WINTER 2025
VOL. 23 NO. 2

Wound Care CANADA

THE OFFICIAL PUBLICATION OF WOUNDS CANADA

Harnessing The Power Of Compliance

Catheter-Associated Skin Injury

Remote Wound Monitoring

AI: The Newest Member Of The Wound Care Team

True Cost Of Wounds For Canadians: Annual Update

WOUNDS CANADA
CELEBRATING THIRTY YEARS
30

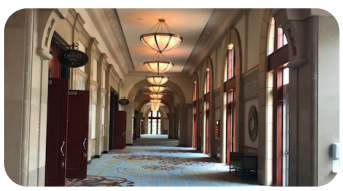
Celebrating our 31st year

SAVE THE DATE
OCTOBER 22-24, 2026

2026 WOUNDS CANADA NATIONAL CONFERENCE

Fallsview Casino Resort, Niagara Falls, Ontario





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Volume 23, Number 2 Winter 2025
ISSN 1708-6884

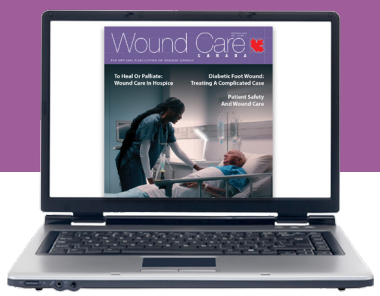
Wound Care Canada is published by Wounds Canada. Canada's first publication devoted entirely to wound care, *Wound Care Canada* addresses the needs of clinicians, patients, care partners and industry.

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.

Don't Miss Out

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



Thirty Years Of Progress, And A Future Built On Patients' Rights

This year, Wounds Canada proudly celebrates 30 years of advancing skin health and excellence in wound management.

Looking back, we are deeply grateful to the clinicians, researchers, patients, caregivers and partners who have journeyed with us. Together, we have transformed wound care in Canada—from an often-overlooked aspect of health care to a national priority rooted in evidence, compassion and collaboration.

Our mission has always been simple yet profound: to build a healthier Canada by advancing skin health and excellence in wound management. This mission continues to drive everything we do, through education, research, advocacy and awareness.

At this 30-year milestone, we are excited to launch our *Patients' Bill of Rights and Responsibilities,* a document co-created with patients, caregivers and experts across Canada. It affirms that everyone living with, or at risk of, deserves timely, equitable and compassionate care, and that every patient is a partner in their own healing journey.

The Winter 2025 issue of *Wound Care Canada* reflects this vision in action. The articles in this issue highlight innovation, education and interprofessional collaboration, all aligned with the principles outlined in the Bill.

Education: Transforming Practice

Education has always been Wounds Canada's cornerstone. Through our Wounds Canada Institute and continuing professional development programs, thousands of clinicians have gained the knowledge to deliver evidence-based wound prevention and care.

For example, this issue features *Appropriate Bedding on Low Air Loss Mattresses* by **Dugas** and **Kuta-George**, a project that grew out of the IIWCC. Their initiative demonstrates how **education drives practice change**, improving outcomes and protecting skin integrity in long-term care settings.

In *Rethinking Mobility in PAD Patient Care* by **Nicholas** and **Alper**, and *Reframing Amputation Prevention* by **Voltaire**, education becomes empowerment. Both call for 'earlier intervention and holistic thinking'—seeing the person, not just the limb, and preserving independence through proactive, coordinated care.

Research: Innovation For Better Outcomes

Research fuels the evolution of wound care. This issue highlights how science and technology are helping us care smarter and heal faster.

Gefen's *Bioengineering Computer Models for Efficacy Research in Wound Dressings* demonstrates how simulation-based tools are redefining product evaluation and patient safety. Costa and Woo's *Healing Without Harm* underscores that innovation must be paired with 'antimicrobial stewardship' to protect future generations.

Meanwhile, **Alleyne's** *Welcome to the Newest Member of the Interprofessional Wound Care Team: Artificial Intelligence* presents AI as a trusted collaborator—one that can amplify human judgment and extend compassionate care through ethical integration.

Advocacy: Turning Knowledge Into Action

At Wounds Canada, we believe knowledge must lead to policy change. Advocacy ensures that the rights and responsibilities of patients and providers alike are reflected in systems of care.

Do You Hate Policy? If so, If So, Come To The Policy Café by **McSwiggan** captures this spirit of engagement. Through dialogue, participants turn frustration into focus and policy into possibility.

Complementing this is the *True Cost of Wounds for Canadians: Annual Update (2024)* by **Queen** and **Botros**, which provides essential evidence to guide decision-makers. Together, these works remind us that advocacy is not just about policy—it's about people.

Awareness: Listening To Patients' Voices

Healing begins when we listen. *Using Indigenous Knowledge to Improve Persons' Quality of Life When Living with Skin Conditions* by **O'Donnell et al.** beautifully illustrates the value of Indigenous wisdom and holistic healing traditions.

Closing the Distance: Engaging Patients Using Remote Wound Monitoring by **Bavaro** and **colleagues** showcases how digital tools can reduce inequities for patients in underserved regions.

And in *The Association Between Sleep Disorders and Diabetes-related Foot Ulcers,* **Brocklehurst** reveals how sleep—something so fundamental—can profoundly influence wound outcomes and quality of life.

We are also pleased to feature our *Presentation Digest* section, highlighting the high quality, expert-driven and well-attended educational seminars sponsored by our industry partners at our successful *Wounds Canada 2025 Wounds Canada National Hybrid Conference* held this past October in Toronto.

Together, these articles reflect Wounds Canada's commitment to awareness and inclusion, ensuring every voice is heard and every story informs better care.

Looking Ahead

As we move into our fourth decade, we remain steadfast in our mission. Through our four pillars of education, research, advocacy and awareness, we will continue to champion excellence in wound prevention and management, and strengthen Canada's capacity to care.

The *Patients' Bill of Rights and Responsibilities* will serve as our guiding light, uniting our community around shared values of respect, equity and accountability.

Thank you for being part of this journey. Here's to the next 30 years of innovation, compassion, and collaboration, toward a healthier Canada for all.

Mariam Botros DCH DE IIWCC
Chief Executive Officer
Wounds Canada

2025 Wounds Canada National Hybrid Conference Welcomes Delegated to Toronto And Reaches Across Canada

Wounds Canada's 2025 conference was a notable success, with attendees reporting being very happy with the sessions, speakers, facilities and exhibitors. Work has now begun on the 2026 conference to take place in Niagara Falls, Ontario. Stay tuned to our site for more details as they become available.

A Free Educational Webinar On Pressure Injuries

On Pressure Injury (PI) Awareness Day November of 2025, Wounds Canada conducted a free interactive webinar to teach health-care professionals the ins and outs of implementing the *Wounds Canada Pathway for Preventing and Managing Pressure Injuries*.

The special event, moderated by Dr. Irmajean Bajnok, demonstrated how the newly-launched pathway can be used in all sectors to support health-system decision-makers, frontline care providers and patients and their families in preventing and managing PIs by integrating systems of care to enable prevention, early detection and treatment.

2025 Update of BPR Briefs Launched

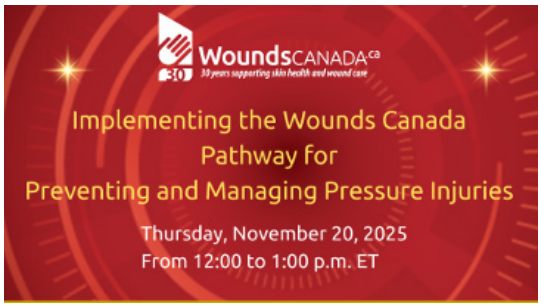
A Digest Version of Best Practice Recommendations for Skin Health and Wound Management

The Best Practice Recommendations (BPRs) are Wounds Canada's most popular resources, used by frontline clinicians, students and policy makers around the nation. To ensure their widespread and sustained use, the Wounds Canada team has created abbreviated versions that can be used by clinicians who are already familiar with the full versions to quickly access the key information they need. In 2025, when the BPRs were updated, the Briefs were also edited to reflect the latest information.

Readers can access the full document or connect to the individual BPR Briefs using this link: BPR Briefs 2025 - Wounds Canada

Ongoing Awareness Campaigns

Wounds Canada is dedicated to spreading awareness, and one crucial way to reach wider audiences is by celebrating relevant awareness campaigns both national and global. In May, we celebrated *Foot Healing Month*. June was our month to shine as *Wound Healing* was front and centre around the world. September was PAD Awareness Month and November highlighted *Diabetes and Pressure Injuries*.



IT'S TIME

to invest in your future

Register Now for the Latest Innovation in Skin Health Education:

The Skin Health Program for Personal Care Providers

This educational program is designed to enhance the knowledge of PSW's in monitoring health or skin changes in the individuals they care for, reporting observations to supervisors or health-care professionals, accurately documenting those observations and collaborating in follow-up care.

Apply today!
www.woundscanada.ca/programs/skin-health

Wounds CANADA Institute

RNAO

This program has just been awarded micro-credential recognition by Nipissing University!

NIPISSING UNIVERSITY

Structure of the Program

- 11 highly interactive online modules
- 1 live webinar featuring expert faculty
- 3 discussion boards on skin health and wound prevention
- 1 final exam to test knowledge

Program Topics

- Skin structure and functions
- Risk factors for skin breakdown
- Common types of skin breakdown, including skin tears, pressure injuries, moisture-associated skin damage, diabetic foot ulcers, leg ulcers and swelling, and thermal skin injuries
- Strategies to maintain healthy skin and prevent skin breakdown

We gratefully acknowledge the support and funding for the development of the Skin Health Program by the Government of Ontario

NEWS FROM OUR INDUSTRY PARTNERS

Arjo

At Arjo, we believe that empowering movement within health-care environments is essential to quality care. Our products and solutions are designed to promote a safe and dignified experience through patient handling, medical beds, personal hygiene, disinfection and the prevention of pressure injuries and venous thromboembolism.

We understand that your health-care organization is dynamic, constantly evolving and responding to its surrounding environment. Patients and patient needs fluctuate as seasons change, making your flexibility in answering challenges even more important. Predicting when you will need more sophisticated systems and which patients will need them isn't easy. Arjo rental solutions are customizable to fit the demands of your health-care environment, now offering a range of products and solutions that includes therapeutic support surfaces, bariatric room solutions, ICU early mobility, dementia care, safe patient handling and specialized seating.

Learn more at ca.arjo.com/Arjo-Rental-Solutions

Biocomposites

Biocomposites is an international medical device company that engineers, manufactures and markets world leading products for use in infection management.

Based in Keele, UK with operations around the world, Biocomposites is a leading developer of innovative calcium compounds and specialty polymer products for surgical use.

Today our products are used in over 1 million procedures every year.

Learn more at biocomposites.com/

Biomiq

Biomiq is a Canadian innovator in advanced wound care, committed to reimagining healing through science, safety and simplicity.

At the heart of our portfolio is PureCleanse™, a Super Oxidizing Saline™ wound cleanser that harnesses the natural power of hypochlorous acid (HOCl) to deliver broad-spectrum antimicrobial performance while remaining as gentle as saline. PureCleanse™ preserves viable tissue and supports wound bed hygiene for optimal healing across all care settings.

Proudly made in Canada, PureCleanse™ and PureGel™ combine purity, stability and proprietary delivery systems to meet the needs of clinicians and patients alike—from acute care to community and home environments.

Beyond wound cleansing, Biomiq offers complementary technologies such as PureCleanse™-compatible JetOx™ jet lavage devices and Suturegard® HEMIGARD® tension offloading suture supports for surgical wound protection.

PureCleanse™ products are available in the community, LTC and through national GPO contracts via your preferred Canadian distributor.

Learn more at biomiq.health/WoundCare

Carilex

With more than 30 years of expertise, Carilex has become a trusted global leader in wound care, advancing technology for the prevention and treatment of wounds. Guided by the belief that 'Caring Makes the Difference', every Carilex product is developed with compassion, innovation and clinical expertise at its heart.

Carilex operates on a truly global scale. Our manufacturing in Taiwan ensures high-quality production using advanced technology. To better serve our North American partners, we maintain operations and service in City of Industry, California, where responsive support and reliable service are always close at hand.

Our vision is to be recognized worldwide as a leader in medical devices that help prevent pressure ulcers and support wound care management. We hold firm to our mission. Pressure ulcers are preventable, and wound care outcomes can be improved through proper management. Carilex is committed to developing solutions that empower health-care professionals and enhance patient quality of life.

At the core of our company are values that define how we operate. We are deeply committed to patient well-being, meticulous in our attention to design and innovation, and proud of the dedication shown by our team. For us, success is measured not only by clinical outcomes but also by the comfort, safety and confidence our products bring to patients.

Carilex continues to invest in research, technology and strategic partnerships to deliver innovative solutions that advance wound care and truly make a difference.

Learn more at carilexmedical.com/products

Coloplast

Coloplast was founded on passion, ambition and commitment. We were born from a nurse's wish to help her sister and the skills of an engineer. Guided by empathy, our mission is to make life easier for people with intimate health-care needs. Over decades, we have helped millions of people live more independent lives and continue to do so through innovative products and services. Globally, our business areas include Ostomy Care, Continence Care, Advanced Wound Care, Interventional Urology and Voice and Respiratory Care.

Biatain® Silicone – foam dressings for the treatment of wounds – Coloplast

Convatec

Convatec is a global medical products and technologies company, focused on solutions for the management of chronic conditions, with leading positions in advanced wound care, ostomy care, continence, critical care and infusion care. With around 10,000 colleagues, we provide our products and services in over 100 countries, united by a promise to be forever caring. Our products provide a range of benefits, from infection prevention and protection of at-risk skin, to improved patient outcomes and reduced care costs.

Learn more at convatec.ca

Convatec est une entreprise mondiale de produits et de technologies, chef de file dans le marché des soins pour stomie, des traitements des plaies, de l'incontinence et des soins aigus ainsi que des

dispositifs de perfusion. Les produits de Convatec apportent un éventail d'avantages et de bienfaits cliniques et économiques, y compris une protection contre les infections et pour la peau à risque, une amélioration des résultats cliniques et une réduction de l'ensemble des coûts associés aux soins.

Pour en savoir plus, visitez convatec.com/fr-ca/

Designs for Vision

With a strong focus on research, development and close collaboration with practitioners, Designs for Vision, Inc. stands at the forefront of medical visualization technology. Designs for Visions newest innovation is the Reveal FC. The Reveal FC is the only wearable in Wound Care that provides real-time autofluorescence imaging in skin wounds, providing clinicians with immediate assistance information during their wound assessment and treatment process. Designs for Vision, Inc. is a pioneering medical device manufacturer dedicated to advancing surgical precision and clinical outcomes. Established in 1961, the company revolutionized the field of surgery by inventing the first surgical loupe, setting a new global standard for magnification and visualization in health care.

More than six decades later, Designs for Vision continues to lead innovation by designing, manufacturing, and assembling all its devices in Bohemia, Long Island. As a proudly North American-made company, we remain committed to precision engineering and supporting the medical professionals who rely on our products every day. Our mission is to empower health-care professionals with tools that enhance vision, accuracy, and outcomes.

Learn more at designsforvision.com/

Howie, Sacks & Henry

Howie, Sacks & Henry LLP (HSH) is one of Canada's leading personal injury law firms, recognized for its expertise in representing individuals and families affected by catastrophic injuries and nursing home neglect. With over 25 years of experience, our team is dedicated to protecting the rights and well-being of seniors and vulnerable people in nursing homes, retirement residences and long-term care facilities. We understand the trust families place in these institutions and the profound impact when that trust is broken, often due to systemic failures, despite the best efforts of dedicated staff. HSH combines legal excellence with compassion, providing personalized and client-focused service. Our experienced lawyers have a proven track record in complex cases, including brain and spinal cord injuries, severe fractures, abuse, neglect and medical malpractice.

We are committed to holding negligent facilities accountable, improving standards of care and securing justice and compensation for victims. Consistently recognized by industry-leading publications such as 'The Best Lawyers in Canada™' and Canadian Lawyer's Top 10 Personal Injury Boutiques, we operate on a contingency fee basis and offer free consultations to ensure access to justice for all. At HSH, we do everything possible to help clients obtain the compensation they deserve and move forward with confidence.

Learn more at hshlawyers.com

medi Canada

medi Canada is a recognized leader in medical compression solutions, serving health-care providers and patients across the country. As part of the global medi World of Compression, the company leverages more than 75 years of international expertise to deliver innovative, high-quality products that meet the evolving demands of modern medicine.

The company's mission is to provide compression therapy solutions that combine clinical effectiveness, advanced design and patient comfort. Its flagship mediven® line addresses a broad spectrum of clinical needs — including phlebological conditions, lymphedema, and post-surgical recovery — while offering a wide selection of colours, styles and compression levels. From standard options to custom-fit garments, medi Canada ensures that every patient can find an appropriate and reliable solution.

Beyond product innovation, medi Canada is committed to building strong partnerships with health-care professionals. The organization provides training, resources and ongoing support to help optimize patient outcomes. A range of complementary accessories further enhances wearability and adherence, making daily therapy more effective and practical.

Serving clinics, hospitals and distributors, medi Canada positions itself as more than a supplier: it is a trusted partner invested in the success of its stakeholders. With a focus on innovation, service excellence and long-term collaboration, the company continues to set new standards in compression care.

medi — shaping the future of compression therapy through expertise, innovation, and trust.

Learn more at medicanada.ca

Medline

Medline is a leading global manufacturer and provider of high-quality medical products and services to the health-care industry. Our expertise in health-care solutions throughout the continuum of care, coupled with the scale and agility of our supply chain, allow us to partner with our customers to enhance patient care, improve clinical outcomes, drive effective cost management and provide fast access to quality products.

By applying our 'CARES' values every day, in all that we do, Medline Canada is deeply committed to the health and wellbeing of our customers, employees, partners and communities. With more than 550 employees, including 125 dedicated sales and clinical professionals and 8 distribution centres located across Canada, we are a trusted partner in delivering the health-care needs of Canadians from coast-to coast – Together Improving Care™.

Learn more at medline.ca

Medline est l'un des principaux fabricants et fournisseurs mondiaux de produits et services médicaux de haute qualité destinés au secteur des soins de santé. Notre expertise en matière de solutions pour l'ensemble de ces secteurs, combinée à une chaîne d'approvisionnement agile et de grande envergure, nous permet de travailler en partenariat avec nos clients afin d'améliorer les soins aux patients, les résultats cliniques et la gestion efficace des coûts en plus de leur offrir un accès rapide à des produits de qualité.

Chez Medline Canada, nous mettons en application nos valeurs CARES tous les jours, dans tout ce que nous entreprenons. Nous sommes profondément engagés envers la santé et le bien-être de nos clients,

nos employés, nos partenaires et les communautés où ils vivent. Comptant plus de 550 employés, dont 125 professionnels cliniques et de la vente, et huit centres de distribution répartis dans tout le pays, nous sommes un partenaire de confiance qui répond aux besoins de santé des Canadiens d'un océan à l'autre. Ensemble au cœur des soins[MC].

Pour en savoir plus, visitez medline.ca

MIP

We Believe in Caring as a Science

As a leading global supplier, MIP offers a broad range of textiles and related products, services and solutions for the continuum of care. From scrubs and mattresses to bed pads and clean linen carts, MIP produces and provides what is needed for caregivers and care recipients to have more time to focus on caring and healing.

Our customers and their customers are the driving force of our business. We will do the best job possible to be proactive and innovative in providing products and services that help them meet or exceed their objectives.

Supporting Canada's Healthcare Community since 1977.

MIP Inc. | The softer side of healthcare

Mölnlycke

At Mölnlycke, we are driven by a commitment to revolutionize care for both people and the planet. This begins with creating lasting change that enhances the quality of life for patients and health-care providers alike.

Our mission is to relieve patients, caregivers and health-care systems from the burden of wounds. We achieve this by offering products that not only support prevention but also promote faster healing. This ensures patients receive the care they need while empowering health-care professionals with solutions that reduce treatment times, lower costs and accelerate recovery. By preventing wounds before they occur, we can help health-care systems, already stretched thin, save millions annually.

Our innovative prophylactic dressings and positioning products are specifically designed to prevent hospital-acquired pressure injuries. These solutions help to reduce patient suffering, minimize staff hours, and shorten hospital stays.

Mölnlycke has been at the forefront of pressure injury prevention, continuously developing and improving solutions that help health-care providers deliver safer, more effective care. Our dedication to preventing these injuries and advancing patient care drives everything we do. By empowering health-care systems with the knowledge, tools and resources to reduce pressure injuries, we are improving patient outcomes and helping build a more sustainable future for health care.

A world-leading provider of single-use surgical and wound care products | Mölnlycke

NanoTess

At NanoTess, our purpose is clear and urgent: to help address the silent pandemic of wounds affecting Canadians. As a proudly Canadian social enterprise, we are guided by both clinical impact and equitable access, working to ensure that all Canadians, regardless of location or care setting, can benefit from our advanced, hospital-grade wound care solution.

NanoSALV™ Catalytic, a Health Canada–authorized medical device, harnesses catalytic technology to support the body's natural healing processes. By aiming to promote biochemical reactions that support tissue regeneration, it addresses three central challenges in skin and wound care - injured skin, inflammation and infection - helping to optimize recovery and improve outcomes.

In a provincial evaluation with Alberta Health Services, NanoSALV™ Catalytic was associated with a 57.6% improvement in wound healing, approximately a 46% reduction in wound care costs, and meaningful gains in patient well-being and quality of life when used alongside standard care.

Trusted by clinicians and care teams across Canada, NanoSALV™ Catalytic has helped thousands of Canadians heal, including closing a chronic wound that had remained open for more than 13 years. Through partnerships with health-care organizations and programs spanning acute care, long-term care, community and home settings, this advanced skin and wound solution is reaching patients where they need it most.

Every healed skin or wound represents more than recovery. It reflects collaboration, compassion and the value of integrating evidence-informed innovation, ensuring that every person, in every community, has the opportunity to heal.

Learn more at nanotess.com

Pixalere

The Pixalere Digital Wound Management Solution, proudly developed and operated in Canada, is a transformative, intuitive decision-support system that streamlines wound care delivery, optimizes resource allocation and enhances patient outcomes.

Pixalere extends the reach of wound care specialists through remote asynchronous and synchronous collaboration, enabling high-quality care across diverse settings. The platform:

- Increases nurse specialist productivity by up to 10 times through asynchronous collaboration, reducing wait times for specialist consultations*
- Improves access to care for patients in rural and underserved areas
- Promotes patient engagement in care planning and self-management

By combining mobile applications, automated wound image analysis and precision measurement technology, Pixalere supports nurses in performing accurate and efficient wound assessments.

Key features include:

- AI-based wound measurements for objective tracking of healing progress
- Predictive analytics to detect complications early and support timely intervention
- Decision-support tools that empower nurses, reducing dependency on specialists while maintaining care quality
- Integration with EHRs, streamlining workflows, providing centralized wound data and enhanced communication
- Comprehensive reporting tools providing insights on healing rates, response times, wound product and resource use, and treatment efficacy

Pixalere reduces hospitalizations, minimizes in-person consultations and optimizes resource utilization, delivering measurable cost savings. Studies show proactive wound management can

save health-care systems an average of $3,500 per avoided hospitalization.**

By improving collaboration between nurses and specialists, Pixalere enhances staff satisfaction, reducing burnout and turnover. Each month, over 14,000 clinical users complete approximately 150,000 wound assessments using Pixalere.

*Interior Health Case Study (2025) reported productivity improvements of 7.4 times.

**American Academy of Family Physicians, 2020; Hwang, 2023.

Learn more at pixalere.com

SIGVARIS GROUP

Sigvaris

For more than 160 years, SIGVARIS GROUP has been committed to helping people feel their best, every day, with high-quality and innovative medical compression therapy solutions.

Our product portfolio combines advanced technology, quality craftsmanship and fashionable designs that caters to a wide range of different needs and indications.

Sigvaris compression solutions help you go easily through your day. These compression products are made for anyone, anywhere, anytime.

Sigvaris offers compression wear for most medical needs, ranging from standard medical level to highly sophisticated solutions for specific indications and complex edemas.

Move on with your life without compromise: Sigvaris compression therapy addresses more than your medical requirements and comfort. It caters to your way of life.

Live your life. Be yourself.

Learn more at sigvaris.com

Smith+Nephew

Smith + Nephew

Smith+Nephew is a portfolio medical technology company focused on the repair, regeneration and replacement of soft and hard tissue. Our Advanced Wound Management business works to Shape What's Possible in Wound Care through a comprehensive portfolio that supports health-care professionals in preventing, managing and healing wounds. From Advanced Wound Care products that address exudate, infection and pressure injury prevention, to Advanced Wound Bioactives that enable debridement and tissue repair and Advanced Wound Devices that deliver innovative Negative Pressure Wound Therapy, we are committed to helping reduce the human and economic burden of wounds while improving outcomes for patients.

