress of a disease that requires you to pay attention to the food you eat, and your activity level, medications, monitoring and screenings can build up. Sometimes people can feel overwhelmed or frustrated by their diabetes and, as a result, may start to ignore their condition. This is called "diabetes burnout."¹⁵



A Daily Commitment

Follow this link to learn how to [perform foot examinations and test the temperature of your feet](#).

Clinician:

What Can I Do?

Frontline health-care professionals play an important role in supporting a person living with diabetes and reducing their risk of amputation by ensuring they receive timely and appropriate care. The time to start with preventative strategies with any patient is NOW!

Primary Prevention

Preventing diabetic foot complications requires a holistic approach—that is, looking at the whole patient, including the environment in which they live, work and play, what kind of support they have or could access, and how capable they are of self-management. Once a thorough health assessment is made, goals are set with the patient and a team is established, you can begin to implement regular preventative strategies (basic and advanced foot, nail and skin care), patient education/instruction that supports self-management, and a comprehensive diabetes management plan.

Every individual with diabetes requires *at a minimum* an annual foot exam, though patients at higher risk of complications should be assessed more frequently.¹⁶ Use a standardized screening tool to help assess your patients' risk level for developing foot complications, including neuropathy or ulcers.¹⁰ The tools for this assessment should be standardized and validated, and assessment should be completed by staff who have received education and training in this area.¹⁷ If you are unsure of your abilities in this area, visit the [Wounds Canada Institute](#) website for courses you can take to further your education.

Inlow's 60-Second Diabetic Foot Screen is a validated tool provided by Wounds Canada for assessing amputation risk.¹⁸ This tool involves three steps:

1. Complete an assessment of both feet (including assessing for skin and nail changes, loss of protective sensation, peripheral arterial disease, bony deformity and footwear).
2. Determine the risk for ulceration and amputation (using the International Diabetes Federation's Risk Categories [modified]).
3. Create a plan of care with the patient based on their identified risks.

[Inlow's 60-Second Diabetic Foot Screen](#) can be accessed online.

Once you have assessed the patient and determined the level of risk (five possible levels), you can begin working with your patient to set goals and assemble a team to implement a plan of care tailored to the patient's goals and their body's ability to heal itself. The plan of care should include the following:

- Engage the patient and family or care partners with individualized and interactive instruction about performing daily foot care.
- Ensure self-monitoring through regular foot inspection; basic foot, nail and skin care; and selection and use of appropriate footwear.
- Identify necessary contacts in the event of a concerning change.
- Provide your patients with information about financial supports that may be available to ensure foot care and footwear needs can be achieved and maintained.

Primary prevention includes assisting patients to manage their glycemic levels, which, in turn, helps prevent the development of risk factors that contribute to diabetic-foot-related complications.



The Importance of Screening

According to Dorresteyn and colleagues (2012), diabetic foot care education can improve short-term outcomes, but education in the absence of screening examinations and comprehensive disease management does not lead to a reduction in diabetes-related foot ulcer or amputation incidence.²⁶

Active Pathology

You also have a role to play in managing active diabetic foot-related pathologies, including ulceration, vasculopathy, neuropathy, callus management, infection (bacterial, viral and/or fungal), structural deformities (e.g., Charcot foot, hammer toe) and gait anomalies. Your involvement in the initial care of any active pathology requires undertaking, or referring your patient to, a comprehensive assessment of vascular status, the presence of infection, and pressure. Careful assessment of these elements can help you, your patient and the team determine the healing potential of the wound,¹⁹ direct the goals of the plan of care and enable appropriate referrals to specialists or other members of the interprofessional team who can deliver ongoing, co-ordinated, integrated care. Remember, pressure offloading is a crucial part of your plan of care for the healing of a diabetic foot ulcer. Without it, all other interventions are of limited value.

Timely care is critical in these cases; patients with limb-threatening complications need to be seen by a specialized team within 24 hours.^{1,20} Don't hesitate to act. You could save a limb and a life.

You should also take an active role in supporting your patients as they move through different care settings by communicating effectively with the patient and other team members and providing education resources.