Learn more at smith-nephew.com

STEVENS

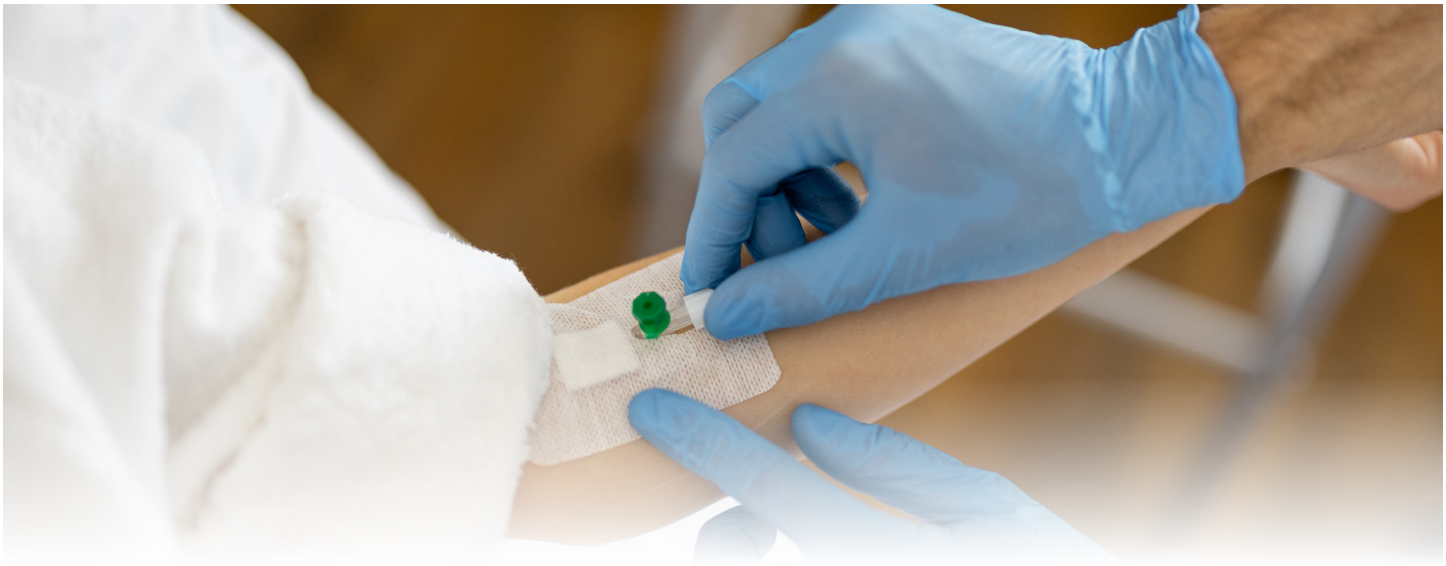
The Stevens Company

Medical Supplies and Equipment Distribution—Established in 1830

A leading Canadian supplier to Hospitals, Physicians, and Long Term Care Facilities for over 150 years.

National distribution of medical supplies and health-care solutions across Canada with locations in Toronto, Halifax, Montreal, Winnipeg, Calgary, and Vancouver.

Learn more at stevens.ca



Catheter-Associated Skin Injury: Integration Of MARSI Principles Into Vascular Access

By Daphne Broadhurst RN MN CVAA(c) and Anne-Marie Blais RN BScN NSWOC(C) CVAA(C)

How to cite: Broadhurst B, Blais A-M. Catheter-associated skin injury: integration of MARSI principles into vascular access. Wound Care Canada. 2025;23(2): 16-26. DOI: 10.56885/909580rvqkrr

The seminal work of McNichol et al. has been foundational in standardizing the identification and classification of medical adhesive-related skin injury (MARSI).[1] This foundational research, along with subsequent studies, has provided invaluable general guidance for the prevention, management, and treatment of various integumentary issues related to adhesives across diverse health-care settings.[2] However, despite these advancements in wound care, there remained a lack of specific recommendations concerning vascular access device (VAD) sites, particularly when faced with conditions analogous to MARSI.

Addressing this unmet need led to the development of a novel clinical algorithm: CVAD Skin Impairment (CASI).[3] The term 'Central Vascular Access Device (CVAD)-Associated Skin Injury' was adapted from 'Medical Adhesive-Related Skin Injury' (MARSI) to more comprehensively describe compromised skin integrity associated with the myriad products used in vascular access care, such as medical adhesives, catheters, securement devices, needle-free connectors, etc.[4,5] This algorithm, which provides a standardized approach to identifying and managing VAD-related skin injuries, has been instrumental in the recognition and adoption of the term 'catheter-associated skin injury' (CASI) in prominent Canadian and international best practice guidelines.[4,5]

The Canadian Vascular Access Association defines catheter-associated skin injury (CASI) as: *Disruption of the skin, characterized by drainage, skin irritation (irritant or allergic contact dermatitis [e.g., erythema, vesicle, bulla, pruritis]), skin damage (erosion or skin tear, blister, stripping) at a VAD site, under the dressing*

area, which lasts longer than 30 minutes after dressing/securement removal (excluding skin conditions such as eczema, autoimmune disorders, extravasation); CASI may result in patient discomfort, delays in treatment, unscheduled VAD removal and replacement, and increased healthcare costs.[4]

This article outlines how prevalent this issue is, the evolution of the CASI algorithm (Figure 1) and discusses key interventions to provide targeted guidance for the assessment, management and prevention of wounds occurring at vascular access device sites.

Prevalence And Types of Vascular Access Skin Injuries

Vascular access catheters are frequently associated with various skin complications, posing a significant clinical challenge. Various studies report diverse prevalence rates and types of skin injuries, highlighting the complex and persistent nature of these complications, as well as the need for a comprehensive and standardized approach to prevention, assessment and management. Overall prevalence rates of skin impairment at CVAD sites have been reported to range from 3.23% to 36%.[6-11] Table 1 summarizes the reported prevalence and types of catheter-associated skin injury.

Environmental Scan Of CVAD Skin Impairment Management

Despite the recognized prevalence of skin complications associated with vascular access devices, early literature specifically addressing the identification and management of such impairment at these critical sites was limited. Pioneering discussions on vascular access site impairment were initiated by Thayer and Kutzcher, who highlighted the often-overlooked aspect of skin integrity in this context.[12,13] Their contributions helped to lay the groundwork for understanding that maintaining skin integrity at vascular access sites is often a secondary consideration to establishing access and preventing infection. This early work pointed to the need for greater awareness and a more systematic approach to recognizing and managing skin reactions to dressings, adhesives and securement devices used around vascular access, setting the stage for more comprehensive research in this area.

Author DB received a plea from her sister as their young son battling cancer and multiple transplants developed an exit-site infection with no change in plan of care.[14] A brief literature review revealed this lack of available evidence to support optimal care in the context of skin injuries. Building upon these observations and the recognized gap in evidence, an international survey conducted by Broadhurst, Moureau and Ullman in 2016 specifically aimed to determine current central venous access device (CVAD) site care practices across 34 countries.[15] This study revealed significant global inconsistencies in CVAD site care, impacting skin integrity at insertion sites. Clinicians showed varied preferences for dressing products based on impaired site conditions, such as redness, rash, skin stripping or drainage. For example, when faced with skin stripping/adhesive-related injuries, clinicians showed a notable shift from transparent dressings towards hydro-colloid dressings (23.3%), gauze with adhesive borders (17.7%), or other unspecified dressings. Inconsistencies were also noted in fundamental management approaches, such as adapting various antiseptic solutions for sensitive skin. A critical finding revealed that only a small percentage (11.4%) of organizations had formal procedures or algorithms for managing CVAD sites with impaired skin integrity. This broad lack of standardized institutional guidance often leads to reliance on individual clinician judgment.[15]

CASI Algorithm: A Comprehensive Framework

Following the revelation of significant inconsistencies in CVAD site care practices and a notable paucity of literature guiding the management of impaired skin integrity,[15] the World Congress of Vascular Access (WoCoVA) initiated the development of the first comprehensive evidence and consensus-based algorithm specifically designed for the management of Central Venous Access Device-Associated Skin Impairment (CASI). (See Figure 1).[3]

Table 1: Reported Prevalence and Types of Catheter-Associated Skin Injury

Prevalence Metric	Reported Rate	Source (Author, Year)
Overall Skin Impairment at CVAD Sites	3.23% to 36%	Chan et al., 2017; Ullman et al., 2019; Wang et al., 2019; Zhao et al., 2018; Liu et al., 2022
CVAD-associated skin complication	27% (n=168/626)	27% (n=168/626)
Incidence rate per 1,000 CVAD-days	30 skin complications	Gavin et al., 2024
Skin complications with peripheral venous/arterial devices	12.3% (46.2 per 1,000 catheter days)	Ullman et al., 2019
Skin complications with CVADs	11.7% (22.5 per 1,000 catheter days)	Ullman et al., 2019
CASI at PICC Sites (Oncology Patients)	19.70% to 33.99%	Wang et al., 2018; Zhao, He, Huang, et al., 2018; Zhao, He, Wei, & Ying, 2018; Li, Zhang, Zhang, Hou, & Feng, 2023; Tian, Yin, Zhu, & Zhang, 2021
MARSI in outpatients	14.7%	Xia, Chen, Ma, & Zhang, 2025
Specific CASI Types		
Local infection (PICC CASI)	56.1%	Li, Wang, Liu, & He, 2020
Skin injury (PICC-related)	40.8%	Wang, Miao, & Wan, 2023
- Dermatitis	63.1% (of skin injury)	Wang, Miao, & Wan, 2023
- Mechanical skin injuries (blisters, pressure injuries)	36.9% (of skin injury)	Wang, Miao, & Wan, 2023
Blisters/vesicles (CVADs)	3% (of participants)	Gavin et al., 2024
Skin tears (CVADs)	2% (of participants)	Gavin et al., 2024
Skin stripping (CVADs)	1% (of participants)	Gavin et al., 2024
Mechanical injuries (overall MARSI)	70.3%	Frota et al., 2023
- Skin stripping (of mechanical injuries)	41.3%	w et al., 2023
- Skin tears (of mechanical injuries)	26.1%	Frota et al., 2023
Contact dermatitis (PICC sites)	9.31%	Zhao et al., 2018
Contact/allergic dermatitis (CVADs)	<1%	Gavin et al., 2024
Pruritus (itch) (CVADs)	34%	Gavin et al., 2024
Pressure injuries (CVADs)	<1%	Gavin et al., 2024

CVAD- central venous access device, PICC- peripherally inserted central device

Figure 1: CVAD-Associated Skin Impairment Algorithm

CVAD– Associated Skin Impairment (CASI) Algorithm

1. Assess Patient

EXIT SITE INFECTION
Redness, induration (hard), and/or tenderness within 2 cm of the catheter exit site; possibly with other signs and symptoms of infection, such as fever or purulent drainage at exit site, concomitant bloodstream infections

SKIN INJURY
- Stripping: Shallow irregular lesions; shiny skin
- Tears: Partial or full thickness tension blisters

SKIN IRRITATION/CONTACT DERMATITIS
Skin color change (red, dark, shiny, dull) persisting 30 min. after dressing change (often mimics shape of dressing) and/or burning, itchy skin and/or lesions (macules, papules, vesicles, bullae)

WEEPING/OOZING
(Non-infectious)
Assess color, consistency, odor, amount and location of exudate

2. Protect Skin and Provide Comfort

If Exit Site Infection is Suspected:
- Culture site and draw blood cultures
- Collaborate with practitioner; may need to remove catheter
- Topical antimicrobial agent† (based on culture results) or consider non-CHG antimicrobial dressing
- If there is no resolution with topical therapy or it is accompanied by purulent drainage, start systemic antibiotics
- Consider cauterizing exuberant granulation tissue at site of long-term CVAD

†Confirm compatibility with dressing and catheter

- Consider non-alcohol antiseptic agent
- If skin flap present, approximate viable skin flap edges prior to dressing application

- Rule out infiltration/extravasation, thrombophlebitis and other skin conditions (e.g., eczema, impetigo)
- Identify and avoid suspected irritant:
  - Change type/concentration of cleansing solution (see Fig. 1)
  - Ensure solution and barrier film are allowed to dry fully before dressing application
  - If no resolution, change brand/type of dressing
  - Consider open application test of dressing/antiseptic solution on unaffected skin (see Fig. 2)

- Control bleeding: pressure at site, alginate and/or hemostatic agent under dressing
- Apply non-alcohol barrier film and absorbent dressing

- Apply alcohol-free barrier film and appropriate dressing
- Consider anti-inflammatory, anti-pruritic agents and/or analgesics; cool compresses (applied on top of dressing)
- Assess irritated skin every 24 hrs; monitor for signs and symptoms of infection
  - If no improvement to sites with suspected contact dermatitis, consider short-term use of topical corticosteroid (do not apply directly on exit site
- If no improvement within 3–7 days, consult wound/skin specialist

- Educate staff and/or patients/caregivers on proper dressing selection, atraumatic application/removal, site care
- Identify patients at risk and take precautions with site care (e.g., malnutrition, dehydration, elderly/neonates, dermatologic conditions, low/high humidity, radiation therapy, medications [chemotherapy, anti-inflammatories, including long-term corticosteroid use, anticoagulants])

Dressing Usage Guide for CVAD Skin Impairment Management

Dressing*	Skin Injury (e.g., tear/blister)	Skin Irritation	Drainage			Able to see site
			Low	Med	High	
Non-adherent non-woven gauze** (if skin intact or topical agent applied)		▯	▯			
Transparent film		▯				Yes
Absorbent clear acrylic	▯	▯	▯	▯	▯	Yes
Hydrocolloid (do not apply directly on CVAD exit site)		▯	▯	▯		
Foam (silicone or low-tack)	▯	▯	▯	▯	▯	
Alginate (also has hemostatic properties)	▯			▯	▯	
Skin glue (2-octylcyanoacrylate alcohol-free topical bandage) + Cover Dressing	if skin flap is present					Yes
Antimicrobial dressing***			▯	▯	▯	

- Apply sterile alcohol-free skin barrier film prior to dressing (let dry before applying dressing)
- If skin damage/drainage is away from the exit site, isolate wound and exudate from exit site: apply absorbent dressing over area of injury and transparent dressing over exit site and prepped skin.
- If exudate leakage, use a different dressing with higher fluid handling capacity

*Stabilize catheter with securement device/dressing
**Does not provide a microbial barrier
***Assess manufacturer's contraindications. Recommend consult wound/skin specialist and/or physician.

Fig. 1–Reaction to CHG w/ Alcohol

Try CHG w/o alcohol
↓
No improvement?
↓
Try Povidone Iodine
↓
No improvement?
↓
Try sterile normal saline

Fig. 2–Open Application Test

1. Apply product to forearm
2. Monitor for 30-60 min.
3. Reassess in 3-4 days for signs of dermatitis

Reprinted with permission from the Canadian Vascular Access Association. Broadhurst D, Moureau N, Ullman AJ; The World Congress of Vascular Access (WoCoVA) Skin Impairment Management Advisory Panel. Management of central venous access device-associated skin impairment: an evidence-based algorithm. J Wound Ostomy Continence Nurs. 2017;44(3):211-220.

This groundbreaking work aimed to standardize the identification and diagnosis of impaired skin around CVAD sites, guide clinical decision-making, and enhance clinician confidence in managing these complex conditions.

The development of the CASI algorithm was a multi-stage process.[3] It commenced with a comprehensive scoping review of existing literature, mapping current research and identifying critical gaps related to CVAD site care and skin impairment management. This review informed an international advisory panel, comprising 16 clinicians and academics with diverse expertise in wounds, vascular access, pediatrics, geriatrics, home care, intensive care, infection control and acute care.[3] Leveraging a 2-phase, modified Delphi technique, the panel reviewed and critiqued the available evidence. Phase 1 involved open-text surveys on algorithm components, followed by panel discussions to collaboratively construct entry points, assessment tasks and decision nodes for CASI management. Phase 2 entailed electronic distribution of the draft algorithm providing a visual representation of CASI practice recommendations for final consensus and feedback, culminating in a 93.7% approval rate.[3]

The final phase was external validation of the algorithm, using a pre- and post-test design with 25 nurses in Canada, Australia, the US and New Zealand. The external validation of the CASI algorithm demonstrated its effectiveness in significantly improving clinician confidence in the assessment and management of a) skin injury, b) skin irritation/contact dermatitis and c) non-infectious exudates.

A high majority of participants found the algorithm easy to understand, comprehensive, time-saving, and recommended its use to others, underscoring its practical utility in clinical settings.[3]

CASI Management: Assess, Protect, Comfort

The CASI algorithm is structured to guide health-care professionals through a systematic approach to identifying and managing four most commonly seen skin impairment conditions associated with CVADs, as identified by the working panel: 1) exit-site infection; 2) skin injury (including skin stripping, skin tears and tension blisters); 3) skin irritation (irritant or allergic contact dermatitis); and 4) weeping/oozing (non-infectious drainage).[3]

The algorithm is not intended for conditions unrelated to CVADs or those requiring more complex interventions, such as tunnel infections. Its utility is primarily for direct CVAD care providers (generalist and vascular access nurses) and those consulted for CASI management (wound care specialists, physicians).[3]

The management of catheter-associated skin injury is guided by a systematic approach encompassing three domains: a) assessment, b) skin protection and c) patient comfort.[3] Table 2 provides a summary of recommended interventions and their goals, derived from both the original CASI algorithm and recent publications. As CASI evidence evolves, clinicians are advised to use a standardized process or tool for CASI management and prevention, such as the CASI Algorithm or Li et al's assessment tool (2022) and Xu et al's CASI classification tool.[3,4,11,16,17]

Management OF CASI

Initial assessment of CASI requires a thorough evaluation of the patient and the VAD site. This includes inspecting skin integrity, noting exudate characteristics and ruling out other dermatological conditions.[3-5] When CASI is present, a risk-benefit analysis should be performed to determine if catheter salvage or removal is warranted. Whenever possible, management of CASI associated with a peripherally inserted central catheter (PICC) should be undertaken without removing the device, to avoid interrupting therapy.[18]

Interventions are then focused on promoting skin healing and preventing further injury. Key strategies include identifying and eliminating the cause of the skin damage through product substitutions and using atraumatic dressing removal techniques, such as the 'low-and-slow' method for bordered dressings or the lateral stretch method for non-bordered dressings.[19]

Chlorhexidine 2% with 70% alcohol is the preferred agent for intact skin.[4,5] When skin is broken or chlorhexidine is a suspected irritant, consider aqueous CHG (alcohol-free), a reduced CHG concentration (0.5%), or povidone and lastly sterile saline, allowing for greater drying time.[3-5] A product open application patch test can help determine potential irritants.[3-5] An alcohol-free skin barrier film should be applied to dry, intact skin before a new dressing to act as a protective interface.[1,4] For broken or wet skin, an alternative skin protectant may be necessary.[19]

While a transparent semi-permeable dressing is the standard of care, an alternate dressing may be required to manage skin injury and exudate. If feasible, the wound should be isolated from the VAD exit site, with a separate dressing (e.g., silicone mesh) applied to the wound area to promote healing and drainage absorption (e.g., foam, acrylic clear, alginate, hemostatic).[4,5,19,20] Soft silicone dressings are considered atraumatic as their non-stick wound contact layer allows for easy removal without causing skin damage and are designed to remain in place for up to a week.[21] A novel clear silicone adhesive dressing, which has an option integrated with chlorhexidine and silver, provides another choice for both managing and preventing CASI.[22] Figure 2 provides illustrations of some alterative dressing approaches for management of CASI. Typically transparent dressings are changed at a minimum of weekly and gauze dressings at least every 48 hours.[4,5] As the goal is to minimize dressing change frequency to facilitate skin healing, if a non-transparent dressing is applied, the clinician may consider leaving the dressing in place up to seven days if able to assess site through palpation and signs and symptoms of discomfort or complications.[4] Patient comfort is addressed concurrently (see Table 1) with skin protection, recognizing the impact of skin damage on quality of life.[3]

Minimizing Risk: The Foundation Of CASI Prevention

Effective prevention of CASI is paramount to mitigating its significant impact on patient outcomes and health-care costs (see Figure 3). Prevention strategies begin with optimizing VAD insertion through to site assessment for prompt recognition of early signs of CASI; staff education (e.g., proper application and removal techniques, application of dressing to dry skin, use of skin barrier films); pressure prevention strategies (e.g., soft silicone foam dressing [preferred] or gauze beneath devices at VAD site as a cushioning barrier for patients at risk of pressure injuries)[21] and patient education.[3-5] These measures, combined with the use of standardized assessment and prevention tools, contribute to a comprehensive anti-CASI approach. Finally, organizations are encouraged to implement quality improvement measures to monitor and address CASI incidence,[4-5] including continuous monitoring of current evidence, and participation in further research activities related to CASI prevention and management.

Figure 2: Examples of Dressings for CASI Management

A. Wound isolated with segment of foam dressing (to absorb drainage and protect/heal injured skin) and covered with transparent dressing

B. Wound isolated with segment of silicone dressing (to protect/ heal injured skin) and covered with transparent dressing

C. Site covered with transparent dressing with wound isolated with separate foam dressing

D. Site covered with foam/silicone dressing with cut in dressing to accommodate catheter; cover with transparent dressing

Figure 3: CASI Impact and Prevention Model

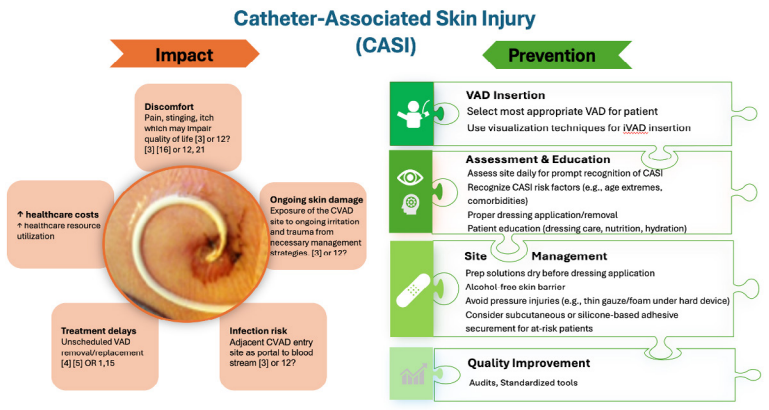
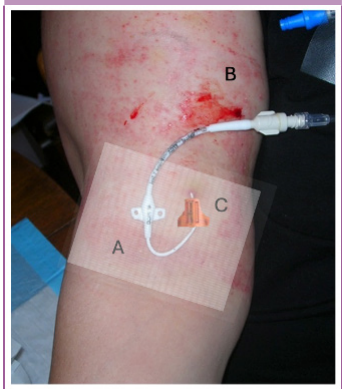


Table 2: Management of Catheter-Associated Skin Injury (CASI)

A. CASI Type Domain	Skin Condition(s) Length of Product Use	Skin Symptoms Symptom Location	Improvement Timeline Frequency of Product Use
CASI (all types) ASSESS	• Thorough patient - site assessment[4,5] - Skin inspection (colour, texture, integrity)[4,5] - Exudate characteristics[4,5] - Use standardized assessment tool[4,5,9-11] - Risk and causative factors affecting skin health • Rule out other conditions[4,5] • Swab for infection (if suspected)[4,5] • Patient history (allergies)[4,5]	• Routine assessment crucial (e.g., every shift/visit)[4,5] • Education on assessment vital[4,5] • Consider an objective classification system for skin-tone description (as skin tone may impact early recognition of symptoms)	• Appropriate and prompt problem identification and management • Accurate diagnosis
PROTECT SKIN	• Atraumatic dressing removal (low & slow/ stretch;[13] alcohol-free adhesive remover[4,5] or sterile NaCl[13] • Antisepsis: - Aqueous CHG / 0.5% CHG / PVI / sterile NaCl (for broken skin or CHG-alcohol sensitivity)[4,5,13] - Adequate antiseptic drying time[4,5] • Alcohol-free skin barrier film before dressing[4,5] • Dressing selection to absorb exudate and promote wound healing;[4,5,13,14] isolate wound from VAD site if possible[4,5] • Minimize device pressure; reposition catheter/ device prn[4] • Consider catheter salvage vs removal[4,5]	• Sterile NaCl for cleaning • Avoid barrier film under CHG gel/disc; consider alternate product if skin broken (e.g., Cavilon TM Adv. Skin Protectant)[13] • Increase monitoring if no securement[4] • Alternative securement (e.g., subcutaneous, integrated[4,5] splinting, vests) • Proper hydration/nutrition[4,5] • Staff/patient education key[15]	• Protect skin- prevent skin breakdown • Restore skin integrity • Protective interface between skin and adhesives (barrier film) • Prevent CASI, including pressure injuries • Resolve infection
COMFORT	• Assess/document pain (validated tools)[4,5] • Administer pain relief (local/systemic)[4,5] • Cool compresses (for pruritus/irritation)[4,5] • Anti-inflammatory/anti-pruritic agents[4,5] • Refer to specialist (if unresponsive/ deteriorating)[4,5]	• Assess and document pain consistently • Short-term low-mod topical steroids for contact dermatitis (if no improvement)[4,5,14]	• Alleviate discomfort • Improve QOL

CASI Wound Management - Example



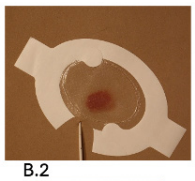
(Original photo courtesy of Deb Thayer, RN)

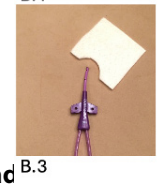
Isolate wound from VAD site (if feasible)

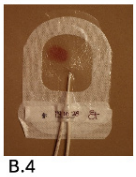
A) Erythema (no drainage)
Silicone mesh dressing protecting erythematous skin; cover with transparent dressing adhered to healthy skin if possible OR transparent silicone dressing

B) Broken skin and/or drainage
B.1 Silicone foam dressing* OR
B.2 Acrylic clear absorbent dressing* OR
B.3 Hemostatic dressing (e.g., alginate) if bleeding*
May cut segment of adhesive dressing border to prevent covering catheter site, if feasible
B.4 Transparent dressing applied over catheter site-may cover non-bordered wound dressing


B.1


B.2


B.3


B.4

C) Consider subcutaneous securement device or siliconead prevent dislodgement (may add silicone material under subcutaneous securement base)

Abbreviations: Adv: Advanced, CHG- chlorhexidine gluconate, PHMB- polyhexamethylene biguanide, PVI- povidione iodine, QOL- quality of life.

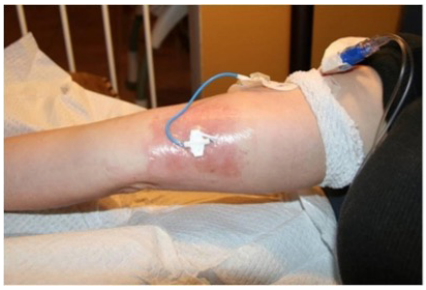
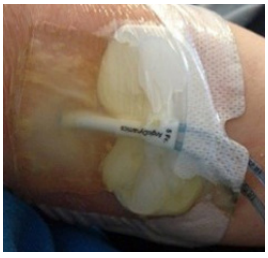
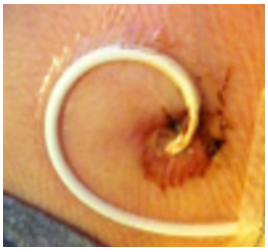
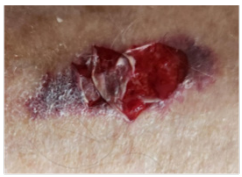
B. CASI Wound Management	
CASI Condition	**Intervention** (in addition to previously stated general interventions)
1. Erythema; Inflammation; Skin damage (no drainage)  (e.g., Contact dermatitis, Skin stripping, Tension blister)	• Identify and correct the cause if contact dermatitis suspected[3,4,5] - Open application skin test (e.g., application of suspected product to anterior forearm; intrascapular) - Monitor patch test (30-60min, then 3-4 days); remove product if dermatitis develops - Substitute antiseptic agent (if indicated; alcohol is an irritant)[4,5] - If mild redness, use alternate brand of transparent dressing • Silicone mesh covered with transparent dressing[13,14] or silicone transparent dressing • If no improvement in inflammation/pruritis[3,4,5] - Low-to-moderate potency topical steroids (avoid applying non-sterile agent directly adjacent to catheter exit site; for short-term use) - Topical/systemic agents (analgesic/antihistamine) - Cold compresses *Goals:* Stop inflammatory cycle; prevent epidermal breakdown; reduce adhesive trauma, Relieve inflammation and itch
2. Exudate  (e.g., Contact dermatitis; mechanical skin injury)	• Absorbent dressing - Silicone-based or foam[13,14] - Acrylic clear absorbent dressing[3,4,5] - Hemostatic dressing for bleeding (e.g., StatSeal, alginate) (control bleeding first)[3,4,5] • Isolate wound from exit site with second dressing if feasible;[4,5] apply transparent dressing over non-bordered non-transparent dressing • Change dressing weekly +PRN (assess by site palpation if non-transparent dressing) *Goals:* Manage exudate; prevent epidermal breakdown; maintain VAD integrity while addressing wound
3. Local Infection  (e.g., Exit site infection; cellulitis)	• Antimicrobial dressing[3]/disc[13] (e.g., CHG, silver, PHMB) with absorptive properties if drainage present (confirm no contraindications on product instructions for use)[3,4,5] • Culture site and draw blood cultures[3] • Collaborate with medical team[14] • Consider catheter salvage vs removal[4,5] • Topical antimicrobials (e.g., mupirocin/ketoconazole /lotrimin based on culture)[3] • Systemic antimicrobial therapy if no resolution or purulent drainage[2] *Goals:* Manage local pathogens; reduce microbial load; resolve infection
4. Skin Tear - viable flap 	• Realign flap (with moist cotton tip applicator)[3,4,5] • Secure flap with tissue adhesive[3] / silicone mesh;14 do not use adhesive strips or hydrocolloid dressing[3] • Apply absorbent clear acrylic/ silicone foam or alginate dressing (if bleeding)[3,4,5,22] • Transparent dressing over non-bordered non-transparent dressing (e.g., alginate)[13,14] *Goals:* Promote re-approximation and wound healing

Image credits with permission: Image 1. Dr. Nancy Moureau, Image 2. Chantal Mailljours, Image 3. Diana Holmes, Image 4. Marnie Allan

Translating Knowledge into Practice

The CASI algorithm, alongside the best practice recommendations from the Canadian Vascular Access Association (CVAA), [4] the Infusion Nurses Society (INS)[5] and the Association for Vascular Access (AVA; in development), represent critical resources available to health-care organizations. To facilitate the adoption of these recommendations, the CVAA, INS and AVA guidelines provide structured, step-by-step guidance for the assessment, management and prevention of CASI. Notably, the CVAA Guidelines, explicitly encourage organizations not only to integrate these recommendations but also to reproduce CVAA recommendations and figures verbatim, fostering a standardized and optimized approach to managing CASI.[4] Consequently, clinicians are encouraged to incorporate these recommendations and the CASI Algorithm into vascular access-related organizational policies, procedures, clinical guidelines and training, and to post the Algorithm as an effective visual clinical practice tool.

Advancing CASI Science: Research Implications

It is a significant achievement to now have a defined term identifying this complication and published clinical guidelines addressing the management and prevention of CASI, reflecting the burgeoning evidence addressing its care. Building on this progress, efforts continue to advance our understanding of CASI, exemplified by a recent study proposing a refined classification system for these conditions.

A recent consensus panel validated a novel CASI classification tool.[17] We agree with the authors' recommendation to expand the classification tool to include pressure injuries. Pressure from securement devices, the catheter, hub or suture wing and add-on devices, such as needle-free connectors, may cause skin injury due to persistent local pressure on the skin.[21] The authors also altered the category CASI 'skin injury' to 'mechanical injuries,' in alignment with MARSI definitions,[1] both of which include skin stripping, tension injury or blister and skin tears. An etiology category added to this tool was 'complex clinical presentation' to account for sites with more than one of these CASI conditions.[17] The term 'skin irritation' was used in the original CASI algorithm as consensus panel members opined that the generalist nurse may be unfamiliar with the term 'contact dermatitis'. However, given the widespread familiarity with MARSI and increasing uptake of CASI framework, the more formal identification of 'contact dermatitis' seems appropriate. Another difference is that the newer CASI classification system changed the term 'exit site infection' to local infection, to incorporate cellulitis and folliculitis, which we also support.

Future research is needed to validate a CASI Management tool which addresses the recommended revised classification system to capture:

- Contact dermatitis
- Mechanical injuries
- Local infection
- Device-related pressure injury
- Complex clinical presentation.[17]

Opportunities for future research in CASI are critical to addressing current gaps in evidence and practice. Health economic studies are needed to examine the costs associated with inappropriate dressing and securement choices, their resulting complications, and impact on treatment plans and hospital length of stay.[23] Furthermore, randomized controlled trials are required to investigate the effectiveness of various dressing and securement products.[20] Developing valid and reliable assessment and management tools that encompass all types of CASI is also crucial for advancing care, including the evaluation of effective management strategies[3] and modifiable and non-modifiable risk factors.[23]

Additionally, the recent MARSI update panel indicated further investigation is warranted into the use of steroids and systemic chemotherapy as independent risk factors for medical adhesive-related skin injuries (MARSI), alongside a need to evaluate the safety profiles of skin protectants and adhesive removers, particularly in neonatal and geriatric populations.[2]

Conclusion

In conclusion, catheter-associated skin injury (CASI) represents a significant complication in vascular access care, impacting patient comfort, treatment efficacy and health-care costs. The development of the evidence-based CASI algorithm, a product of international consensus and expert collaboration initiated by the World Congress of Vascular Access (WoCoVA),[3] marks a pivotal advancement in addressing this challenge.

The algorithm provides a structured, step-by-step framework for the comprehensive assessment, proactive prevention and effective management of CASI, spanning crucial domains of patient assessment, skin protection and comfort.[3] Its utility extends beyond direct patient care, serving as a foundational resource that has been integrated into the guidelines of prominent professional organizations, including the Canadian Vascular Access Association and the Infusion Nurses Society.[4,5] This broad recognition facilitates the widespread adoption of CASI principles.

Health-care organizations and clinicians are actively encouraged to incorporate the CASI algorithm and CASI practice recommendations into their internal policies, procedures and clinical guidelines. By enabling the verbatim reproduction of recommendations and figures, as explicitly supported by the CVAA,[4] guideline recommendations support consistent and standardized practice. Ultimately, the systematic application of the CASI algorithm empowers clinicians to enhance patient outcomes, improve the quality of vascular access care and advance the overall standard of skin integrity management in clinical settings. Continued adherence to these best practices and ongoing evaluation will be essential to further mitigate the impact of CASI.

Conflict of interest/funding statement: *DB reports employment with the manufacturer of a medical device manufacturer and reports personal fees (i.e., consultancy, travel and honoraria) from Solventum and BD Canada. AMB reports employment with a medical supply distributor and contract work for NSWOCC. No funding was provided for the development of this manuscript. The original CASI Algorithm research was partially supported via an unrestricted project grant from the World Congress of Vascular Access, provided by legacy 3M.*

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Author contributions: DB contributed to the conceptualization and administration of the project, original research, original draft preparation, and review and editing of the manuscript. AMB to the draft preparation and review and editing of the manuscript. All authors have read and agreed to the final version of the manuscript.

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Welcome To The Newest Member Of The Inter-professional Wound Care Team: Artificial Intelligence

By Joel Alleyne BSc (Computer Science) MISt

How to cite: Alleyne J. Welcome to the newest member on the inter-professional wound care team: Artificial Intelligence. Wound Care Canada. 2025;23(2): 28-31. DOI: 10.56885/555017

I wrote about 'Interprofessional Wound Care Teams' in a previous article for this journal (Wound Care Teams Are Stronger When They Embrace An Interprofessional Approach). This article builds on that and extends the list of team members.

In modern health care and in wound care, inter-professional (IP) teams have become the backbone of high-quality, coordinated and compassionate care. Nurses, physicians, therapists, pharmacists, administrators and technologists collaborate to ensure patient well-being through a holistic approach that values both expertise and empathy. Yet another colleague has quietly joined this team—one who does not sleep, forget, or tire: artificial intelligence (AI). A lightbulb went on when my colleague Nathan, in Amsterdam, brought to my attention that AI Agents are now acting under direction to complete tasks humans would otherwise be responsible for.

AI's entry into the world of inter-professional health-care practice is not simply an upgrade in tools or analytics—it represents the dawn of a new kind of partnership between humans and machines. As the boundary between biological intelligence and artificial cognition begins to blur, professionals are discovering what *Wired* columnist Clive Thompson once described as the 'cyborg advantage'—the extraordinary amplification of human capability through seamless collaboration with technology.[1]

The Cyborg Advantage: From Tools To Teammates

In his 2010 article 'The Cyborg Advantage,' Thompson envisioned a future where humans and machines didn't merely divide labour, but fused strengths to form hybrid intelligences.[1] The vision was bold: instead of relying on technology as a tool, humans could co-evolve with AI systems that think, learn

and adapt in real time. That future has arrived—and health care is among the domains where this integration can transform both practice and patient outcomes.[2,3] The promise of becoming 'cyborgs' lies in moving beyond the old paradigm of task substitution toward one of collaboration. Traditional automation separated human and machine work: AI performed repetitive tasks, humans tackled the rest. The new model—the cyborg model—merges the two. Humans and AI operate in concert, each adapting to the other's strengths in real-time.[4,5]

Unlike the 'centaur model' (see box), often used in early human-machine collaboration (such as in chess), cyborg collaboration integrates AI more fluidly into the human workflow[1,4] The key lies not in substitution, but synthesis. Health-care professionals who learn to operate as cyborgs—adapting their judgment, empathy and expertise with machine efficiency and pattern recognition—gain transformative capabilities.[3,4,5]

Centaur model: A computational model that can predict and simulate human behaviour in any experiment expressible in natural language. *Source: Nature*

Examples abound:

- AI drafts clinical documentation or patient summaries, which clinicians refine using contextual expertise and empathy.[5]
- Predictive algorithms flag potential medication errors or infection risks, prompting human investigation before harm occurs.[2]
- Conversational AI manages routine patient inquiries, freeing clinicians to focus on complex emotional or diagnostic interactions.[2,5,6]
- The cyborg advantage thus emerges not from AI replacing professionals, but from both sides learning to work symbiotically.[3,7]

Beyond Efficiency: The Just-in-Time Knowledge Revolution

Health care has long operated on a 'just-in-case' model—training professionals to memorize extensive knowledge they might someday need. AI shifts the paradigm toward 'just-in-time' knowledge *access*.[3,4,7] Clinical decision support systems embedded within electronic health records can instantly retrieve the most current guidelines or flag contraindicated medications at the moment of care.[3,5,8]

This change redefines what expertise looks like. The health-care professional's value is no longer measured primarily by recall, but by judgment, synthesis and communication.[2,4] They know how to ask the right questions, interpret AI insights and apply them responsibly within the patient's context.[3]

In this new world, expertise becomes relational. AI supplies data and probabilities; the professional supplies ethics, empathy, and understanding.[2,5,7]

As with all paradigm shifts, this one requires rethinking how teams train, communicate and measure success. Health-care leaders must design environments in which clinicians are both learners and mentors to their AI systems.[7,9] As futurist Stan Davis wisely noted, "You cannot run on tracks you have not laid." Teams that invest now in building ethical, transparent and interoperable AI systems are laying the tracks for the next generation of care.[4,9]

Why Embrace The Cyborg Future?

The convergence of human and artificial intelligence promises more than operational efficiency—it redefines human flourishing itself.[2,5]

1. **Cognitive Extension and Decision Support**
   AI can process millions of patient records, identify subtle patterns across populations, and suggest treatment pathways that no human could discern unaided.[3,5] Yet, ultimate decisions rely on the clinician's moral reasoning and contextual understanding: the synergy enhances accuracy and safeguards human judgment.[2,4]
2. **Balanced Progress and Human Values**
   When integrated responsibly, AI amplifies progress without undermining dignity. A cyborg approach emphasizes that technology should not strip care of its humanity but instead allows clinicians to focus on what machines cannot: empathy, reassurance and ethical discernment.[6,9]

3. **Organizational Innovation**
   IP teams that reward members for leveraging AI effectively will see surges in creativity and problem-solving.[2,4] The best organizations value how human and AI together reach an insight.[7]
4. **Healthier and More Capable Humans**
   Cognitive prosthetics, AI that assists with memory, planning, or language, can extend human capabilities beyond biological constraints.[5,6,8] For populations with disabilities or age-related decline, the implications are profound.[5]

However, with every promise comes a challenge. To ensure that AI strengthens rather than diminishes human agency, transparency is essential.[4,9,10] Health-care systems must remain clear about how AI models reach conclusions, who holds ethical accountability and how patients give informed consent when machines participate in care decisions.[4,9,10]

Key Affordances Of AI In Human Collaboration

AI enables new forms of efficiency, insight and creativity within health-care IP teams. Its key affordances reveal why integration has the potential to transform both workplace and care outcomes.[5,7,8]

1. **Automation of Repetitive Tasks**
   AI can automate documentation, scheduling and communications, allowing clinicians to refocus on patient-centered work.[3,5,6]
2. **Data Processing and Insights**
   Diagnostic AI analyzes large datasets, imaging, pathology and genomics to identify patterns and suggest diagnoses.[3,6]
3. **Enhanced Accuracy and Consistency**
   In laboratory reporting, drug interaction checking and translating information, AI reduces variability.[4,7]
4. **Creativity Augmentation**
   AI can suggest hypotheses and generate preliminary treatment pathways, which humans refine and innovate upon.[3,5]
5. **Scalability and Speed**
   Especially during global health crises, AI's ability to process vast data enables fast, evidence-based responses.[5,6]

Empowering Humans And Organizations

Understanding how AI empowers individuals and organizations is central to realizing its potential in IP teams.[3,4,7]

1. **Amplifying Human Strengths**
   AI complements empathy, intuition, and creative reasoning by taking on repetitive tasks.[3,5] This gives professionals space to connect and solve complex problems.[5,6]
2. **Proactive Support**
   AI monitoring systems can predict and prevent failures in IT or medical equipment.[4,6]
3. **Improved Productivity and Job Satisfaction**
   Automation reduces after-hours work and administrative burden, improving morale.[5,7]
4. **Facilitating Innovation**
   AI-driven insights can help teams to find unmet needs and launch new service models.[3,8]
5. **Ethical and Contextual Decision-Making**
   Human oversight is vital for ethics and context; AI calculates while humans interpret and own the outcomes.[4,7,9]

Flourishing Through Integration

The rise of AI in inter-professional teams symbolizes the next evolution of teamwork.[5,7,9] Rather than replacing the human touch, it enables greater focus on what matters: empathy, ethics and innovation.[9]

As health-care systems confront aging populations and rising demands, the question is not whether AI should be on the team, but how to make it the best collaborator possible.[4,7,8,10] Those who master human-AI partnership will redefine care from reactive to proactive and from human-limited to human-extended.[2,3]

In essence, every professional who learns to work in tandem with AI becomes a modern cyborg—more informed, more capable and more human than before.

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- **Bajwa J, Munir U, Nori A, Williams B. Artificial intelligence in healthcare: transforming the practice of medicine. Future Healthc J. 2021 Jul;8(2):e188-e194**
  The authors frame AI as a disruptive but essential force capable of achieving health care's quadruple aim: improving patient experience, enhancing care quality, supporting providers, and reducing costs. They note that global challenges—aging populations, chronic disease, workforce shortages, and inequities in access—demand innovative systems like AI-augmented health care. The authors also highlight cloud computing and digital infrastructure as enablers for large-scale AI adoption.[11]
- **Rajkomar A, Oren E, Chen K, Dai AM, Hajaj N, Hardt M, et al. Scalable and accurate deep learning with electronic health records. NPJ Digit Med. 2018 May 8;1:18.**
  The 2018 study "Scalable and accurate deep learning with electronic health records" by Rajkomar et al. presents a major advance in health-care predictive modeling by demonstrating how deep learning can accurately analyze raw, unharmonized electronic health record (EHR) data at scale.[12]
- **Yu KH, Beam AL, Kohane IS. Artificial intelligence in healthcare. Nat Biomed Eng. 2018 Oct;2(10):719-731.**
  The authors explain that the rapid evolution of digitized data acquisition, machine learning methods, and computing infrastructure has enabled AI to perform tasks once reserved for human experts. The review highlights AI's growing role in medical imaging, genomics, pathology, and clinical decision support, illustrating how algorithms can complement or even surpass clinicians in diagnostic accuracy.[13]
- **Wang F, Casalino LP, Khullar D. Deep learning in medicine-promise, progress, and challenges. JAMA Intern Med. 2019 Mar 1;179(3):293-294.**
  The authors critically evaluate recent advances in deep learning applications across medical imaging, genomics, and disease prediction. While highlighting significant improvements in speed and accuracy, they stress ongoing barriers related to data heterogeneity and integration into multi-disciplinary clinical teams, calling for frameworks that promote ethical AI adoption.[14]
- **Krittanawong C, Johnson KW, Rosenson RS, Wang Z, Aydar M, Baber U, et al. Deep learning for cardiovascular medicine: a practical primer. Eur Heart J. 2019 Jul 1;40(25):2058-2073.**
  This primer addresses cardiovascular applications of deep learning within clinical workflows, including risk prediction, diagnostics, and treatment optimization. The paper illustrates the synergy between AI tools and clinician judgment, noting that human oversight remains integral to ethical and contextual decision-making in high-stakes cardiac care.[15]

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Rethinking Mobility In PAD Patient Care: The Potential Of Targeted Exercise

By Kym McNicholas and David B Alper DPM

How to cite: McNicholas K, Alper DB. Rethinking mobility in PAD patient care: the potential of targeted exercise. Wound Care Canada. 2025;23(2): 33-36. DOI: 10.56885/160305mumbbs

A critical gap exists in Peripheral Artery Disease (PAD) management, particularly for patients with wounds. While the benefits of exercise, especially walking, are well-established for PAD patients, those with critical limb ischemia (CLI) or critical limb-threatening ischemia (CLTI) often find traditional walking exercises unfeasible due to the location of their wounds. This creates a paradoxical situation where limited mobility potentially impacts not just circulation and wound healing, but overall health, including mental well-being and survival.

Movement, even in its smallest forms, plays a crucial role in maintaining and improving overall circulation throughout the body. When patients engage in any form of physical activity, it stimulates blood flow, forcing the heart to pump more efficiently. This increased circulation not only benefits the legs, but also enhances cardiovascular health as a whole. Moreover, the impact of movement extends beyond physical well-being. Studies have shown that immobility and prolonged bed rest can lead to depression, highlighting the profound connection between physical activity and mental health. For PAD patients with wounds who cannot engage in traditional walking exercises, implementing targeted, low-impact movements becomes essential. These adapted exercises can help maintain circulation, support wound healing and, crucially, safeguard leg, heart and mental health during the recovery process.

Contrasting Cases

The story of 'Valerie', a recent patient, starkly illustrates this point. After two years of multiple revascularization procedures and advanced care to heal her wounds, during which doctors advised her not to walk, Valerie finally rang the bell for a healed wound on the first Monday of March, 2025.
She started walking again, but by Friday,

she had suffered a fatal stroke. This tragic outcome underscores that it's not just limb healing at stake with lack of mobility, but overall circulation and life itself.

Kevin Morgan's story offers a contrasting narrative of innovation and resilience.[1] At 66, this marathon runner was told by his doctor that his leg arteries were too calcified for surgical intervention. Undeterred, Kevin developed an innovative approach to maintain mobility. He created a foot-strengthening routine focused on building collateral vessels in his feet, including an exercise he terms "Yoga Toes," which involves repeatedly spreading and contracting his toes. Fifteen years post-diagnosis, at 81, Kevin has not only managed his PAD but has competed twice in the *World Triathlon* for his age group.

Kevin's success highlights an opportunity we have in adding to the treatment plan for PAD patients, especially those with CLI/CLTI. While we know that walking is excellent medicine for PAD, many of these patients find themselves unable to engage in traditional walking exercises due to their wounds.

Challenges

This creates a challenging situation where limited mobility can impact circulation, potentially affecting wound healing. These patients often face a vicious cycle of immobility and decreased blood flow, potentially leading to a higher need for revascularization procedures. While direct studies on the correlation between immobility and revascularization rates in CLI patients with wounds are limited, several factors suggest this relationship:

1. **Impaired Collateral Development:** Immobility in CLI patients may hinder the development of collateral circulation. Baum et al. noted that reduced exercise capacity in PAD patients is associated with alterations in capillary ultrastructure and mitochondrial volume density in skeletal muscle.[2] This suggests that lack of movement could impair the body's natural ability to form new blood vessels around blocked arteries.
2. **Metabolic Dysfunction:** CLI patients with wounds often experience significant metabolic dysfunction in the affected limb. Lindegaard Pedersen et al. observed mitochondrial dysfunction in calf muscles of patients with combined peripheral arterial disease and diabetes type 2.[3] Immobility may exacerbate this metabolic impairment, potentially necessitating more frequent revascularization interventions.
3. **Impaired Wound Healing:** The combination of reduced blood flow and immobility can significantly impair wound healing in CLI patients. This may lead to a higher risk of infection and tissue loss, potentially increasing the need for revascularization procedures to salvage the limb.
4. **Vascular Remodeling:** Regular movement and exercise are known to promote positive vascular remodeling in the lower extremities. In the absence of this mobility, CLI patients may experience negative vascular remodeling, potentially leading to a higher rate of restenosis after initial revascularization procedures.

While these factors strongly suggest a link between immobility and increased need for revascularization in CLI patients with wounds, it is important to note that direct clinical studies on this specific correlation are needed. Future research should focus on quantifying this relationship to guide treatment strategies for this high-risk patient group.