When treating active foot pathology, identify the underlying cause of the problem or delay in healing (pressure, repeated trauma, poor circulation, infection), as it will be crucial both for managing the active pathology and preventing recurrence. In Canada, "[t]he costs of amputations have been found to be 10 to 40 times greater than the cost of effective initiatives to prevent amputation."²¹

Preventing Recurrence

Unfortunately, recurrence of complications is common in patients with diabetic foot disease. According to Armstrong and colleagues (2017), after the resolution of a foot ulcer, there is an estimated 40% recurrence rate within one year and almost 60% within three years.²² Furthermore, Örneholm and colleagues (2017) reported that 42% of patients they followed developed a new ulcer within two years of closure of the initial ulcer.²³ These studies remind clinicians to think of patients who have achieved wound closure as being in remission rather than being healed.²³ They are still at high risk.

As a member of a care team, ensure your patients are receiving integrated foot care and appropriate self-management resources and have appropriate shoes and orthotic devices. Education alone does not appear to significantly change foot health outcomes in persons with diabetes. It needs to be combined with motivation for self-care behaviours.⁸ Since persons living with established neuropathy do not experience pain, symptom-driven motivation to be more attentive to their self-care behaviours or adhere to day-to-day preventative behaviours can be challenging.

According to Steel and colleagues (2016), there is an increase in depressive symptoms associated with risk of DFUs, and depression remains underrecognized and undertreated in the DFU patient population.²⁴ As a clinician, you need to be aware of the individual's capacity for self-care. Consider assessing their psychological well-being and engaging a mental health specialist in the multidisciplinary treatment of patients with a diabetic foot ulcer.²⁴

Screening for depression and anxiety are part of holistic care, and such screenings may be of additional benefit if the patient is not fully engaged in care.⁷ Ahmed and colleagues (2018) report rates of anxiety of 37% and depression near 40%.²⁵ Furthermore, the research shows that depression is positively associated with females, current smokers, patient over the age of 50, patients with foot ulceration duration greater than seven months, and those with three or more comorbid diseases. Diabetes Canada's Diabetes Distress Screening scale is a simple, two-item screening tool that can be used. Access it online here: www.diabetesed.net/page/_files/diabetes-distress.pdf.

Resources

There are excellent, credible resources available online that can support your patient in understanding the complexity of their disease, such as:

- Wounds Canada.
Overview: Diabetic Foot Ulcers
- Diabetes Canada.
Diabetes and Foot Care: A Patient's Checklist



Policy Maker:

What Can I Do?

Diabetic foot ulcers remain a major health-care problem despite the existence of Canadian guidelines. This area of medicine appears to be susceptible to non-standardized forms of care delivery and care approaches, which contribute to the geographic variation in outcomes.²⁷ It is also noteworthy that the area of diabetic foot complications has failed to attract the same level of research interest by health-care professionals as other diabetes complications, due to the complexity of the disease progression and its impact on trial design, funding opportunities and complexity of the care process.²⁷ Differences in amputation rates within and among countries are related more to attitudes and systems of health-care organizations, rather than type of comorbidity or insufficient resources.²⁸

There are numerous obstacles to any individual achieving optimal diabetic foot care. One of the most obvious is the lack of hospital-based integrated diabetic foot care teams. Clinicians can't refer a patient to a clinical service that does not exist. As well, patients with economic challenges who have had the benefit of a foot care team may not be able to afford footwear or custom orthotics to prevent further complications.

Some of the barriers identified by primary care in a 2019 study include poor implementation of best practice and evaluation, lack of supportive education for all staff on all shifts, and the absence of supportive policies and procedures.²⁹ In this study, 135 nurses, two occupational therapists and two family physicians, while committed to excellence in wound care, recognized the need for effective and widespread dissemination of wound care practice through health-care systems.

As a policy maker, you need to consider what changes you can make to improve and standardize care to reduce variation in health outcomes and support equitable care. You have an opportunity to create and maintain a health-care system, institution or agency that provides early identification and intervention services to this unique patient population. Your primary goals should favour prevention, as this benefits patient quality of life as well as health-care budgets; amputations are expensive.