The potential link between immobility and increased revascularization needs in CLI patients underscores the importance of developing targeted exercise interventions for these patients. Health-care providers may want to consider innovative approaches to maintain or improve mobility in CLI patients with wounds, when they cannot walk at a pace that improves their collateral circulation. This could include the types of targeted exercises and movement strategies offered by recent studies for patients with special mobility needs.

As examples: Chuter et al. found that simple ankle rotations and flexions significantly increased popliteal artery blood flow in PAD patients;[4] Saval et al. demonstrated that low-impact seated pedal exercises

improved calf muscle hemoglobin oxygen saturation in PAD patients with type 2 diabetes.[5]

Parmenter et al. found that lower-body resistance training improved walking performance in PAD patients, with participants showing a 1-minute increase in pain-free walking time and a 1.5-minute increase in maximum walking time after a 24-week program.[6]

Health-care providers are exploring innovative movement strategies for PAD patients with wounds. Dr. Nik Patel, an Interventional Radiologist with AVA Vascular in Southern California, has implemented an exercise regimen for his PAD patients that mimics the action of pressing and releasing a car's accelerator pedal. While formal studies are pending, Dr. Patel reports observing improvements and a potential delay in the need for repeated interventions.

John Scallions, a nurse practitioner at Southern Vascular and Interventional Pain Management, with clinics in Mississippi and Tennessee, has been incorporating foot cycles into his care plan for patients with wounds, aiming to improve circulation until they can resume more traditional exercises. This approach aligns with the findings of Saval et al., demonstrating the potential benefits of seated pedal exercises for patients with limited mobility.

At the Global PAD Association, through our collaboration with Dr. Chris Seenan, recipient of our world-renowned *Walking Therapy Researcher of the Year 2024-2025* award, we have encouraged our patients to engage in simple, yet creative movement solutions. These include tracing the alphabet with their feet and rocking up onto their tippy toes and back on their heels while sitting to pump the calves. These exercises can be performed even when traditional walking or weight bearing is not advised, to assist in increasing circulation and muscle engagement.

Innovation not only comes from health-care professionals, but from the patients themselves through necessity. Douglas Salisbury, one of our patients, shared a particularly innovative approach to his circulatory challenges. While hospitalized and unable to walk, he placed two towels on the floor and pushed each one back and forth 30 times an hour. At home, he continues this practice using paper plates while watching TV, ensuring consistent movement throughout the day.

Moving Forward

Given these insights, there are several areas where the PAD/CLI care community could focus its efforts:

1. **Development of Tailored Exercise Protocols:** Creating evidence-based exercise regimens specifically designed for PAD/CLI patients with wounds that do not allow weight bearing, focusing on improving overall circulation while prioritizing wound healing and patient safety.
2. **Knowledge Sharing:** Facilitating the exchange of best practices and experiences across our network of health-care providers to accelerate learning and implementation of effective strategies.
3. **Patient Education:** Developing comprehensive educational materials to inform PAD patients about the critical importance of movement, even when traditional exercises are not feasible, and providing them with safe, alternative movement options.
4. **Research Support:** Advocating for, and participating in, robust clinical studies regarding non-weight bearing exercises in order to establish the efficacy of alternative exercise methods and potentially integrate them into standard care protocols.
5. **Interdisciplinary Collaboration:** Encouraging collaboration between vascular medicine, physical therapy, wound care, and other relevant fields in order to develop more comprehensive care strategies that address both limb health and overall patient well-being.

The innovative approaches of patients like Kevin Morgan and Douglas Salisbury, combined with emerging research on targeted exercises for those with limited mobility, highlight promising avenues for advancing PAD management. By exploring novel movement interventions, health-care providers may significantly improve outcomes for patients

unable to engage in traditional walking or weight bearing exercises, potentially enhancing both limb preservation and overall survival rates.

This paradigm shift in PAD care could redefine the approach to patient mobility, especially for those with wounds and severe walking and weight bearing limitations. Preliminary evidence and patient reports provide a compelling rationale for further investigation into alternative exercise strategies. As dedicated professionals in the field of PAD treatment, health-care providers are uniquely positioned to lead this shift in approach. The goal should be to ensure that all patients, regardless of mobility limitations, have access to effective movement-based interventions that can significantly improve their health outcomes and quality of life.

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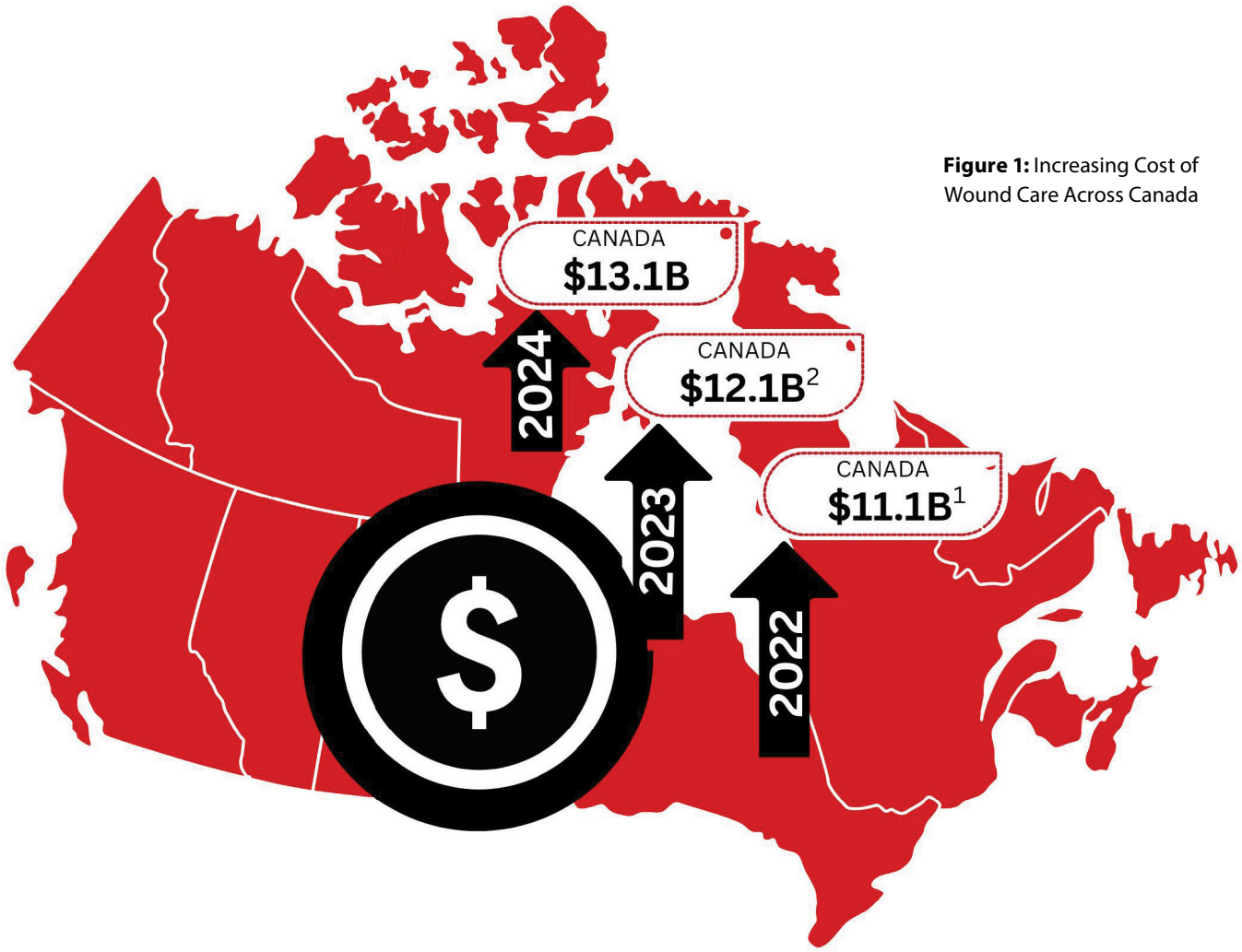

Figure 1: Increasing Cost of Wound Care Across Canada

True Cost Of Wounds For Canadians: Annual Update (2024)

By Douglas Queen BSc PhD MBA and Mariam Botros DCh DE IIWCC MEd

How to cite: Queen D, Botros M. True cost of wounds for Canadians: annual update (2024). Wound Care Canada. 2025;23(2): 37-42. DOI: 10.56885/032346qumxzp

Introduction

Recent publications have outlined the costs of wounds within Canada and across its provinces in 2023.[1,2] In an article in *Wound Care Canada*, the authors indicated they would update the figures annually.[2]

Recognition of the challenges of wounds faced by those caring for this problem should be obvious.[3] The researchers and clinicians working in this clinical arena are aware of the resource drain these patients place on the health-care systems of the world.[4,5] Validating this knowledge with data is a challenge. Many researchers have completed studies to evaluate the costs of wounds.[6-12] These are typically done through health economic costing studies involving health economists. Such studies are complicated.

One consistent theme from several inter-national research studies, however, is that they relate the costs

of wounds, extrapolated or other-wise, to the total geographic health-care costs of that region.[6-12] This provides a percentage figure as a benchmark, an approach which Canada has used previously.[13] While this is likely an underestimate, it is at least a starting point for most wound care providers.[13]

An editorial in the *International Wound Journal* introduced an approach to estimate the possible costs of wound care using freely available governmental health data, population statistics and the research findings of many international groups.[1,14] A subsequent article[2] published in 2024 specifically used this approach for Canada and its provinces and territories.

As promised within that article Wounds Canada will provide annual updates. As such, we provide the the following updated data.

As a follow on from the economic model, Queen & Harding[15] expanded the approach to estimate wound numbers. Once more this is an estimation approach based on governmental statistics and published studies.

Subsequently, this estimation approach has also been extended to provide an estimation of the number of wounds across the same Canadian geographies.

Like cost studies, several groups have done prevalence studies to determine the number of wounds in different geographies.[2,16-19] Also, with the emerging area of real-world data and wound registries,[20-21] more is becoming known about the number of wounds. The focus for this estimation model is a general category of wounds rather than specific subgroups or aetiologies.[22-23]

Table 1A: Formula To Estimate Wound Costs

EWCE = [PCHCS x TP] x AWCCP

EWCE - Estimated Wound Care Expenditure – our estimate of the likely wound care costs.
PCHCS - Per Capita Health Care Spend[17] – current published per capita health-care cost by Canadian Government.
TP - Total Population[16]
AWCCP – Average Wound Care Cost Percentage[14] – several published studies have indicated that the percentage of total health-care costs that is represented by the cost of wounds, ranges from 2% on the low end to 5% on the high end. For the purposes of our calculations, remembering different geographies can be at differing evolutionary stages regarding wound care, we chose the median of 3.5% as the AWCCP.

Table 1B: Formula To Estimate Wound Numbers

EWN = TP x AWPP

EWN - Estimated Wound Number - our estimate of the likely number of wounds.
TP - Total Population[16]
AWPP - Average Wound Prevalence Percentage - several published studies have indicated that the percentage of total population having a wound, ranges from 0.9% on the low end to 7% on the high end. For the purposes of our calculations, remembering different geographies can be at differing evolutionary stages regarding wound care, we chose the median of 3% as the AWPP.

Table 2: Estimated Costs Of Wound Care Within Canada:

Province or Territory	Population (2024)[16]	Per Capita Health Spend 2024 (CAD$)[17]	Estimated Total Health-care Spend 2024(CAD$)	Estimated Spend On Wounds 2024 (CAD$)
Yukon	46,948	$17,760	$833,796,480	$29,182,877
Prince Edward Island	179,301	$9,463	$1,696,725,363	$59,385,388
British Columbia	5,719,594	$9,673	$55,325,632,762	$1,936,397,147
Ontario	16,171,802	$8,405	$135,923,995,810	$4,757,339,853
Manitoba	1,499,981	$9,273	$13,909,323,813	$486,826,333
Nova Scotia	1,079,676	$10,505	$11,341,996,380	$396,969,873
Alberta	4,931,601	$9,370	$46,209,101,370	$1,617,318,548
Quebec	9,100,249	$8,984	$81,756,637,016	$2,861,482,296
New Brunswick	875,381	$8,922	$7,810,149,282	$273,355,225
Saskatchewan	1,246,691	$10,018	$12,489,350,438	$437,127,265
Nunavut	41,258	$27,401	$1,130,510,458	$39,567,866
Northwest Territories	44,936	$25,369	$1,139,981,384	$39,899,348
Newfoundland and Labrabor	545,880	$11,030	$6,021,056,400	$210,736,974
Canada	**41,465,298**	**$9,054**	**$375,426,808,092**	**$13,139,938,283**

Table 3: Estimated Number of Wounds Within Canada:

Province or Territory	Population (2024)[16]	Estimate No Wounds	Province or Territory	Population (2024)[16]	Estimate No Wounds
Yukon	46,948	1,408	Quebec	9,100,249	273,007
Prince Edward Island	179,301	5,379	New Brunswick	875,381	26,261
British Columbia	5,719,594	171,588	Saskatchewan	1,246,691	37,401
Ontario	16,171,802	485,154	Nunavut	41,258	1,238
Manitoba	1,499,981	44,999	Northwest Territories	44,936	1,348
Nova Scotia	1,079,676	32,390	Newfoundland and Labrabor	545,880	16,376
Alberta	4,931,601	147,948			
Estimated Numbers Of Wounds Within Canada				**1,243,959**	

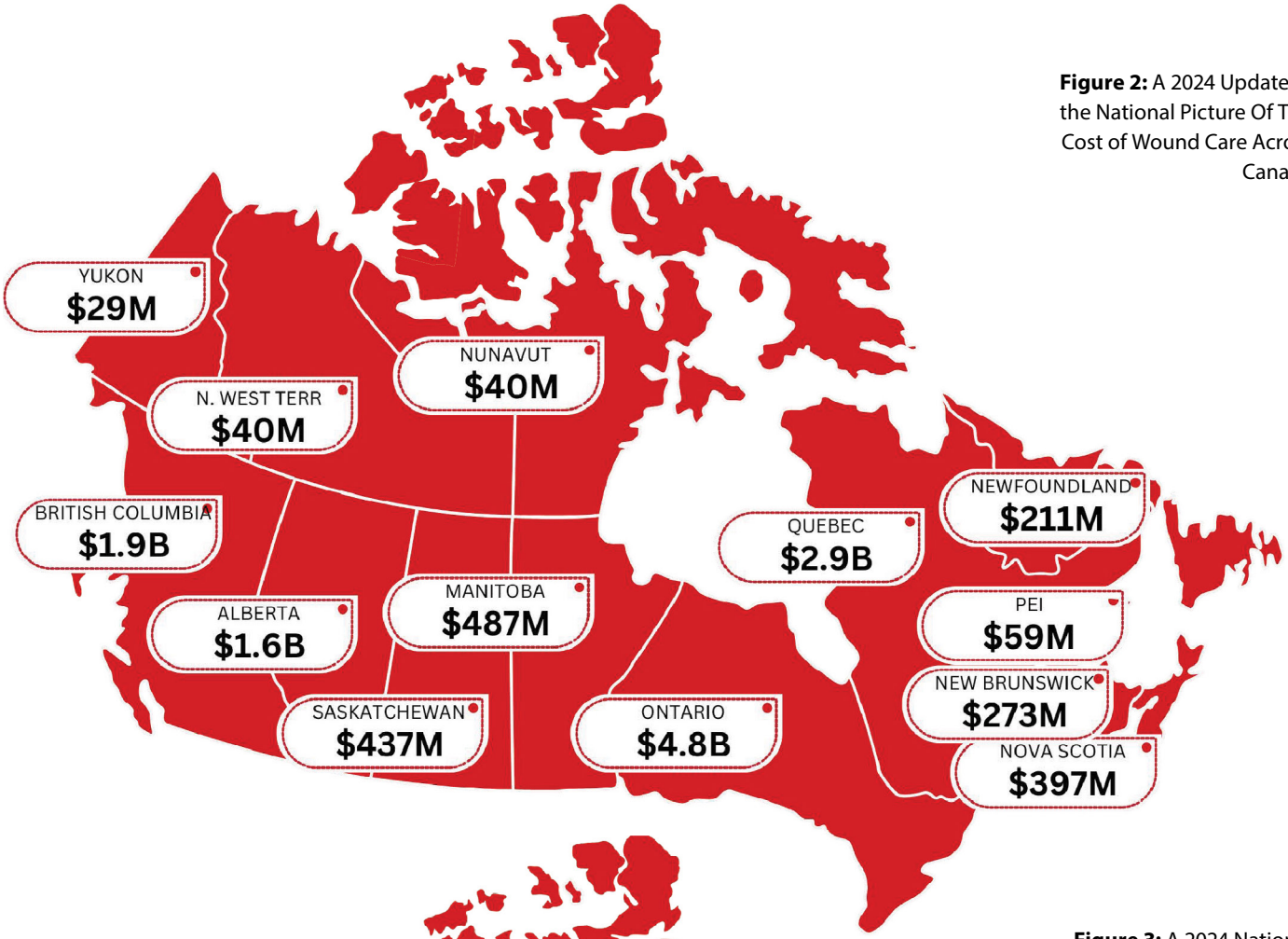

Figure 2: A 2024 Update of the National Picture Of The Cost of Wound Care Across Canada

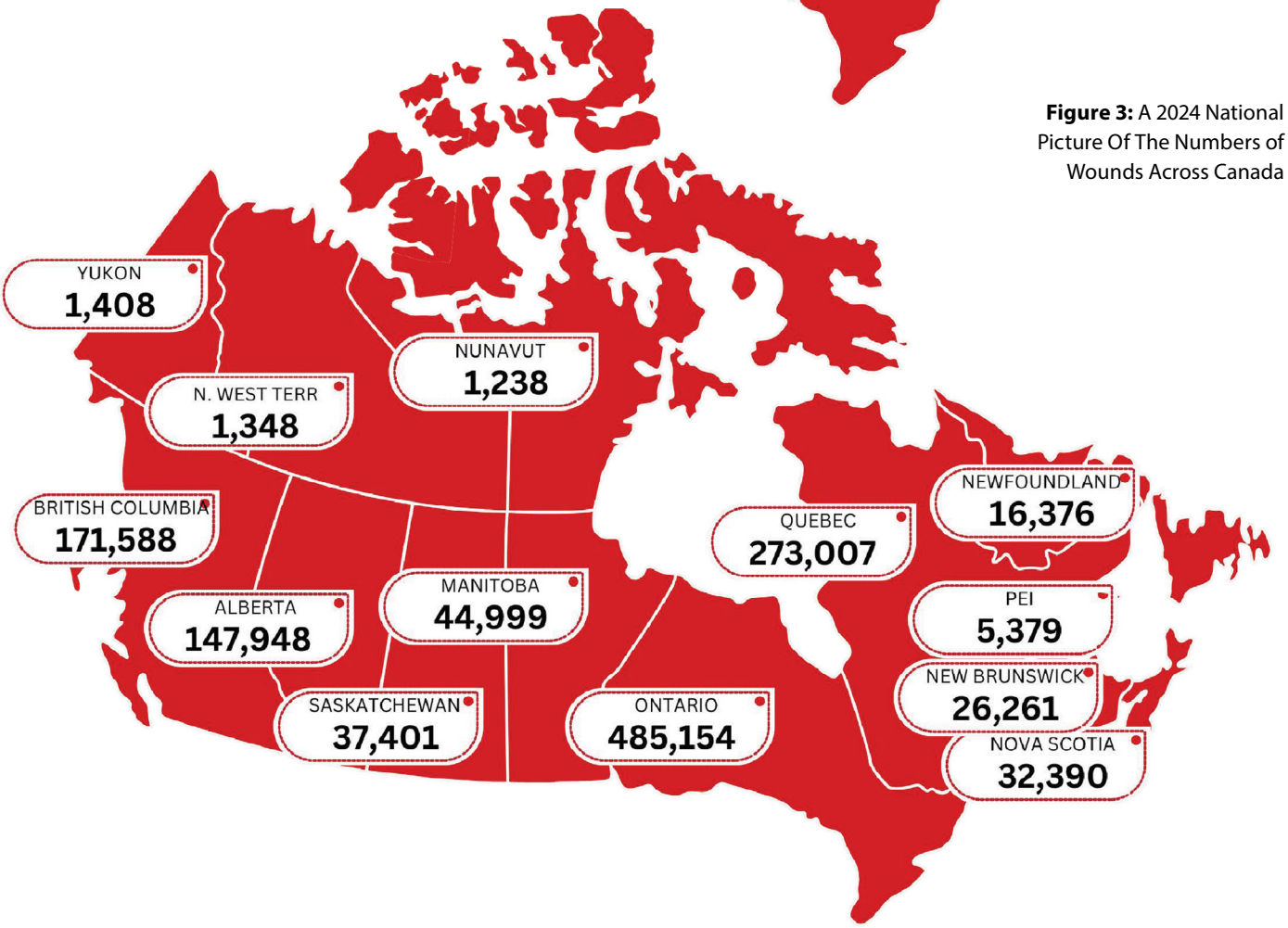

Figure 3: A 2024 National Picture Of The Numbers of Wounds Across Canada

Methods

Governments, including both Canada's federal and provincial/territorial legislative bodies, capture annual population[24] and health-care costs.[25] These statistics are a valuable starting point for the estimation of the cost and number of wounds.

Researchers have studied and estimated the costs[4-10] and number of wounds[2, 16-19] in many locations around the world. Such studies have demonstrated relative commonalities regarding wound care costs, ranging from 2-5% of total regional health-care costs.[2, 19-23] Understanding that research bias and GDP spending differences between geographies may influence this figure, the authors decided to take the median point of 3.5% as an international average.

Similar to costs several groups have carried out studies to determine the incidence of wounds within their institution of country.[2, 16-19] The number of wounds ranges from 0.9% to 7% of total population.[2, 16-19] Following the approach of taking a median point for the estimation model that authors have used 3% to calculate an estimation.

Using the methodology of Queen & Harding,[14] the indicated formula (See Table 1A) was used to estimate the costs of wounds both in Canada and within its provinces and territories. Similarly using a new formula (See Table 1B) the authors estimated the number of wounds.

Results

Table 2 provides a snapshot of the possible costs of wound care within Canada in the year 2024. Table 3 provides a snapshot of the possible number of wounds within Canada in the year 2024.

Discussion

From a previously published editorial in the *International Wound Journal*,[1] it was estimated that the costs of wound care in Canada in 2019, were just over S11 billion. A recent estimate[2] for 2023 put the figure at over $12 billion.

In this article we have updated the figures to 2024, as new governmental figures for population and cost were available. Once again, these figures have risen as the population of Canada increases and, for the most part, so do the cost of our individual health care. The 2024 estimate for Canada as a nation has now surpassed $13 billion.

The data presented in Table 2 and Figure 1 provides a crucial estimate of the likely costs of wounds across Canada's provinces and territories. This comprehensive national perspective on wound costs significantly surpasses prior estimates from 2012.[2] It acts as a vital benchmark at both provincial/territorial and national levels, serving as a tool for evaluating the effectiveness of standardizing wound care, advancing education and training initiatives and measuring the return on investment for government-funded research and educational grants in this clinical field.[2]

Conclusions

Comprehending the economic impact of wound care offers valuable insights to policymakers and health-care leaders, shedding light on the broader economic implications of wound management. This knowledge serves as a foundation for informed decision-making and the development of policies and research direction that support effective wound prevention and care practices. Wounds Canada has committed to provide the regional updates regularly, this being the first, to keep researchers up-to-date with the most recent estimates based on updated government statistics and any research findings.

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Closing The Distance: Engaging Patients Using Remote Wound Monitoring

By Katerina Bavaro HBSc, Samantha Bestavros BSc, Sukaina Muhammad MClSc -WH RN NSWOC WOCC (C), Rose Raizman MN NP, Sheila C Wang PhD MD and Robert Douglas John Fraser MN RN NSWOC WOCC (C)

How to cite: Bavaro K, Bestavros S, Muhammad S, Raizman R, Wang SC, Fraser RDJ. Closing the distance: engaging patients using remote wound monitoring. Wound Care Canada. 2025;23(2): 44-50. DOI: 10.56885/036138uuyiaq

Chronic wounds cost the Canadian health-care system approximately $12 billion per year.[1] These costs include directs expenses, such as dressings and wound care materials, as well as indirect costs borne by patients.[1] Indirect costs encompass out-of-pocket expenses due to the inability to perform domestic tasks, loss of income from reduced work capacity and welfare or disability payments provided by the government or insurance companies.[1]

Chronic wounds significantly impact activities of daily living (ADLs), making life more challenging for affected individuals. They may require more frequent health-care visits for assessments and interventions due to longer healing timeframes. This can be especially burdensome for those living in underserved communities, where access to care is limited.

A relationship also exists between quality of life and chronic non-healing wounds.[2] According to a paper published in *Wounds International*, chronic wound patients often experience poor quality of life, as multiple areas of their lives are compromised.[2]

One study that conducted an assessment on chronic wound patients using the Wound Quality of Life (Wound-QoL) and Freiburg Life Quality Assessment (FLQA-Wk) found that values for patients with chronic wounds were below average.[3] The total quality of life value was 37.50/100 (Wound-QoL) and 44.20/100 (FLQA- Wk).[3] Pain is consistently identified as one of the most common and disabling symptoms

related to quality of life.[2] It can lead to issues such as mobility, sleep disorders and loss of employment.[2]

A major question that remains is which populations are a higher risk of developing chronic wounds. Chronic wounds, specifically venous leg ulcers, have been found be more prevalent in lower socioeconomic classes. Factors such as socioeconomic status includes marital status, employment, income, social security benefits and housing, have direct effects on wound-healing processes.[4] A study conducted in patients with venous leg ulcers concluded that being single, being of a lower socioeconomic status and having a lack of central heating in the home led to significantly prolonged wound healing or lower likelihood of healing at 12 weeks follow-up.[4]

Remote And At-risk Communities

The health-care needs of Indigenous peoples are of particular concern. Between 2017 and 2020, reports indicated that a significantly higher percentage of First Nations peoples living off-reserve (20.3%), Métis (17.9%) and Inuit (56.5%) lacked a regular health-care provider compared to their non-Indigenous counterparts.[5]

Indigenous communities have been cited in the literature as having a higher risk of developing diabetic foot complications, including foot ulcers, amputations and peripheral arterial disease.[6] Diabetes is a large issue within Indigenous communities, as people are affected at a rate which is three to five times higher than the general population.[6] Among individuals with diabetes, 34% will develop a diabetic foot ulcer (DFU) in their lifetime, which can cause significant disability, diminish quality of life and increase the risk of premature death.[6]

Lower limb amputations are a critical concern, with research showing that DFUs precede 85% of these cases.[7] Additionally, 60% of all lower limb amputations occur in individuals with diabetes.[7]

The town of Sioux Lookout Northwestern Ontario is home to 30,000 people and serves 33 remote Indigenous communities, where the documented rate of diabetes is approximately 25% of the population.[8] The amputation rates in the town are four to seven times higher than the provincial average. The nearest vascular surgeon program is in Thunder Bay, 393 km away, which is equivalent to a five-hour drive or a two-hour flight.

Patient Empowerment In Wound Care

Patient empowerment can be defined as a process in which patients can understand their role in their health care, and where they are given the required knowledge and skills demonstration by their health-care providers to perform a task in an environment that recognizes community and cultural differences and encourages patient participation.[9] Empowering patients is crucial in chronic wound management, as it enables them to take an active role in their care.

There has been an emerging trend of the adoption of technology for patient empowerment. For example, smartphone apps are now being designed to empower patients to contribute towards safer surgical care.[10] The successful implementation of smartphone apps within clinical practice can lead to improved treatment options, as they can encourage behaviours such as patients being more involved in their care conversations and increased awareness of safety-related behaviours.[10]

A study done by Keegan and colleagues involved patients who were trained to use a mobile app to obtain weekly-at-home scans during regular dressing changes.[11] The results proved that remote wound monitoring could enhance patient engagement, with a 94% satisfaction rate and early intervention in 36% of the cases.[11] Many of the participants in this study noted that they felt more involved in their wound care, more responsible for their health, and had increased access to health-care services.[11]

Applications Of Digital Tools In Wound Care

The use of digital tools has been previously applied to the wound care space. The Photographic Wound Assessment Tool (PWAT) has been validated as an instrument to determine ulcer status wound imaging and has been included as an educational

tool for wound care clinicians.[12] Smart devices (e.g., phones, tablets) continue to increase the quality and resolution of their built-in cameras, with some including built-in 3D scanners. These devices are becoming widely adopted by patients and in the workplace, making wound imaging more feasible.

Using the PWAT system, clinicians can assess the following features all graded between zero and four with a higher total score indicating wound deterioration:[13]

- Size
- Depth
- Necrotic tissue type
- Total amount of necrotic tissue
- Granulation tissue type
- Total amount of granulation tissue
- Edges (directly touching and within 0.5 cm of the wound edge)
- Peri ulcer skin viability.

While the PWAT system remains clinically valuable for remote wound assessment, artificial intelligence (AI) and computer vision (CV) have the potential to transform how clinicians and patients can use digital imaging to support wound care. Digital wound imaging can use AI to automatically identify and measure a wound. Studies of several software applications that provide wound measurement have found high rates of accuracy and inter- and intra-rater reliability.[14] AI can also facilitate the rapid analysis of a vast array of wound images, working in combination with intelligent algorithms and extensive databases to accurately identify, classify, and predict tissue characteristics.[15] One paper was able to demonstrate a strong correlation between a machine learning model's PWAT score and the clinician's PWAT score.[16]

Wound healing can also be predicted, as proposed by Telemedicine Based Wound Tissue Prediction (TWTP), which uses linear discriminant analysis to classify tissue types.[15] This has been proven to achieve a prediction accuracy of 91.45%, thereby being applicable in the remote diagnosis of chronic wound healing statuses.[15]

A home health region in Ontario implemented a digital wound management solution (DWMS) inter-professional remote wound care, which included the ability for patients to collect images. The mobile application (Swift Skin & Wound, Patient Connect, Toronto ON) uses CV technology to automatically focus and calculate wound dimensions from images taken within the mobile app. Additional features are also captured in the application, such as healing-associated metrics, wound-bed information, anatomical location and patient identifiers. Through remote collaboration using the DWMS, the region was able to improve healing, reduce home health readmission and reduce wound care costs.[17]

DWMS have been around for over a decade, however, until recently, DWMS were focused on the clinician. Shifting the emphasis to the patient requires a simplification of the user interface and careful design of the experience to support patient adoption. Figure 1 shows an example of a clinician application, which has options for detailed documentation of the wound's size, appearance and analysis of progress. For the patient application, a streamlined interface, embedded training videos on wound imaging, educational material on dressing changes and low literacy level questions are available during the process.

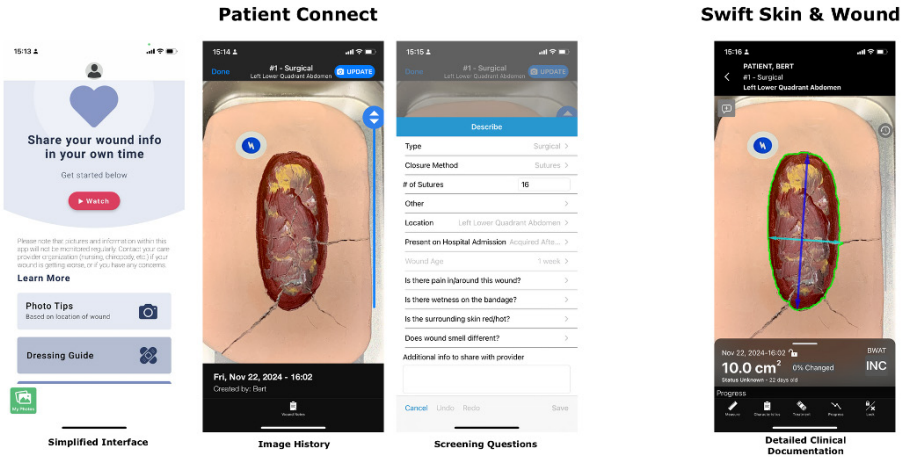

Figure 1: Digital Wound Management Solution. Patient facing interface with simple language and documentation interface (left) and Clinician Interface with detailed wound care documentation and analysis (right).

A feasibility study included patients with diabetic ulcers, venous ulcers, pressure ulcers and post-surgical wounds who were recruited and trained to use the Patient Connect App developed for wound imaging and secure data sharing with health-care team members.[18] Throughout the study, the 28 participants captured a median of 13 images per wound and achieved an 80% wound closure rate.[18]

As highlighted in the study, remote monitoring fostered patient engagement through weekly assessments, while remote follow-ups proved beneficial in reducing patient anxiety.[18] Additionally, clinicians reported that the system enhanced their confidence in delivering care remotely.[18]

General Attitudes Towards Patient-Owned Surveillance

When implementing remote wound care monitoring, it is essential to consider the unique needs of specific patient populations. Capturing images of patient wounds may be a sensitive subject. A majority (81%) of patients studied at an outpatient wound clinic in Toronto reported photographing their wound increased their ability to track their wound progress and 58% percent felt more involved in care.[19] Another paper from Montreal reported positive feedback from the use of a patient application for wound monitoring due to the decrease in travel requirements and objective data captured by the patient wound imaging application. However, successful adoption requires thoughtful implementation.[20]

Lo and colleagues conducted a qualitative study on patient-owned surveillance systems in patients with DFUs, identifying four key themes.[21]

1. **Technology Literacy:** Some patients were hesitant to use digital applications due to low technological literacy, despite having access to the internet.
2. **Application Usability:** Challenges were noted, particularly among elderly patients with diabetic foot ulcers. Many expressed a need for educational tools on foot care and infection prevention.
3. **Feasibility of Wound Imaging:** Patients generally lacked a habit of taking wound photos, as clinicians typically handled this during visits.
4. **Social and Physical Support:** Many patients had difficulty in taking wound images due to visual impairments or physical disabilities. Support from family members was crucial for wound care. Retinopathy is a complication of diabetes which is present in 22.7% of the diabetic population globally, further underscoring the need for social assistance for wound imaging.[22] These themes can be considered in the patient education in support of adopting digital wound monitoring. The feasibility study on patient adoption used build-in education within the application, and teaching was facilitated by the clinician having the patient capture an image while still at the ambulatory clinic (see Figure 2).

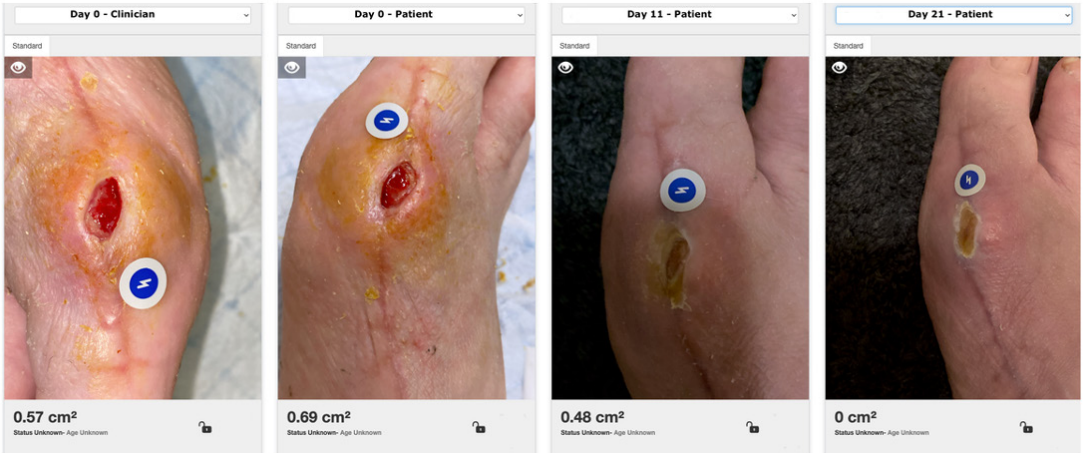

Figure 2: Digital Wound Management Solution imaging of a post-surgical wound. Each image identifies who captured the image and the amount of time from the first date of evaluation.

Although digital wound imaging and patient captured images are more feasible. Wound care clinicians need to consider how the technology fits into their practice to support efficiency and drive improved outcomes.

Logistics Of Care

It was concluded from the Lo and colleagues' study that patients, carers and their health-care practitioners had a positive attitude towards a patient-operated imaging system.[21]

Some patients acknowledged that remote monitoring saved time and reduced costs, particularly during the COVID-19 pandemic.[21] However, some preferred in-person consultations, believing they would receive better care.[21]

During the COVID-19 pandemic, a crucial response involved postponing or transitioning wound care appointments to telephone consultations.[23] To limit exposure, it was recommended by the Wound Healing Society that the frequency of wound dressing changes decreased and caregivers and patients undertaking interval dressing applications was encouraged.[23] Initially, there were concerns about the challenges involved in educating patients on the proper technique.[23] However, resources were made available, such as a self-education tool from Wounds Canada available for downloading and printing out as a handout.[24] These digital resources can support clinicians to implement patient empowerment programs supported by evidence-based resources.

Remote wound care monitoring was also tested in the Virtual Wound Care Command Centre (VWCCC) in Australia.[25] All patients who participated in this study reported high satisfaction with their wound care, with 86.4% of patients recommending the VWCCC to other patients.[25]

Potential savings due to reduced travel was mentioned in this study.[25] Participants within Metropolitan Sydney potentially saved an average distance of 20.5 km, travel time of 54 minutes and travels costs of $AU 6.37 for a single visit. For those who lived in regional New South Wales (NSW), the mean travel savings were 260 km, 3.1 hours, and $AU 38.02.[25]

The greatest savings by far were for those accessing wound specialist services remotely, with a single visit costing a mean of 638 km, 8.6 hours of travel time, and $AU 99.65 in fuel costs.[16]

This thereby support the notion that remote wound care monitoring can address indirect costs to patients while also enhancing patient satisfaction.

Future Research

The current availability of smart devices provides a confluence of digital imaging and internet connectivity making wound imaging more feasible for patients living with wounds. Barriers need to be addressed including how to securely capture data and communicate with patients in a privacy-compliant way. The studies mentioned in this paper highlight the growing number of applications being made for adoption within clinical practice. While there are positive indicators for this area for patient acceptance and usability, larger studies and quality improvement initiatives are needed to understand the impact on health-care systems, such as improved healing rates, lower wound reoccurrence and reduced complications.

Beyond outcomes, research wound care clinicians need to continue to work with machine learning and data scientists. Increasing image capture will result in more data. Machine learning and other forms of AI can help to analyze and triage images for health-care providers. With limited health human resources, wound care clinicians need to partner in the design of technology to meet the challenges of managing chronic wounds.

Patient Empowerment In The Context Of Remote Wound Monitoring

To conclude, patient empowerment in the context of remote wound monitoring is certainly a viable option as a part of management planning. AI and CV can enhance monitoring strategies, as they are useful to collect relevant data such as healing-associated metrics, wound-bed information and anatomical

location, as in the reported case from SWIFT Medical technology.[11]

Remote wound monitoring can be beneficial for those with chronic wounds who are suffering with ADLs. There is an overall positive attitude towards the application of remote wound monitoring as it can reduce patient anxiety, decrease transportation costs, and save time for patients with long commutes.

Of note, is crucial to educate patients about this treatment option and assess whether they are suitable candidates, taking accessibility into account.

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- Effective management of exudate.[1,2]
- Help prevent peri-wound maceration.[6]
- Protect peri-wound skin.[6]
- Promote wound healing.[7]
- Manage biofilm and infections[4,5]

This may improve patient comfort and clinical outcome.[3]

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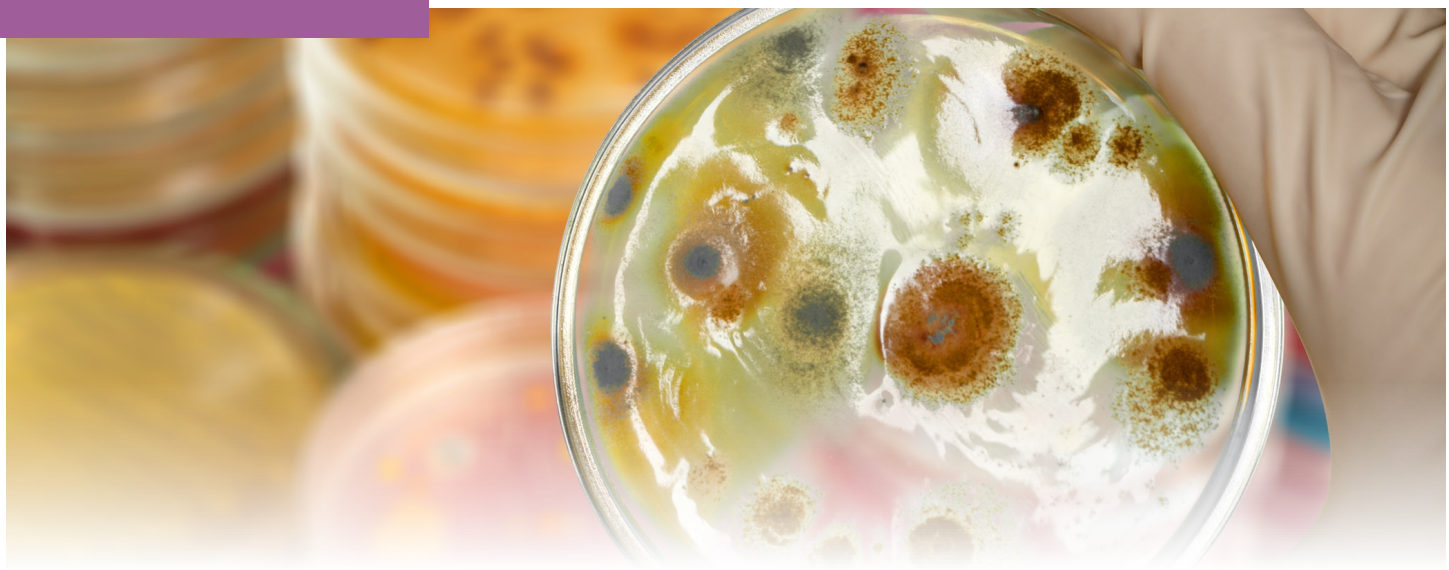
CASE REPORT



Healing Without Harm: Advancing Antimicrobial Stewardship In Canada with Gentian Violet Methylene Blue Dressings

By Idevania G Costa RN NSWOC PhD and Kevin Woo RN NSWOC WOCC PhD

How to cite: Costa IG, Woo K. Healing without harm: advancing antimicrobial stewardship in Canada with gentian violet methylene blue dressings. Wound Care Canada. 2025;23(2): 51-59. DOI: 10.56885/207982bamjrl

Antimicrobial resistance (AMR) represents a rapidly escalating global health crisis that threatens the foundations of modern medicine. Recognized by the United Nations as a critical global priority, AMR is responsible for an estimated 4.95 million deaths annually, with global targets aimed at reducing this toll by 10% by 2030.[1] Despite high-level commitments, progress remains fragmented, and Canada has yet to establish wound care-specific strategies within its national antimicrobial stewardship (AMS) framework.

International bodies, including the World Health Organization and United Nations, have called for urgent action to curb AMR (WHO, 2020). In Canada, progress has been slower. One in four antimicrobial prescriptions in Ontario is unnecessary,[2] and over 90% of human antibiotics are prescribed in the community, not hospitals.[3] Public Health Ontario has documented significant regional variability in prescribing, suggesting inconsistent adherence to stewardship principles. In wound care, the misuse of antimicrobials persists despite clear guidance on product selection and usage.[4] This gap between evidence and practice calls for not only better education, but also access to safe, effective topical alternatives that reduce bioburden without harming host tissue.

Hard-to-heal wounds are skin lesions that do not follow a normal healing trajectory and their prevalence is increasing due to the high rates of cardiovascular disease, obesity and aging in the population. While current national data are limited,

estimates suggest that hundreds of thousands of Canadians are living with, or at risk of, developing wounds such as diabetic foot ulcers, pressure injuries or complex surgical wounds—many of whom are vulnerable to infection.[5] Based on international data, lifetime prevalence may be as high as 1–2% of the population in developed countries, which would correspond to approximately 380,000–760,000 Canadians.[6]

This growing burden of wounds is closely linked to the overuse of systemic antibiotics. A significant proportion of wounds exhibiting bacterial colonization are treated with antibiotics even when clinical signs of infection are absent, driving unnecessary use and resistance.[7,8] In wound care, overuse of systemic antibiotics is often driven by diagnostic uncertainty and limited non-antibiotic options, enabling microbes to adapt and develop resistance.[9,10] Stronger infection control strategies, including judicious use of evidence-based antimicrobial dressings, are essential to reduce this risk. Amplifying this concern is the continued widespread use of topical antibiotics in wound care, despite their known risks, such as cytotoxicity, limited antimicrobial spectrum and potential for allergic reactions.[9] Their excessive use, especially mupirocin and fusidic acid, has been directly linked to resistance in *Staphylococcus aureus*.[11] A recent systematic review confirms that inappropriate or prolonged topical antimicrobial use can contribute to AMR. In response, a 2025 consensus panel recommended restricting topical antimicrobials to clinically indicated cases, ideally guided by cultures and always combined with standard wound care.[12]

Amid these challenges, antimicrobial-based wound dressings offer a promising alternative to systemic and topical antibiotic misuse by targeting biofilm and pathogen proliferation directly at the wound site. Common antimicrobial agents used in dressings include gentian violet and methylene blue (GVMB), silver, iodine, chlorhexidine, polyhexamethylene biguanide and honey.[13] This article focuses specifically on GVMB dressings, marketed as Hydrofera Blue® (Hydorfera LLC/Essity), as a clinically viable and non-cytotoxic option within the antimicrobial dressing toolbox.

Hydrofera Blue® (HFB®) is a foam dressing bound with GVMB antibacterial agents [hence referred to as the GVMB dressing or GVMB]. While GV exerts broad-spectrum antimicrobial effects by altering redox potential, inhibiting protein synthesis and interfering with bacterial cell wall formation, MB targets pathogens via oxidative stress mechanisms. A particular advantage is its effectiveness against a wide spectrum of microorganisms found in wounds, including methicillin-resistant staphylococcus aureus (MRSA), vancomycin-resistant enterococcus VRE and Candida.[9] Additionally, it is non-cytotoxic and does not impede tissue regeneration, offering a significant advantage over many other commonly used topical treatments such as iodine-based dressings and topical antibiotics, which are often associated with cytotoxic effects.[4, 7, 8, 9]

There are two types of HFB® foam dressings: CLASSIC polyvinyl alcohol (PVA) foam and READY polyurethane (PU) foam. (See company website for more details: https://hydrofera.com/hydrofera-blue/.)

GVMB is one of very few antibacterial dressings that can be used in conjunction with enzymatic debriding agents, growth factors, or hydrogels without inhibiting their actions.[14, 15]

To examine the clinical performance of GVMB dressings, we reviewed five published studies. In a prospective, non-randomized trial, 29 patients treated with GVMB for four weeks showed significant improvements in tissue quality, wound size, exudate, and infection scores, with no need for systemic antibiotics.[8] A quality improvement initiative analyzing 6,300 home care clients found GVMB reduced healing time by 50% and costs by over 75%.[10] In a retrospective case series of 53 lower extremity wounds, all achieved full re-epithelialization within 20 weeks with GVMB and ovine-based collagen extracellular matrix.[16] Another case series of five chronic wounds reported reduced infection signs and pain after four weeks of GVMB.[17] More recently, a prospective open-label trial of 20 patients showed a 53% mean reduction in wound size, four complete

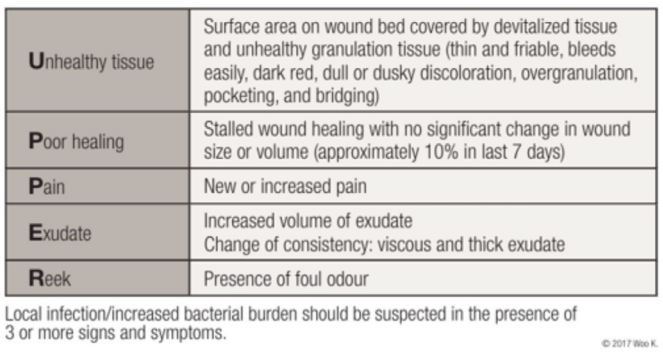
closures and marked bacterial load reduction after four weeks of GVMB with debridement.[18] Collectively, these findings highlight GVMB's role in accelerating healing, reducing bacterial burden and supporting AMS in wound care.

To illustrate our experience using HFB in a diverse population of Northwestern Ontario (NWO), including people in remote and rural areas (e.g., Indigenous) and Southeastern Ontario (SEO) we selected representative case studies that demonstrate its clinical utility and contribution to advancing AMS.

Case Study Series

The following case studies from our advanced wound-care practices illustrate how GVMB dressings can reduce reliance on systemic and topical antibiotics and support healing at all stages of the wound-care continuum, ultimately contributing efforts to mitigate antimicrobial resistance. Table 1 provides an overview of the selected case studies, detailing patient demographics (living area, sex and age), wound characteristics (type, initial size, duration before HFB treatment, time to wound closure), the use or absence of systemic antibiotics according to UPPER (unhealthy tissue, poor healing, pain, exudate, and reek) and LOWER (larger size, osseous tissue and /or deep structure, warmth, edema and redness) tools as described in Figures 1 and 2.