Foot care is the costliest complication, and the most amenable to rapid change.

You are in a position to support patients with diabetes and your health-care system, institution or agency throughout primary prevention, active pathology and prevention of recurrence phases by doing the following:

- Establishing well-defined treatment pathways for persons with diabetes that support timely access to care in each community (see Figure 1, [Wounds Canada's Diabetic Foot Pathway](#), pg 54).
- Establishing integrated multidisciplinary services to assess and treat patients living with diabetes holistically and address their systemic, psychological well-being and detect foot complications.
- Establishing a diabetic foot hotline that assists patients living with diabetes-related foot complications to navigate the health-care system.
- Establishing integrated teams with specialized education who can deliver timely and effective treatment if foot complications arise. According to the IWGDF, the health-care experts who can support patients at different levels of risk include:¹⁰
 - **Low Risk (Category 0):** Primary care practitioner, diabetes educator, dietitian, pharmacist
 - **Moderate Risk (Category 1):** General practitioner, podiatrist/chiropracist, diabetes educator, dietitian, pedorthist/orthotist



"Foot care is the costliest complication, and the most amenable to rapid change."





- **High Risk (Category 2):** Endocrinologist, surgeon (vascular and/or orthopedic), podiatrist/chiropractist, diabetes educator, dietitian, podiatrist/orthotist
- **Very High Risk (Category 3) or Urgent Risk:** Foot centre with multiple disciplines specialized in diabetic foot care and linked to a surgical facility
- Support public reimbursement for preventative foot care, shoes, socks and offloading devices for individuals with no private insurance coverage.
- Ensure patients and care partners have access to educational resources to support self-management: www.woundscanada.ca/for-patients-public.
- Recognize the mental health concerns of people living with diabetes. Ensure they are screened regularly for depression as an element in primary prevention of further foot complication—especially if they have active diabetic foot disease. Addressing mental health issues helps to support the psychological well-being that impacts prevention and healing outcomes.
- Support health-care professionals to acquire skills to address knowledge gaps specific to standard (see the [Wounds Canada Institute](#)).
- Audit all aspects of care to ensure local practice meets accepted national and international standards of care.
- Measure and track amputations (types) and wound care data across the continuum of care, along with hospital admissions related to diabetic foot complications.
- Ensure appropriate coding in documentation so the burden of these pathologies can be reported accurately.
- Consider funding research that addresses knowledge gaps in areas that can impact the high patient morbidity and mortality and health-care costs.

“Nothing new needs to be developed. All the required pieces, all the specialties and skills, are already in the health-care system; some assembly is required.”

—Tom Weisz



Universal Frustration

Canada provides universal funding for the prevention and management of every diabetes complication except foot care. This has implications in every sector of care. The following quotes reflect the frustration this causes individuals impacted by the lack of across-the-board support for best practice in the prevention of diabetic foot complications.

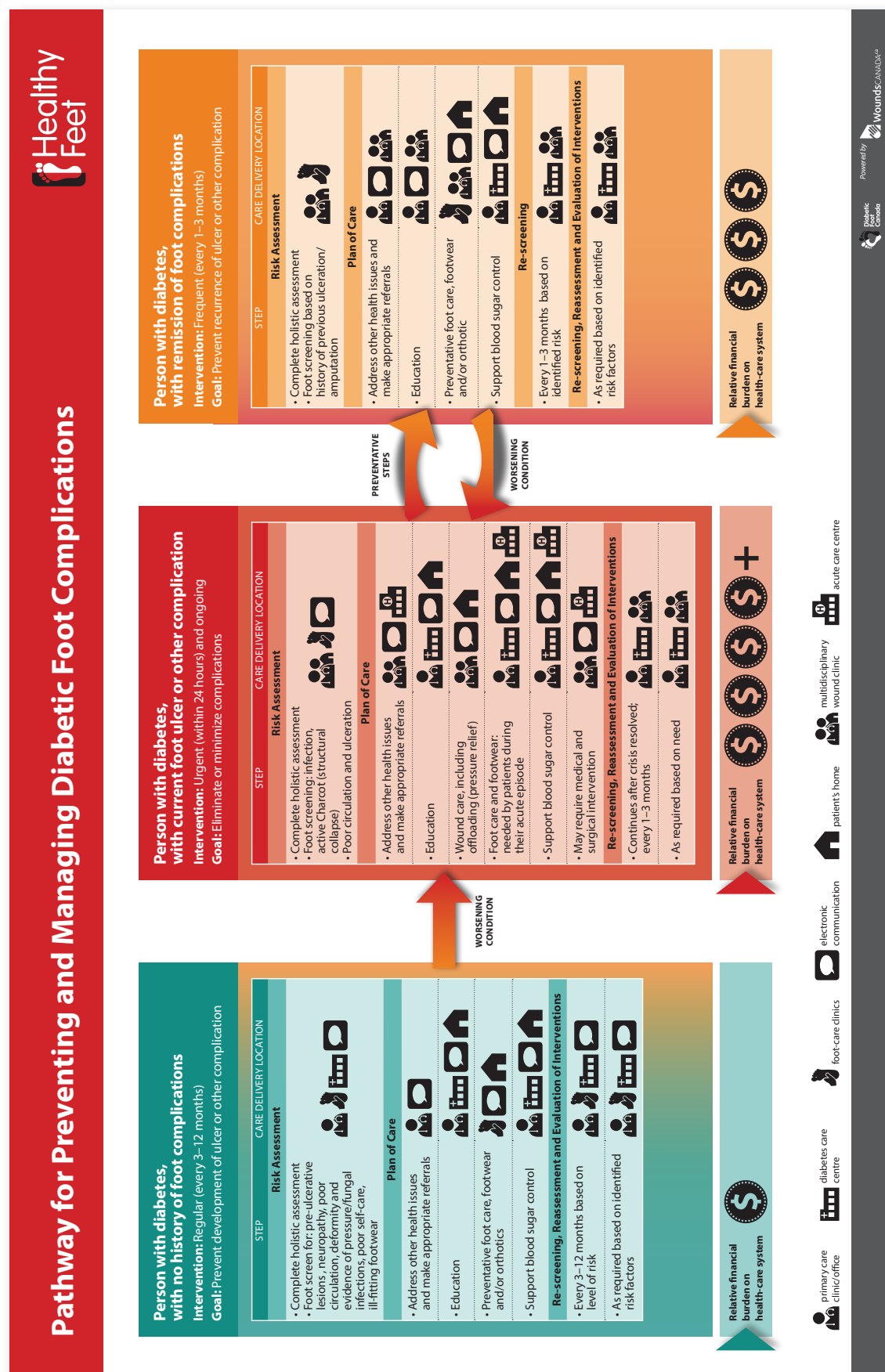
“I think the problem is that people don’t recognize the lack of funded foot clinics as a problem, leaving those of us who are not foot care specialists trying to play the role of foot care specialists and doing a worse job.” —Endocrinologist in the diabetic foot community

“Services such as chiropody/podiatry and orthotic and foot care, which are essential parts of the intervention shown to reduce ulcer occurrence or recurrence and ultimately amputation, are not funded by the government health-care plan.” —Zoe Lysy³⁰

“I am faced with patients with diabetic foot complications frequently in my clinical practice and often struggle to co-ordinate urgent care for them; but more importantly we must be identifying these individuals earlier and trying to avert the need for emergency amputation.”

—Family physician

Figure 1: Wounds Canada's Diabetic Foot Pathway



Conclusion

The evidence is clear. Everyone has an important role to play in preventing diabetic foot complications, identifying and managing active pathologies and preventing recurrence. The key to prevention is a pathway that supports early identification of patients at risk of developing ulcers and amputations,¹⁰ patient self-management and a team approach (see Figure 1, pg 54). Essential for managing active pathologies are well-trained and specialized teams that include the patient, and access to appropriate and timely care. Awareness of the high risk for recurrence is necessary so teams can implement appropriate strategies that reduce variation of health outcomes—such as amputations—and support psychological well-being. 📌

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