Figure 1: UPPER criteria card



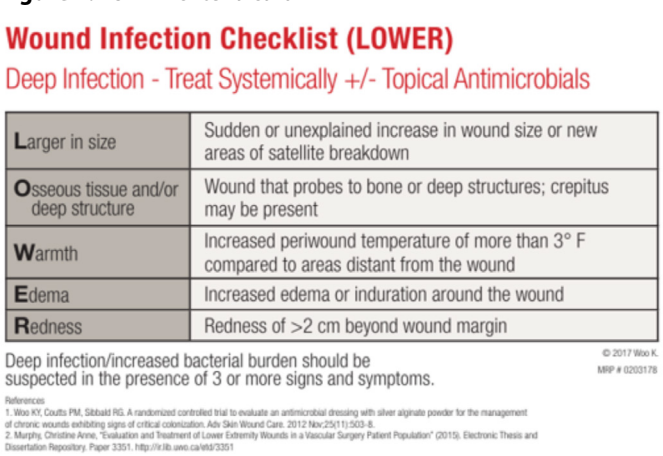
Wound Infection Checklist (UPPER)

Local / Superficial Infection - Treat with Topical Antimicrobials

Unhealthy tissue	Surface area on wound bed covered by devitalized tissue and unhealthy granulation tissue (thin and friable, bleeds easily, dark red, dull or dusky discoloration, overgranulation, pocketing, and bridging)
Poor healing	Stalled wound healing with no significant change in wound size or volume (approximately 10% in last 7 days)
Pain	New or increased pain
Exudate	Increased volume of exudate Change of consistency: viscous and thick exudate
Reek	Presence of foul odour

Local infection/increased bacterial burden should be suspected in the presence of 3 or more signs and symptoms.

Figure 2: LOWER criteria card



Wound Infection Checklist (LOWER)

Deep Infection - Treat Systemically +/- Topical Antimicrobials

Larger in size	Sudden or unexplained increase in wound size or new areas of satellite breakdown
Osseous tissue and/or deep structure	Wound that probes to bone or deep structures; crepitus may be present
Warmth	Increased periwound temperature of more than 3° F compared to areas distant from the wound
Edema	Increased edema or induration around the wound
Redness	Redness of >2 cm beyond wound margin

Deep infection/increased bacterial burden should be suspected in the presence of 3 or more signs and symptoms.

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Table 1: Demographics And Wound Characteristics

Cases	Living Area*	Sex	Age	Types of Wounds	Initial Wound Size (LxWxD/Cm)**	Wound Duration	Systemic Antibiotics*** (Yes/No)	Healing Achievement
1	NWO	F	62	Chronic Venous Leg Ulcer	3.5 x 4.0 x0.0	6y	No	6m (healed)
2	NWO	M	25	Post-Flap Surgical Wound	16 x 12.5x 0.0	32d	No	2m, 2d (healed)
3	NWO	M	54	Post-Traumatic Wound	9 x 6.5 x 1.9	7d	No	2m, 18d (healed)
4	SEO	F	67	Chronic Venous Leg Ulcer	6x4x0	Unknown	No	4 weeks (reduced at half size)
5	SEO	F	77	Inguinal abscess	7X4X2	Unknown	No	7 weeks considerable improvement

* NWO = Northwestern Ontario; SEO = Southeastern Ontario; ** L= Length; W = Width; D = depth (if applied); Cm = Centimeters

*** Systemic Antibiotics used after HFB treatment was initiated.

Case Study 1: Use of GVMBin a Chronic Venous Leg Ulcer

A female in her 60s had been living with a chronic venous leg ulcer on her right leg for over six years. She denied a history of diabetes and venous insufficiency was confirmed in the affected limb. Her ankle-brachial index (ABI) was under 0.78. The wound had previously been managed with iodine-based dressings in a community setting and deemed a "maintenance wound" due to its lack of healing progress. After a new referral to the wound care clinic the initial assessment identified friable tissue along with pain, exudate and odour. UPPER and LOWER tool showed score of 5/5 and 3/5 respectively, suggesting localized infection. A new treatment regimen was initiated using the Classic™ formulation and compression therapy. Over a six-month period, HFB contributed to a marked reduction in friable tissue, exudate, pain and decrease in wound size (Figure 3), contributing to enhancing her overall quality of life (Figure 3).

Case Study 2: GVMB In A Post-Flap Surgical Wound

A male in his 20s presented with a post-flap surgical wound on his right arm following a self-inflicted injury. He reported no underlying health conditions but disclosed smoking 6–7 cigarettes per day. On initial assessment, the wound exhibited dried blood on surgical site and slough on open areas, with an UPPER score of 4/5 and a LOWER score of 2/5, suggesting localized infection. After mechanical cleansing, the application of GVMB (Classic™ formulation) supported autolytic debridement, moisture balance and bioburden management. By day 55, the flap site had progressed significantly toward complete healing (Figure 4), and the patient was discharged from in-person care to continue wound care at a remote nursing station close to his hometown in NWO, with virtual guidance provided by the first author. Complete wound closure was

Figure 3: Initial photograph showing friable tissue. Subsequent images illustrate progressive improvement following treatment with GVMB dressings. The final image was taken just days prior to complete wound closure.

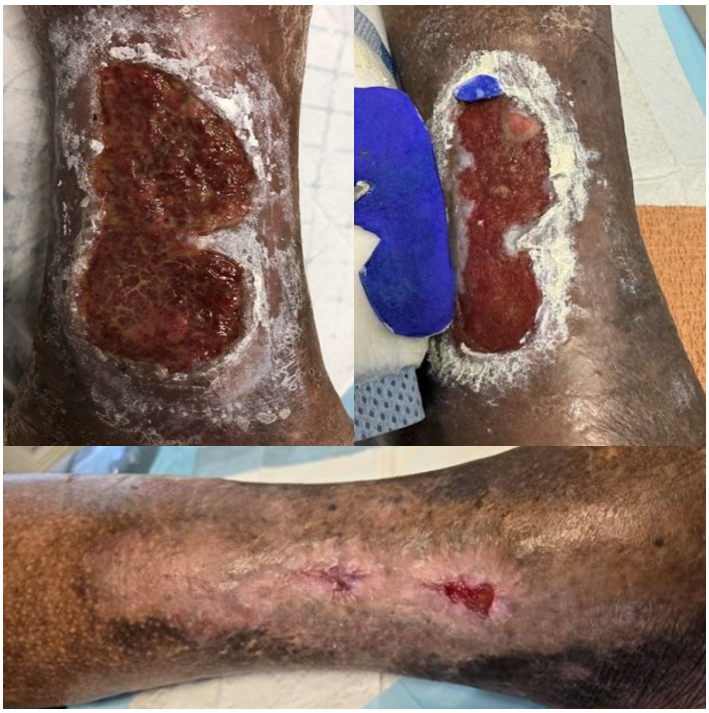
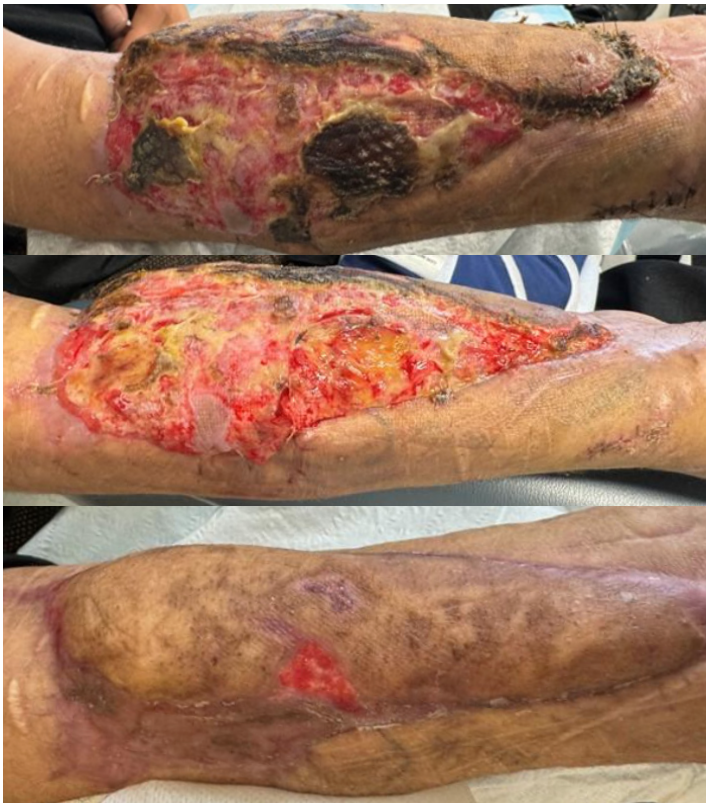


Figure 4: The initial photograph shows necrotic and slough tissue. Subsequent images demonstrate progression following the application of GVMB dressings, with near-complete closure (right) and full epithelialization achieved by day 62.

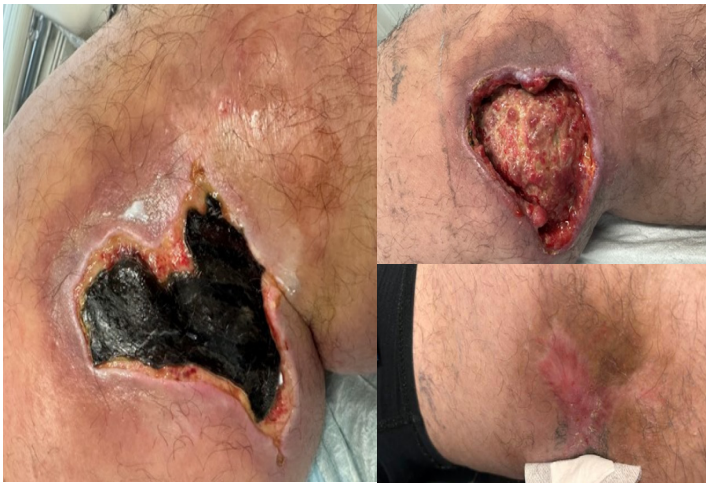


achieved by day 62 (Figure 4).

Case Study 3: GVMB in a Post-Traumatic Wound

A male in his 50s sustained a traumatic leg injury that was further complicated by comorbidities, including obesity and atrial fibrillation. Initial necrotic tissue was managed with sharp debridement, which resulted in the development of tunneling and undermining. An UPPER score of 4/5 with a LOWER score of 2/5 suggested local infection. Therefore, GVMB Classic™ dressing was selected and initiated for its high tensile strength, ability to pack tunnels and undermining and ability to flatten rolled wound edges. Over the course of 78 days, GVMB promoted progressive granulation, maintained moisture balance, and supported edge advancement. The patient was able to resume work by Day 25, and by Day 78, complete wound closure was achieved (Figure 5).

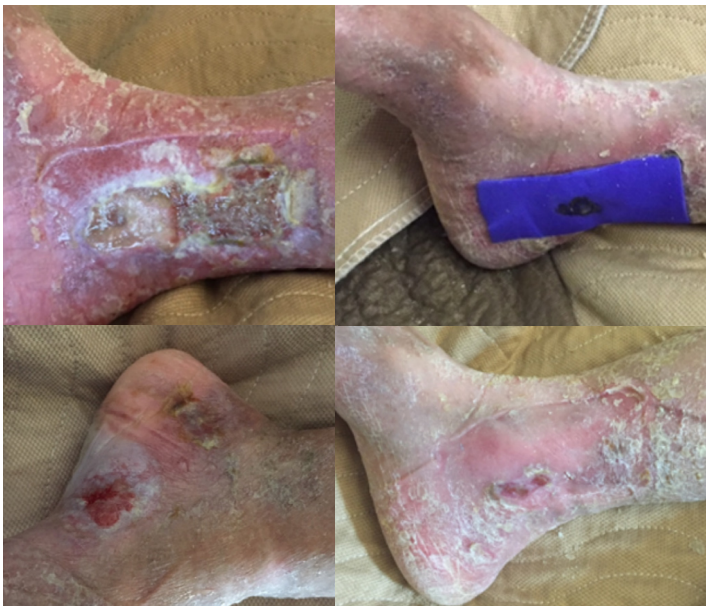
Figure 5: Initial photograph showing necrotic tissue at the site of a traumatic leg injury. Following sharp debridement and the application of GVMB dressings, the wound demonstrated progressive healing, with complete closure achieved by day 78.



Case Study 4: GVMB in a Venous Leg Ulcer

A female in her 60s with diagnosis of venous stasis disease, Duchenne muscular dystrophy, osteoporosis, hyperthyroidism, diabetes and a body mass index (BMI) of 38 developed a hard-to-heal ulcer on the right medial malleolus. Her ankle-brachial index (ABI) was 0.76. The wound measured 6 × 4 cm and was associated with pain, exudate and odor. Initial management with iodine-based dressings failed to improve the wound, and an UPPER score of 5/5 with a LOWER score of 2/5 suggested local infection. A new regimen was initiated with GVMB (Classic™ formulation) as the primary dressing and compression as the secondary therapy. Pain improved almost immediately, and with dressing changes every 2–3 days, the wound reduced to 3 × 3 cm after four weeks and 2 × 1 cm after a further two weeks, with marked improvement in local symptoms

Figure 6: Initial photograph showing friable tissue with slough on left venous leg. Following application of GVMB dressings and compression, the wound healing improved within 2 weeks.

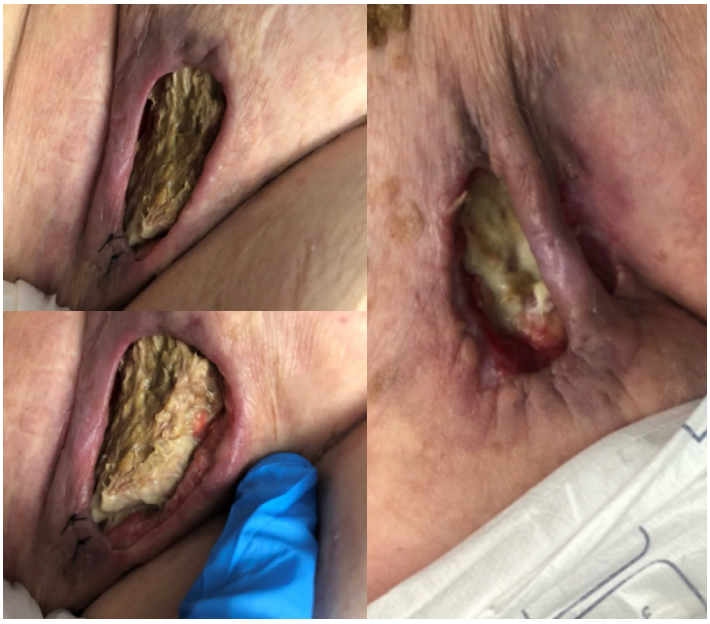


(Figure 6).

Case Study 5: GVMB in an Abscess of a Inguinal area

A female on her 70s with hypertension, ischemic heart disease, depression and chronic kidney disease presented with an abscess in the inguinal area following surgical incision and drainage. The wound measured 7 × 4 cm with a depth of 2 cm and contained heavy slough, fibrinous tissue, drainage, and odour. UPPER and LOWER scores were 4/5 and 3/5, respectively, suggesting local infection. The patient declined sharp debridement, so GVMB (Classic™ formulation) was initiated to promote autolytic debridement and address bacterial burden. After three weeks, early granulation was observed. Treatment continued, and by week seven the wound measured 5 × 3 cm with a depth of 3 cm, showing a thin layer of soft slough, 30% granulation tissue, reduced drainage, no odor and improved UPPER (2/5) and LOWER (0/5) scores (Figure 7).

Figure 7: Initial assessment identified heavy slough, fibrinous tissue, drainage, and odor, which decreased considerably by week seven after GVMB dressing was implemented.



Discussion

The gentian violet and methylene blue (GVMB) dressings used in these case studies demonstrated unique non-cytotoxic antibacterial properties, contributing to decreased bioburden, enhanced granulation and progression of stalled wounds—all without reliance on systemic or cytotoxic agents. These outcomes are consistent with previous studies. For instance, Woo and Heil (2017) reported successful wound management in 29 patients using GVMB dressings without systemic antibiotics. Another study involving 6,300 home care patients also highlighted GVMB as a primary dressing option.

Clinical frameworks such as UPPER/LOWER tool[8] and the Wound Bed Preparation Paradigm.[19] were applied to guide assessment and treatment. These tools helped demonstrate the effectiveness of GVMB dressings in supporting all four factors of local wound care: **D**ebridement, managing local **I**nfection and inflammation, **M**aintaining moisture balance and advancing wound **E**dges (DIME). The following case analyses illustrate how GVMB dressings contributed to meaningful clinical progress across various stages of healing and in wounds deemed maintenance.

Tissue Debridement: In all cases, patients presented with devitalized tissue at baseline. In Case 3, slough was evident and followed by sharp debridement, while Cases 1 and 2 also exhibited slough, with dried blood noted in Case 2. In each case, GVMB dressings facilitated autolytic debridement, effectively preparing the wound bed without systemic antibiotic use. This aligns with existing literature showing that GVMB dressings support gentle autolytic debridement while preserving cell viability. For example, one case involving an amputation site treated with GVMB dressings demonstrated an 18% wound size reduction within two weeks.[20] The presence of slough and devitalized tissue on the removed dressing further confirmed non-traumatic debridement. These findings are consistent with a separate case series involving six wounds treated with GVMB by an advanced clinician.[21] The broader literature supports these findings. GVMB dressings reduce oxidative stress and inflammation while promoting fibroblast viability, allowing effective wound bed preparation without damaging healthy

tissue.[22]

Infection and Inflammation Control (UPPER/LOWER Criteria): Infection control was a primary concern in all cases, and the use of GVMB dressings allowed clinicians to manage bioburden locally—without resorting to systemic antibiotics. Clinical signs aligned with the UPPER and LOWER criteria, indicating local critical colonization without systemic involvement.

This classification, developed by Woo and Sibbald (2009), supports initiating topical antimicrobial therapy in lieu of systemic antibiotics when infection remains localized. Accordingly, GVMB dressings were used to address local infection and inflammation. This strategy is consistent with antimicrobial stewardship principles and supported by Woo and Heil (2017), who found a 75% reduction in infection scores using GVMB dressings. Importantly, no systemic antibiotics were required, demonstrating how local interventions can uphold AMS principles. GVMB dressings are effective against a broad range of pathogens—including MRSA and VRE. Due to the dressing's mechanism of action, bacteria laden exudate is absorbed into the dressings where it is effectively killed with no risk of antimicrobial resistance.[9] By preventing systemic spread and supporting localized control of bioburden, GVMB dressings align with both clinical best practices and global directives to reduce unnecessary systemic antibiotic use.[23]

Moisture Balance: Moisture was successfully managed across all cases without the adverse effects often observed with other antimicrobial dressings such as iodine or silver, which can dry the wound bed and inhibit collagen production.[24] In the venous leg ulcer (VLU) case, frequent dressing changes were initially required due to heavy exudate. As drainage declined, dressing intervals were safely extended. GVMB dressings maintained moisture balance and prevented maceration through their polyvinyl alcohol (PVA) foam structure, which exerts a natural negative pressure of 71.2 mmHg and wicks bacteria-laden exudate into the dressing for neutralization (Heying, n.d.). This capillary action enhances both moisture regulation and bioburden control. Importantly, GVMB dressings are non-cytotoxic to fibroblasts and keratinocytes, allowing collagen synthesis and re-epithelialization to continue unhindered—a significant advantage over silver-based dressings (Leaper et al., 2012).

Edge Advancement: The VLU case also showed resolution of a rolled wound edge, supporting the role of GVMB dressings in promoting epithelial advancement. Research has shown that polyvinyl alcohol (PVA)-based dressings support cell proliferation and are compatible with growth factors—key contributors to effective healing[9,20] The physical characteristics of the PVA foam—including its conformability and natural negative pressure—aid in the mechanical flattening of rolled wound edges. Cutting the dressing slightly larger than the wound to overlap the margins helps advance the edge and close the wound. This approach is particularly beneficial in community settings where sharp debridement may not be available due to scope limitations, clinician confidence, or safety concerns.

Clinical and Stewardship Considerations: The case studies presented, along with supporting literature, reinforce that GVMB dressings provide an effective, non-cytotoxic and resistance-free approach to managing hard-to-heal wounds. By enabling local infection control, facilitating autolytic debridement, maintaining moisture balance and supporting edge advancement—all without systemic antibiotics—GVMB dressings align strongly with antimicrobial stewardship (AMS) principles.

Their broad-spectrum antimicrobial, non-leaching and non-cytotoxic mechanism of action allows safe use over extended periods without harming fibroblasts or interfering with growth factors. These properties make GVMB dressings particularly valuable in settings where systemic antibiotic use should be minimized, such as home care or long-term care environments.

Consistent clinical performance in both this and other case studies supports their role in reducing reliance on systemic antibiotics while advancing

healing.[9, 20] As a result, GVMB dressings offer a practical, evidence-based solution that aligns with global AMS goals and helps reduce the health-care burden associated with hard-to-heal wounds.

To translate evidence into action, the expansion of public formulary access to non-cytotoxic dressings, increased clinician education on topical AMS tools, and investment in large-scale research on antimicrobial dressings efficacy are all critical next steps. Such action will not only reduce unnecessary antibiotic use and its associated risks but can also improve healing outcomes, patient quality of life, and sustainability of the broader health-care system.

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Conflict of interest statement: *The authors disclose a consultancy relationship with Essity in the field of wound care.*

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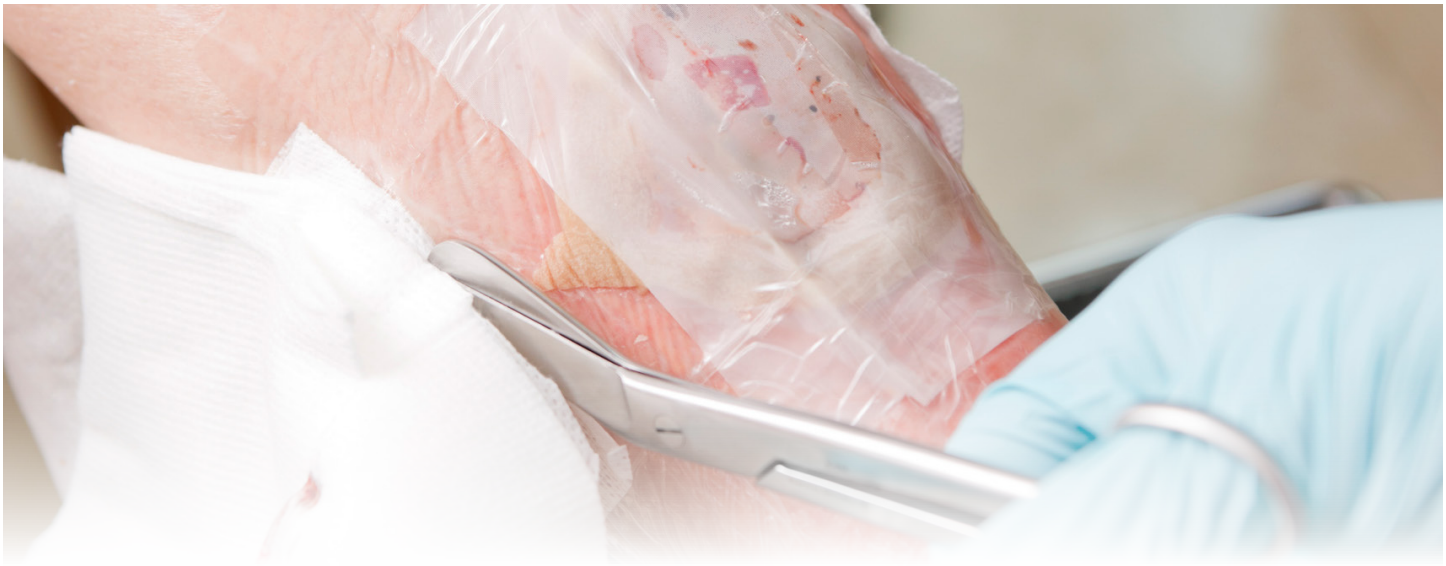

Compliance That Heals: Aligning Outcomes and Costs in Canadian Chronic Wound Care

By Therese Laub LPN CWS FACCWS

How to cite: Laub T. Compliance that heals: aligning outcomes and costs in Canadian chronic wound care. Wound Care Canada. 2025;23(2): 60-64. DOI: 10.56885/480044ttnhoj

Chronic wound care management is complex, and when combined with reporting requirements within interRAI standards (see box), it can seem daunting. Looking at the cost of wound care on our health-care system and the effects of not adhering to appropriate guidelines, we see that practices are not the only things that suffer from audits. Patient care also declines, with wounds consuming billions in public resources despite being considered 'largely preventable' and causing harm we have the power to prevent.

Statistics

Wound care spending estimates: Across Canada, estimates place direct wound spending at about $12.1 billion in 2023, up from approximately $8.28 billion in 2019. These figures are based on a 'standardized costing method' (a framework that accounts for direct health-care costs, indirect and

interRAI

interRAI is a collaborative network of researchers in over 30 countries committed to improving services for vulnerable populations including older persons, persons with disabilities and those affected by mental illness. The goal is to promote evidence-informed clinical practice and policy decisions through the collection and interpretation of high-quality data about the characteristics and outcomes of individuals served across the continuum of care. interRAI instruments have been mandated by governments in several countries including Canada, New Zealand, Hong Kong, Singapore, Belgium, Ireland, Switzerland, Finland, as well as many US states.

- The interRAI HC is a comprehensive, standardized instrument for evaluating the needs, strengths and preferences of those who require home care services.
- The interRAI LTCF is a comprehensive, standardized instrument for evaluating the needs, strengths and preferences of those in a Long Term Care facility.

For more information, visit https://interrai.org/

overhead costs, and adjusts for inflation, ensuring the figures can be compared nationwide) that approximates wounds at about 3.5% of total health-care spending.[1] ***Editor's note:*** *An updated version of Reference 1 is featured in this issue. See pages 37-42.*

Wounds in home care & Long Term Care (LTC): In the most recent national reporting from 2011–2012, CIHI administrative data show that wounds were significantly concerning.

- In home care, out of roughly 4,934 people, 7.3% of clients had a compromised wound, and 4.6% had a chronic wound.
- In Long-term Care (LTC), out of roughly 10,922 people, about 9.6% had a compromised wound and 7.9% had a chronic wound.[2]

More recent national wound data is not available, but a 2025 quality improvement project published in *Wound Care Canada*, titled 'Decreasing Pressure Injuries in Long-Term Care: A Quality Improvement Project', focused on long-term care homes in British Columbia. In that study, pressure injuries accounted for 18.9% of all wounds reported in LTC.

While national data remains outdated, findings like these highlight the ongoing burden of chronic wounds in care settings and underscore the importance of consistent prevention and management practices across Canada.[3]

The long-term cost of complications: In Ontario, the modelled lifetime public-payer cost for people hospitalized with wounds can increase drastically. Over their lifetime, treating a diabetic foot ulcer costs an estimated $619,300, a leg ulcer can cost upwards of $548,100, and a pressure injury can total $98,500. These figures highlight the importance of early wound management.[4]

Across Canada, about 7,720 diabetes-associated lower-limb amputations happen yearly. Roughly 23,500 hospital stays are for serious wound-related complications, including ulcers, gangrene or infections. The total strain on the health-care system is close to $750 million.

Preventable leg amputations cost around $47,000, and experts estimate that around 85% of these could have been prevented with proper wound care.[5] (Source: CIHI, 2022)

Why Compliance Matters

One thing is clear from these numbers: aligning your care with established laws, following standards and clinical guidelines and following evidence-based pathways for best practices can help reduce clinical errors, improve healing times and minimize legal and financial risks. The result is fewer chronic wounds and far fewer costly long-term complications that strain health-care budgets.

The Backbone Of Compliance

Standardized assessment (interRAI): Across most Canadian provinces, compliance in home care and LTC uses operationalized intake and assessments using the standardized system interRAI Contact Assessment (CA). Assessments ensure that every client is evaluated the same way, consistently and with reliable and comparable information.

In many provinces, home care has a two-step model:

- The first is using interRAI HC when longer-term services are anticipated.
- If ongoing care is needed, a more complete and detailed interRAI HC is completed.

For example, Ontario uses a two-stage approach for client needs at the onset of their care. Home care and long-term care submissions flow to CIHI's interRAI reporting platforms, where timing and content expectations are explicit. Your program's audits will check whether the right instrument was used at the right time and whether the care plan reflects those findings.[5]

Focus is given to:

- Assessment and data standardization
- Clinical guidance and care planning
- Quality monitoring and reporting
- Risk mitigation.

Evidence-Based Pathways

Most home care agencies and health authorities build their clinical pathways using wound care protocols that are built around best-practice recommendations from organizations like the Registered Nurses' Association of Ontario (RNAO) and Wounds Canada; for example, compression therapy assessment and workflow for venous leg ulcers (VLUs), off-loading algorithms for diabetic foot ulcer (DFU) and triggers for conservative sharp debridement and referral. Chart language should mirror your adopted pathway; deviations from the care pathway must be justified and clearly noted.

Scope, Orders And Directives

Each province's regulatory college sets the rules and determines what clinicians can do independently or what should be done, requiring a medical directive or a prescriber's order. Conservative sharp debridement, initiating compression and advanced therapy usage require documented competency validation and, in many programs, medical directives. During inspections and peer reviews, surveyors look for clear evidence that the medical staff is competent and able to perform the procedures recommended and that proper authorization was given.

IPAC As Law In LTC

In Long-Term Care facilities, infection prevention and control (IPAC) is mandatory and is the law. The standards set up in Ontario as outlined in the *Fixing Long-Term Care Act* (Ontario exemplar), are the standards that every LTC facility must follow. Nursing home facilities are obligated to implement the Director-issued IPAC Standard, and inspectors test compliance against that standard during proactive inspections. Home care and community programs are required to follow provincial IPAC guidance, which means they must show evidence of point-of-care risk assessments and demonstrate the proper use of personal protective equipment (PPE), safe cleaning practices and proper equipment transfer and storage.[6]

Information Governance

Privacy statutes (e.g., PHIPA in Ontario and substantially similar regimes elsewhere, with PIPEDA for parts of the private sector) obligate minimum-necessary documentation, secure handling, auditable access, and breach reporting. Compliance reviews increasingly connect clinical quality with privacy compliance.

What Auditors Look For In Home Care

Assessment Fidelity

- Use the InterRAI CA at intake and the interRAI HC assessment for clients with ongoing services, ensuring that both are completed within required timelines. Reassessments must also be completed on schedule, and any "significant change" in a client's condition should trigger a new assessment.[5]
- The cause of the wound should be confirmed (etiology), and it should be noted if the wound is arterial, venous, neuropathic, pressure-related, or atypical with appropriate perfusion and neuropathy screening when needed.

Plan-of-care Alignment

- The care plan should reference the clinical pathway your care team should be following. For example: "Venous leg ulcer pathway, step 3: ankle-brachial pressure index (ABPI) is completed; moderate compression is initiated; wound is reassessed within 48-72 hours", showing that the care team provides consistent best-practice care and the care team is aligned.
- Measurement discipline: L×W×D, undermining/tunneling, tissue types, exudate, peri-wound, pain, infection risk, goals with timelines.
- If the wound is not improving as expected and there is less than a 20–30% reduction in the size of the area after four weeks, or signs of poor circulation (suspected ischemia or infection appear), this should trigger referral to the documented prescriber or a specialist.

Authorizing Mechanisms

- Make sure that appropriate orders and medical directives are on file before performing higher-risk interventions, such as debridement, compression initiation beyond stocking class, negative pressure and advanced cellular/tissue-based products.
- Competency currency recorded.

Education & Continuity

- Document all patient and caregiver education, including evidence that 'teach-back' was used and documented. Record all supplies for your supply management documentation, including the type, product size, frequency, and continuity between visits.

IPAC & Privacy

- Document point-of-care risk assessments, and any steps taken for PPE use and environmental cleaning measures, including hygiene steps recorded when clinically relevant. If wound images are captured, make sure that the images are stored correctly and securely in accordance with your organizational security policies.

Why this matters: When done consistently, this reduces the home care compromised wound burden and the pipeline to avoidable admissions outlined above.

What Good Looks Like In LTC

Programmatic Compliance

- An IPAC program meeting the Director's Standard: surveillance, outbreak management, auditing, feedback, and staff training.
- Skin & wound committee with defined review cadence for non-healing wounds and pressure injuries; integration with mobility, nutrition, and diabetes management.

Assessment & Indicators

- Routine interRAI LTCF assessments informing quality indicators (e.g., worsened stage 2 - 4 pressure injuries), with QI cycles tied to findings.
- Regularly review unit-level trends, including how often wounds occur (incidence and prevalence), and include the length of time it took to heal.

Care Plan Fidelity

- Positioning schedules, off-loading strategies and support surfaces should be adjusted and tailored for each person according to their risk level. Provide compression therapy for venous leg ulcers (VLU) where needed and follow established pathways for diabetic foot ulcers (DFU), including keeping blood sugar well controlled to support healing (glycemic optimization pathways).
- Escalate care promptly if there are signs of infection or poor circulation (ischemia), and connect the patient with appropriate hospital services, vascular, and high-risk foot resources as needed.

Documentation Precision

- Short, standardized wound flowsheets paired with narrative notes that justify clinical decisions (e.g., why compression was deferred today; when it will be re-tried; what was done instead).

Why this matters: This alignment directly addresses the 7.9% chronic wounds in LTC and helps prevent the costs that follow failed management of wounds in home or LTC settings. When wounds are not effectively managed, they can cost upwards of $47,000 with each amputation.[5]

Three Compliance Levers With Outsized ROI

1. **Etiology-first pathways (DFU & VLU)**
   Diabetic foot ulcers (DFU) and leg ulcers are among the most expensive wounds to treat over a patient's lifetime; this is why early prevention is essential. Prioritize blood flow assessments, use off-loading for DFUs and follow ankle-brachial pressure index (ABPI)-guided compression for venous leg ulcers (VLUs). Create order sets and medical directives that allow clinicians to start the interventions during the same visit when criteria are met. Track the time from assessment to the first compression or off-loading as a key performance indicator (KPI) to monitor and improve care.[4]

2. **Rapid escalation for non-healing wounds**
   A documented *4-week Rule*, for example, is when a wound shows less than a 20–30% reduction in size after four weeks. This should automatically trigger a referral to a prescriber or specialist. Link documentation to referral service-level agreements (SLAs) and track any exceptions to this process. Follow this approach to help stop wounds from progressing to more complicated, severe problems like infections, hospitalizations or amputations that can escalate. It has been documented that interruptions in the progression to UGI admissions and amputations have cost the system upwards of $750M annually. [5]
3. **Data that proves it**
   Close the loop by using interRAI anchored data to guide and demonstrate results. Draw on outputs from the Contact Assessment (CA), Home Care (HC) and Long-Term Care Facility (LTCF) assessments to stratify risk and to populate dashboards (healing trajectory, time-to-compression/off-loading, escalation timing). Make sure to create detailed documentation to be proof for an audit and so that practice matches policy.[5]

Avoidable Pitfalls That Trigger Findings

- **Assessment gaps** (wrong instrument usage/ timing) or plans that don't echo interRAI findings
- **Pathway drift** (e.g., edema unmanaged; compression omitted without rationale)
- **Unclear authority** (no order/directive on the chart for a controlled act)
- **IPAC blind spots** (poor hand-off of isolation status; reprocessing of reusable tools not documented in policy)
- **Privacy compliance** (no images on unapproved devices; excessive PHI in progress notes).

The Bottom Line

Canada's wound care burden is large, measurable and, in significant part, preventable. The system pays dearly when etiologies aren't established, basic modalities are delayed, or escalation lags. Annually, there are lifetime costs ranging from billions to five-figures in common ulcer types, and thousands of amputations that policy makers classify as 'largely preventable'.

The compliance playbook is our best lever to put wound care on the right track in both home care and LTC.

Acknowledgments: *The author wishes to thank Maya A. Smith for her editorial support and careful proofreading of this article. Appreciation is also extended to the teams at Wounds Canada and CIHI for their publicly available data and resources that informed this work.*

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Note: Specific indications, contraindications, warnings, precautions, and safety information exist for these products and therapies. Please consult a clinician and product instructions for use prior to application.

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Coloplast Sponsored Learning:

Simplifying Wound Healing: Progress You Can See

Presenters: Paddy Markey, Jason Lau RN MScCH IIWCC NSWOC WOCC© and Jordan Smart MCISc-WH BN RN NSWOC WOCC©

The Epidemic Of Chronic Wounds:

Chronic wounds are becoming an epidemic globally. They are costly not just for health systems but for patients and their families. Management of chronic wounds is becoming increasingly challenging worldwide. Patients often access health care later in life, leading to more complex issues and comorbidities. Such increase in complexities often translates to more challenging wounds. This leads to increased workload on health-care practitioners (HCPs) who are already strained due to high turnover rates. Job vacancies are often filled with generalist staff who may not necessarily be equipped and experienced to manage complex patients. These further compound and perpetuate the workload and workforce challenges. There is also increased pressure from governments for cost efficiencies. Health-care providers are often left to do more with less.

Why Research Evidence Matters

Given these challenges, health systems are increasingly requesting higher levels of evidence to support products whether this be for tenders, contracts or reimbursements. Research evidence provides HCPs with standards of care. It also gives confidence and trust to HCPs to achieve optimal wound healing outcomes. Not to be remise, HCPs should always adapt such standards to their patients' unique circumstances. HCPs must consider their patients holistically, including their social contexts and challenges. The most important player in the wound management team is always the patient themselves. As a company, Coloplast is committed to continuing to develop clinical evidence to support their products and services.

How Evidence Informs Practice: Simplifying Wound Healing

Voegeli et al. conducted a two-armed, open-labelled, randomized controlled trial (RCT) to compare Biatain® Silicone (Coloplast) versus standard of care (SOC) in chronic wounds with a depth down to 20mm.[1] SOC was defined as the use of Aquacel® Extra Hydrofiber® (ConvaTec) as a filler and Mepilex® Border (Mönlycke) as a secondary dressing. This was a non-inferiority study involving 102 patients across 10 hospitals and research centres in the United Kingdom from February to December 2023. Key eligibility criteria include:

- Venous leg ulcers (VLUs) and diabetic foot ulcers (DFUs) with a duration of 8 weeks to 24 months
- Wound depth up to 20mm
- Non-infected wounds with exudate levels requiring a filler and standard secondary dressing
- Compression therapy for VLUs and offloading for DFUs as per local best practices

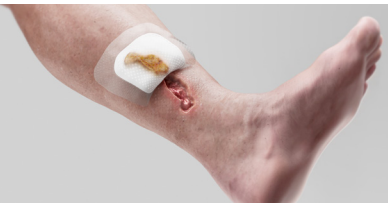
Results were evaluated after four weeks. The primary endpoint of the study was wound area reduction (WAR). The study found that there was a greater mean reduction in WAR for patients using Biatain® Silicone (54.3%) compared to SOC (43%). These results were not statistically significant ($p>0.05$) and showed that Biatain Silicone was equally effective as the two dressing regimen. The secondary

1. Vogeli, D., Clinical performance and cost effectiveness of a Silicone foam with 3DFit™ Technology in chronic wounds compared with standard of care: An open randomised multicentre investigation. Accepted for publication IWJ, 2024

endpoint of this study was the total treatment cost during the investigational period (i.e., number of dressings and unit costs in £). [Editor's note: £1 equals approximately $1.86 CDN.] The study found that there was a 47% product reduction when using Biatain® Silicone (5.6 dressings) compared to SOC (10.6 dressings). This translates to an estimated mean total cost reduction of £7.1 (£14.3 for Biatain® Silicone vs. £21.4 for SOC). These results were statistically significant ($p<0.05$). This is an important finding with practical implications – a reduction in dressing products means a reduction in waste. This study demonstrated that Biatain® Silicone provides comparable clinical outcomes versus SOC while reducing workload and waste (i.e., dressings and dressing changes). Biatain Silicone was shown to be as effective and cost significantly less than the standard of care.

How Evidence Informs Practice

Colboc et al. conducted an observational (Observatoire en Ville de Plaies ExSudatives (VIPES)) study in 2024 to evaluate the effects of Biatain® Silicone on wound healing.[2] This observational study was conducted in France and involved 103 nurses and 407 patients. Specifically, 64 patients were using the Biatain® Silicone dressing. This study included both chronic (58%) and acute (42%) wounds. Mixed etiology leg ulcers and traumatic wounds were the most common (33% and 28%, respectively). Others include pressure injuries, diabetic foot ulcers, malignant wounds and surgical wounds. At baseline, a majority of the wounds had exudate pooling (69%). More than half the wounds had unhealth wound edges (52%). Some of the wounds had unhealthy periwound skin (30%). At the 22.5 day follow-up, the study found that 73% of the wounds were progressing to healing, and within that 73%, a quarter of those wounds (25%) were healed. Majority of the nurses involved found that the Biatain® Silicone dressing conformed closely to the wound bed (93%) and reported that the wounds have improved (88%). More importantly, 85% of the patients felt that their wounds have improved. This study not only demonstrates that Biatain® Silicone can support the healing of complex wounds by effectively managing the gap between the dressing and the wound bed. It also highlighted the positive patient experience. Greater dressing comfort may lead to greater patient adherence. The user-friendliness of the dressing enhances patient autonomy and potentially decreases nursing workload. The extended wear-time allows for undisturbed wound healing and decreases health care resources.



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Jordan Smart MClSc-WH BN RN NSWOC WOCC© graduated with a Bachelor of Nursing from the University of Lethbridge in 2013. He began his career in Home Care and the Wound Clinic in Lethbridge, Alberta, where he developed a deep passion for wound care. Jordan is a Clinical Nurse Specialist who support Seniors Health within Alberta Health Services. Lethbridge, Alberta, where he developed a deep passion for wound care. Jordan is a Clinical Nurse Specialist who support Seniors Health within Alberta Health Services.

2. Colboc, Hester, et al. "Performance of a silicone foam dressing in management of wounds in a community setting: a sub-analysis of the VIPES study." Journal of Wound Care 33.8 (2024): 542-553

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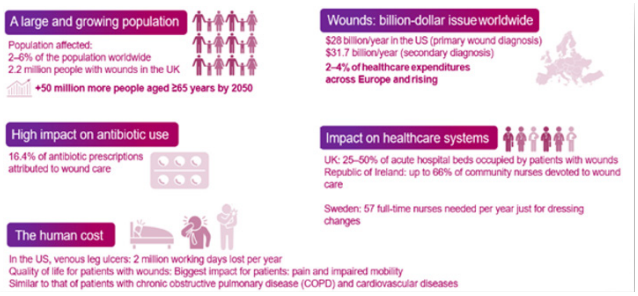
Convatec Sponsored Learning:

Evidence Over Influence; Improving Patient Outcomes With An Antibiofilm Approach

Presenters: Nancy Livada PA-C and Dr. Scarlet Milo PhD

Non-healing wounds are debilitating with high morbidity and mortality in a highly vulnerable patient population. There is increased complexity of the wound care ecosystem due to increasing direct and indirect health-care costs; increasing aging population; increasing prevalence of comorbidities (e.g., diabetes, obesity); and increasing antimicrobial resistance.

Despite recent advances in wound care treatments, the number and global prevalence of hard-to-heal wounds is rising.[1] Hard-to-heal wounds are not only costly to health-care systems but burdensome for patients and their families.



The Problem: Biofilm

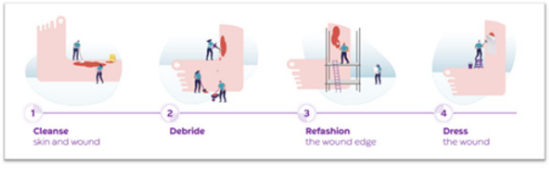
In March 2019, a group of international wound care experts convened to identify barriers and opportunities to drive broader adoption of biofilm-based wound care. At this meeting, the relatable concept of 'Wound Hygiene' was born. Although other underlying host factors may be hinder healing, it was increasingly acknowledged that biofilm is a key barrier to healing.[2-3] A meta-analysis by Malone et al. demonstrated that biofilm was reported in 78.2% of chronic wounds.[4]

Biofilm consists of mixed communities of bacteria and other microorganisms living together under a slimy protective layer known as extrapolymeric substance (EPS). EPS is made of sugars, proteins and extracellular DNA and are held tightly together by metal ions.[5,6] Biofilms can cause persistent low-level inflammation in wounds and delay healing.[7] They can be present at any point of the wound infection continuum. They are difficult to visualize and to remove at point of care and can reform within 24 hours after sharp debridement.[8] Approximately 80% of bacteria in the natural world exist as biofilm (either attached to a surface or each other).[9] Biofilm has been estimated to account for 80% of chronic infections in humans.[9] In other words, biofilm is more common than you think!

The Solution: The Wound Hygiene Protocol

In March 2020, the Journal of Wound Care published a consensus document on Wound Hygiene. This document reframed the way HCPs talk about wounds by shifting from identifying wounds as "chronic" to "hard-to-heal" to illustrate the potential for successful outcomes with appropriate care.[1] Experts also developed a four-step, back-to-basics protocol (i.e., Wound Hygiene) to standard care to reduce microbial burden.[1]

1. **Cleanse** (wound and surrounding skin)
2. **Debride** (initial debridement, as well as maintenance)
3. **Refashion** (the wound edge)
4. **Dress** (the wound with biofilm-targeted management)

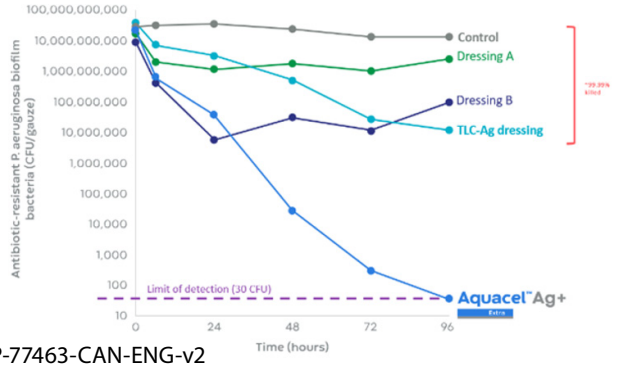


An Antibiofilm Dressing As Part Of The Wound Hygiene Protocol

Aquacel® Ag+ was specifically engineered to overcome wound biofilm. It combines two powerful technologies – the Hydrofiber® technology and the More Than Silver™ technology. The Hydrofiber® technology allows the dressing to form a cohesive gel that absorbs and retains exudate, inflammatory proteases, debris, micro-organisms[11] and disrupts biofilm.[12] It provides a moist wound healing environment and facilities autolytic debridement. The More Than Silver™ technology contains three important components:

- A surfactant (benzethonium chloride) to weaken the biofilm matrix[13]
- A chelating agent (EDTA) to disrupt biofilm's EPS by removing metal ions that hold it together[14-15]
- Ionic silver (broad-spectrum antimicrobial).

These components work synergistically to weaken and break down biofilm and allow the ionic silver to kill exposed micro-organisms more efficiently.[12] Convatec has tested the efficacy of Aquacel® Ag+ on simulated wound biofilm models. These models often contain different bacterial biofilm grown on a piece of gauze and are saturated with simulated wound fluid and attached to simulated skin.[16] They have been validated at an independent, accredited lab for repeatability, reproducibility, and robustness and are more stringent and sophisticated than other conventional in vitro models (e.g., CDC Biofilm Reactor, Colony Drip Flow Reactor). Using these wound models, Aquacel®Ag+ has been shown to be more effective in eradicating MRSA and Klebsiella pneumoniae dual-species biofilm after five days than competitive, silver-only dressings.[16] Although some competitors may claim that their dressings can reduce Pseudomonas aeruginosa biofilm in vitro by 99.99%, Meredith et al. demonstrated that such claim only tells part of the story.[16] Using the aforementioned wound models, Meredith et al. showed that Aquacel® Ag+ can completely eradicate P. aeruginosa biofilm after 96 hours while competitor dressings did not.[16]



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References available on request

For more information on Convatec please click here: www.convatec.com

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Nancy Livada PA-C is a Physician Associate in the U.S. with many years of wound care experience. She now heads up Global Medical Education in Advanced Wound Care for Convatec, where her mission is to provide exciting and ethical wound care education to healthcare providers around the world.

Dr. Scarlet Milo PhD is a Medical Scientific Liaison at Convatec, with a PhD in Biophysical Chemistry and over a decade of experience spanning scientific research, clinical education, and strategic medical affairs. Her work bridges R&D, marketing, and clinical practice, with a strong focus on improving patient outcomes through evidence-based innovation.

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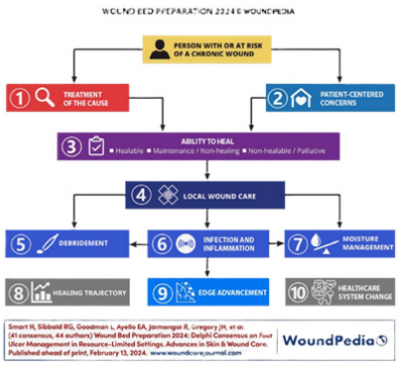
Essity Sponsored Learning:

Wound Wisdom: From First Steps To Mastery

Presenters: Rosmary Hill RN BSN CWOCN FNSWOC WOCC(C), Amanda Sowiak RN BN NSWOC WOCC(C) and Korina Owen RN MClSc-WH NSWOC WOCC(C)

Wound Bed Preparation

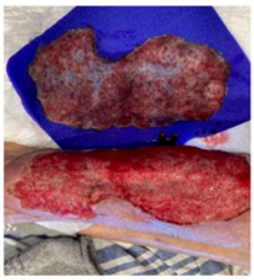
The Wound Bed Preparation (WBP) paradigm was first introduced in 2001 and has gone through periodic updates since then.[2] The most recent update was published in 2021 with a focus on wound management in low-resource settings (see figure below).[3] The WBP is a structured approach to wound healing. It encourages clinicians to identify and treat the cause of the wound and to address patient-/family-centred concerns.[2] It also highlights the importance of determining the patient's ability to heal.[2] The WBP outlines the steps to consider when providing local wound care – debridement, inflammation/local infection, moisture balance and edge advancement, based on the healability of the patient and wound.[2]

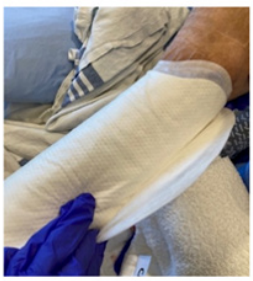


How Hydrofera Blue® Products Fit Within the WBP: Hydrofera Blue® (HFB) products contain two antimicrobial compounds that are non-cytotoxic – gentian violet and methylene blue (GVMB).[4] HFB provides clinicians with "a suite of multifaceted, intuitive, and cost-effective products for a range of wound care needs".[4] The following real-life cases showcase how HFB addresses all four aspects of local wound care outlined in the WBP.

Debridement and Moisture Balance

A 92-year-old female patient sustained a traumatic leg injury resulting in a large hematoma. The patient had a history of atrial fibrillation and was managed with an anticoagulant. The patient underwent surgical debridement of the wound in the operating room and was treated with negative pressure wound therapy (NPWT) for 10 days. Hydrofera Blue® Transfer was utilized prior to discharge. Hydrofera Blue Transfer® is made of open-cell, polyurethane foam and can handle high amount of exudate while maintaining a moist wound bed.[4] Debris and necrotic tissue can be seen on the dressing upon removal. There is no periwound maceration observed, highlighting the dressing's ability to manage moisture balance in the wound.

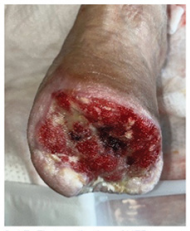




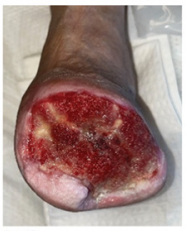
If additional moisture control is required, clinicians can consider the use of Cutimed® Sorbion® XL as a secondary dressing. This super-absorbent dressing is equipped with Hydration Response Technology, where exudate is absorbed and "locked away" vertically. Both the Hydrofera Blue Transfer® and Cutimed® Sorbion® XL can be used under compression therapy.

A 71-year-old female patient underwent a transmetatarsal amputation of the left foot as a result of extensive gangrene. On examination, the wound was quite deep; necrotic tissue can be seen in the wound bed; and periwound maceration was evident. Hydrofera Blue® CLASSIC Heavy Drainage was utilized under NPWT to manage this wound. After one week of treatment, the wound depth was significantly reduced. There was a greater proportion of healthy

granulation tissue in the wound bed. The periwound skin was no longer macerated.



Oct 7: First application of HFB CLASSIC HD under NPWT
Wound size: 7.0 cm x 6.5 cm x 2.3cm

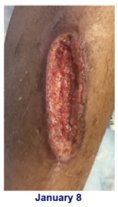


Oct 15:
Wound size: 6.5 cm x 6.0 cm x 0.5 cm

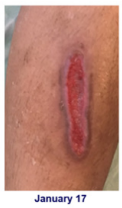
Inflammation, Local Infection And Edge Advancement

A 30-year-old female patient sustained a laceration on their leg. At first, the wound was locally infected and was managed with a hypertonic dressing and a secondary absorbent dressing. Hydrofera Blue® CLASSIC was used approximately three weeks later. Unlike the READY, Hydrofera Blue® CLASSIC is made of polyvinyl alcohol (PVA) foam. This PVA foam exerts negative pressure naturally and can facilitate autolytic debridement. The GVMB infused in the foam reduced bioburden in the wound as evident in the photos. The dressing also flattened the periwound edges, further facilitating wound healing.

A male patient with a history of diabetes and right leg amputation presented with a pressure injury as result of an ill-fitting prosthetic. Upon initial assessment, the wound had significant undermining. Upon using Hydrofera Blue® CLASSIC for two weeks, the undermining was reduced significantly. A month later, an infection led to breakdown near the initial wound; however, there is no undermining observed in the initial wound itself.



January 8



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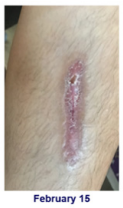
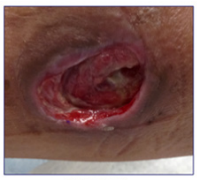
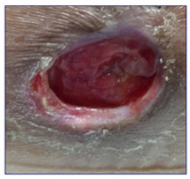


February 15

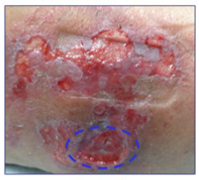
Given its antimicrobial properties, clinicians involved continued to use Hydrofera Blue® CLASSIC in this case. Once the local infection was under control and the exudate level decreased, the dressing was switched to Hydrofera Blue READY Border until wound closure.



March 6
Undermining at 6 o'clock: 1.5cm



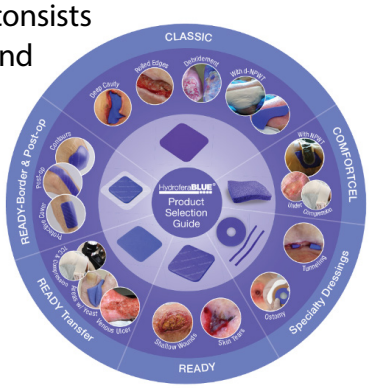
March 20
Undermining at 9-11 o'clock: 0.3cm



April 10
No Undermining

Hydrofera Blue® - The Swiss Army Knife of Wound Dressings:

The wide range of Hydrofera Blue® products offer versatility to address unique wound care needs and patient circumstances. It is like a Swiss Army knife in a clinician's wound care toolkit. As mentioned in the cases above, HFB products can be used under compression therapy (e.g., Jobst® FarrowWrap) as well as total contact casts. Anecdotally, it has been used in conjunction with topical oxygen therapy and advanced regenerative matrix. HFB also offers specialty dressings, such as the Tunneling and Ostomy dressings for tunneling wounds and peristomal ulcerations. The Hydrofera Blue® READY Border dressing consists of a silicone adhesive border and allows for atraumatic dressing changes and is particularly useful in managing painful wounds.[4]



References available on request

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Rosmary Hill RN BSN CWOCN FNSWOC WOCC(C) has devoted 35 years to nursing and has been recognized with the Award of Excellence in Practice from the Association of Registered Nurses of British Columbia.

Amanda Sowiak RN BN NSWOC WOCC(C) is with the Blood Tribe Department of Health Inc., as a Wound Care Specialist and Educator. She graduated from the University of Calgary and Mount Royal conjoint nursing program in 2003. She provides best practice care for the Kainai community.

Korina Owen RN MClSc-WH NSWOC WOCC(C) is a Clinical Nurse Specialist in Wound Care based out of Mount Sinai Hospital in Toronto.

Presentation Digest is a production of Wounds Canada.

Mölnlycke Sponsored Learning:

The Progress Over Perfection: Taking the First Step in Pressure Injury Prevention

Presenters: Rosemary Hill RN BScN NSWOC

Pressure injuries (PIs) are among the most costly and preventable adverse events in healthcare. Their development can significantly impact patient outcomes, prolong hospital stays, and increase the burden on health-care systems. Prevention requires a proactive, structured approach that integrates clinical best practices, education and organizational support.

Impact Of Pressure Injuries

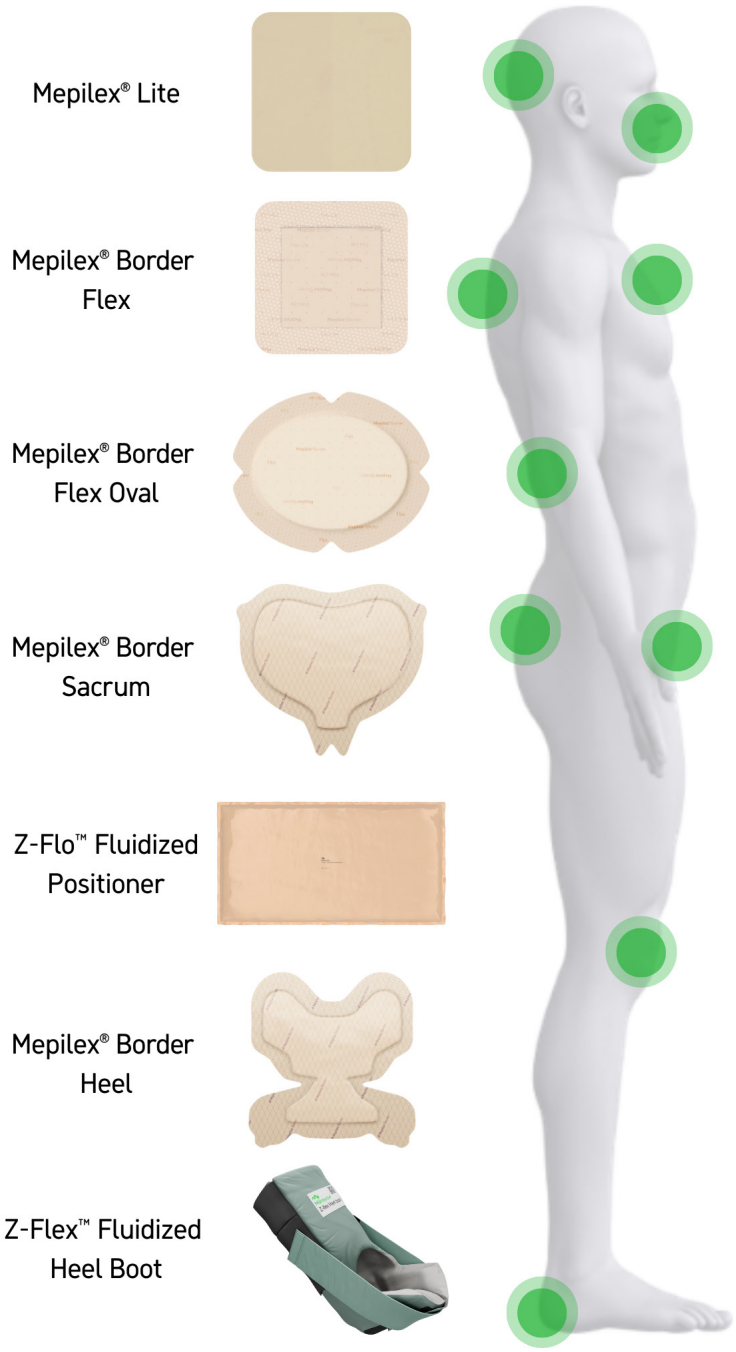
PIs are painful and can lead to serious complications (e.g., osteomyelitis, sepsis) and long-term disability especially at the higher stage (i.e., Stage 3 or 4). The Canada Patient Safety Institute (now Healthcare Excellence Canada) designates Stage 3 or 4 PI acquired after hospital admission as a "Never Event". Prevalence remains high across care settings: 25.1% in acute care, 29.9% in long-term care, 22.1% in mixed health-care settings, and 15.1% in community care. In Ontario, Hospital Acquired Pressure Injury (HAPI) treatment costs can range from $44,000 for Category/Stage 2 to $90,000 for Category/Stage 4. In 2019, it was estimated that HAPI-related cost could exceed $26.8 billion annually in the United States. About 59% of those costs were attributable to Stage 3 and 4 full-thickness wounds (13.3% of patients), which occupy significant clinician time and hospital resources.

Prevalence Study

Effective PI prevention begins with understanding risk factors and implementing evidence-based strategies. A prevalence study is often the first step, helping teams identify patterns and prioritize interventions. Pre-study safety huddles can help shift the culture from blame to learning. Multidisciplinary teams – including wound champions/NSWOC, repositioners, and data recorders – play a key role in data collection and patient assessment. Accurate staging and risk assessment are essential. Tools like the Braden Score help clinicians evaluate risk, while visual aids and training materials support consistent documentation.

Repositioning patients every 2-3 hours, using appropriate support surfaces, and offloading pressure from vulnerable areas (especially heels and sacrum) are foundational practices in pressure injury prevention. Equity in care is also essential. Studies have shown that people with darker skin tones are more likely to develop higher stage PIs across health settings. Clinicians are encouraged to use proper lighting, palpation, and patient-reported symptoms rather than relying solely on visual redness. It's also equally important that clinicians educate themselves on how pressure injuries present in darker skin tones to ensure early detection and timely intervention. Building this awareness is a critical step toward eliminating disparities and strengthening prevention efforts across all patient populations.

Getting started with pressure injury prevention often means confronting systemic barriers - like a culture of blame, limited awareness, and resistance to change. These challenges can stall progress and discourage collaboration. Successful teams overcome them through strong leadership,



structured education, open communication, and access to quality equipment. Prevention isn't the responsibility of one person or role - it requires a coordinated, team-based approach. When everyone is informed, empowered, and supported, prevention becomes achievable and sustainable. Pressure injury prevention is not a one-time initiative, it's a sustained, proactive commitment to patient care. With the right tools, consistent training, and strong leadership, healthcare teams can make measurable progress toward safer outcomes. Preventative care is the quiet force that turns potential tragedies into invisible victories. When done right, there are no alarms or emergencies - just the quiet success of something not happening. Its power lies in its subtlety, measured not in dramatic interventions, but in the crises that never occur.

Pressure injury prevention isn't a one-product solution or a one-time initiative. It's a continuous, team-driven effort, where clinical practices, education, teamwork, and the right tools all work together. When teams are informed, empowered, and aligned, prevention becomes part of the culture, not just a task. It's time to make prevention a priority - quietly but powerfully reducing harm before it begins. For more information on implementing prevention strategies and available solutions, reach out to your local Mölnlycke representative.

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References available on request

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Rosmary Hill RN BSN CWOCN FNSWOC WOCC(C) has been a nurse for over 35 years and is the recipient of the Award of Excellence in Practice from ARNBC. She works at Lions Gate Hospital as a Nurse Specialized in Wound Ostomy and Continence (NSWOC). unit patients compared to no dressings: a randomized controlled parallel-group trial.

Perfuse Medtec Sponsored Learning:

The geko® Device: The Body Of Evidence Continues To Grow

Presenters: Dr. Robyn Evans BSc Med CCFP FCFP, Dr. Keith Harding CBE FRCGP FRCP FRCS FLSW, Dr. Gary Sibbald MD MEd DSC (Hon) FRCPC (Med (Derm) FAAD MAPWCA JM and Dr. Michael Stacey MBBS FRACS Doctor of Surgery

Failure of the calf muscle pump is one of the main contributing factors to venous insufficiency and Venous Leg Ulcers (VLUs). Optimal compression and calf muscle activation are paramount to achieving wound healing in these patients. However, not all patients can tolerate or are indicated for compression – for example, patients may have reduced ABPI (but >0.5) or congestive heart failure that require cardiologist evaluation.*

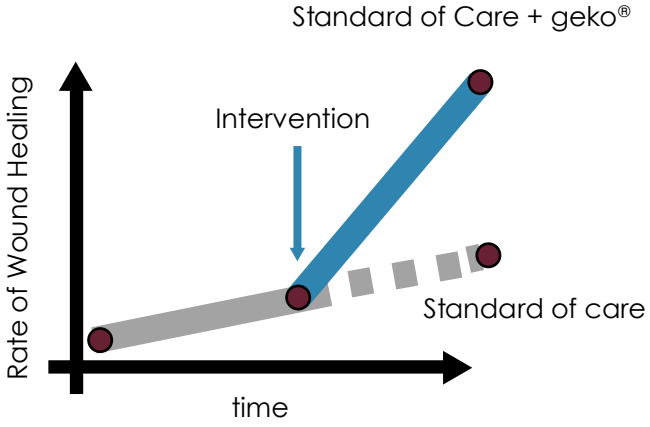
According to the Canadian Consensus Statement (CCS) on the Management of VLUs* such patients may benefit from lower compression plus the use of a muscle pump activator (MPA or geko® device).* For patients who are not able to tolerate any compression at all, the CCS suggests the use of geko® with the aim to progress toward adding lower compression and then optimal compression.*

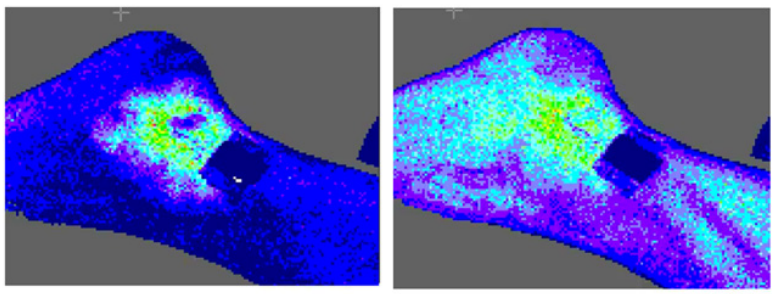
It is also recommended that, when there is no wound size reduction in 2-4 weeks or if the reduction is less than 30% at 4 weeks after initiating treatment, clinicians should add geko® to the management plan if it's not already in place.*

What Is geko® Wound Therapy And How Does It Work?

The geko® wound therapy device is lightweight (10g) and is the size of a wristwatch. It is self-adhesive and is easy to apply, whether by the patient or a caregiver. It is worn for 12 hours/day and geko® stimulates the common peroneal nerve to deliver 1Hz of painless stimulation that results in isometric muscle contraction to the lower leg. This causes the foot to move outwards (evert) and upwards (dorsiflex). In essence, it addresses the issue related to an inadequate calf muscle pump to move fluid and blood (60% of what is achieved by walking).

Studies have shown that geko® has beneficial effects on blood circulation in patients with ischemic ulcers, diabetic foot ulcers (DFUs) and VLUs. The geko® can increase arterial and venous blood flow in major vessels (both in volume and velocity) when patients were assessed with ultrasound. It has also been demonstrated that geko® can increase microcirculatory perfusion not just to the wound bed but to the periwound area (as seen in the figure under laser speckle contrast imaging).





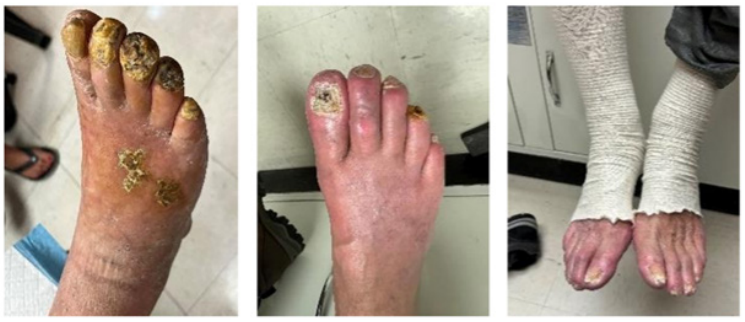
The Growing Body Of Evidence

Bull et al. published a randomized controlled study in 2023 to evaluate the change in rate of wound healing when geko® was added to the standard of care (SoC) in the management of VLUs.* Subjects enrolled in the study received SoC for 28 days.* Subjects were then randomized into two groups – one continued with SoC while the other received SoC plus geko® for 12 hours/day for another 28 days.* The study found that there was a greater than 2.2 fold increase (see figure) in healing rate for the group with SoC plus MPA compared to the SoC group.* A statistically significant reduction of pain was observed in the group with MPA as well.* Murray et al. (Ontario) in 2025 demonstrated similar results – the prospective cohort with SoC with MPA had a shorter mean healing time compared to the retrospective cohort with SoC alone (40 days vs. 77 days, p=0.005).*

Case Study (Courtesy: Dr. G. Sibbald)

A male patient between the age of 70-79 y.o. presented to clinic with multiple areas of necrotic wounds on his right foot. Patient had multiple comorbidities, including peripheral vascular disease, congestive heart failure, chronic anemia and alcohol-related hepatitis. He has had a bilateral femoral artery stent procedure in August 2023 and had been receiving home nursing care for 3-4 months.

A below knee amputation had been suggested before he was first seen by Dr. Sibbald in September 2023. At that time, the patient had extensive pain (15/10) and could not tolerate the foot being touched. He had been sitting/sleeping on the couch with his legs dependent due to pain. He was unable to go up the stairs nor drive. The patient was treated with a tubular compression garment, with 12 hours of the geko® alternating with nitroglycerin 0.4mg for 12 hours. By Jan 2024, his pain improved (8/10) and could tolerate regular sharp surgical debridement of his wounds. His pain was managed with acetaminophen, pregabalin and nortriptyline. By November 2024, his pain was infrequent (only for a few seconds). He was out of the wheelchair and ambulating. All toe ulcers had healed.



Sept 2023 | Jan 2024 | Nov 2024

Dr. Michael Stacey MBBS FRACS Doctor of Surgery is a vascular surgeon at Hamilton Health Sciences and Professor at McMaster University.

Dr. Robyn Evans BSc Med CCFP FCFP is the Medical Director of the Wound Healing Clinic at Women's College Hospital and a full-time family physician in the community.

Dr. Keith Harding CBE FRCGP FRCP FRCS FLSW retired from Academic and Clinical practice in the United Kingdom in 2022 and was appointed as an Independent member of the Cardiff & Vale University Health Board in January 2023.

Dr. Gary Sibbald MD MEd DSC (Hon) FRCPC (Med (Derm) FAAD MAPWCA JM is a professor of Medicine and Public Health at the University of Toronto and an international wound care key opinion leader (educator, clinician and clinical researcher).

**** References available on request***

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Solventum Sponsored Learning:

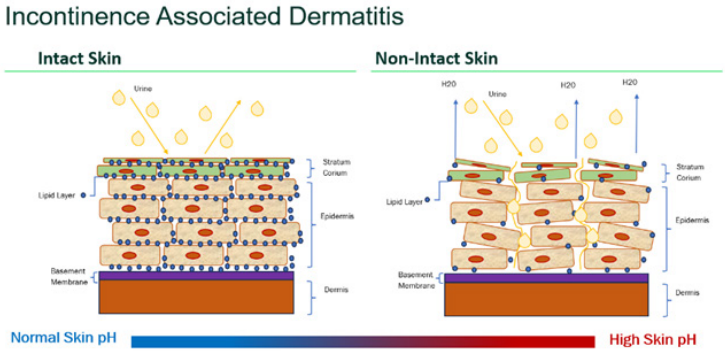
Relieving the Pressure: Innovative Approaches To Preventing and Treating Pressure Injuries

Presenters: Britney A Butt MCISC-WH BScN RN NSWOC WOCC© and Michael N Desvigne MD CWS FACS FACCWS

Pressure injuries (PIs) are localized damage to the skin and/or underlying tissue which commonly occur over a bony prominence or under medical or other devices.[1] PIs can be present below intact skin or as a painful, open ulcer.[1] Sustained tissue loading leads to ischemic, cellular and inflammatory changes, causing tissue damage.

There are intrinsic and extrinsic factors that contribute to the development of PIs. Literature demonstrates a moderate statistical association between excessive skin moisture and the development of new PIs. The presence of moisture may impact the type of load and increase the susceptibility and decrease the tolerance of skin.[2-4]

Prolonged moisture exposure macerates the skin and weakens its ability to act as a protective layer. The skin's natural pH is slightly acidic, typically ranging from 4.5-5.5. This acid mantle helps maintain a healthy microbiome and provides protection against irritants and harmful microorganisms. Urine has a more neutral pH (5.5-7.0). Incontinence can therefore raise the skin's pH and weaken its natural defense. This causes the skin to be more permeable to irritation and infection and dehydrates the skin via an increase in transepidermal water loss (TEWL).



Clinically, moisture associated skin damage (MASD) is often misidentified as PIs. Studies have demonstrated that MASD was incorrectly identified as PI in 44.3% of assessments.[5-6] Similarly, incontinence associated dermatitis (IAD) often mimics Stage 2 PIs (i.e., partial thickness skin loss; blister or shallow ulcer).[1] Practitioners must accurately assess the etiology of skin lesions, whether it's pressure, moisture or both, and address them accordingly.

Topical Prevention And Management Of Incontinence Associated Dermatitis:

Solventum offers various products to prevent and manage IAD, which in turn support PI prevention. 3M™ Cavilon™ No-Rinse Skin Cleanser is a surfactant that can lower surface tension between a liquid and a solid. This is useful for removing stool and urine compared to water alone. 3M™ Cavilon™ Durable Barrier Cream is an occlusive that forms a physical barrier and traps moisture on the skin. The hydrophobic nature repels water and prevents it from evaporating, thereby reducing TEWL. Cyanoacrylates, such as 3M™ Cavilon™ Advanced Skin Protectant, are synthetic adhesives that cure quickly and form a waterproof barrier.

Using Negative Pressure Wound Therapy (NPWT) Through The Continuum Of Care:

NPWT can help prepare the wound bed. Solventum™ Veraflo™ Therapy provides instillation of topical wound treatment solutions while delivering NPWT. This helps soften and solubilize non-viable tissue. The unique, three-layer design of the Solventum™ Veraflo Cleanse Coice™ Dressing facilitates removal

of thick exudate material and provides mechanical debridement. These are particularly useful for cases when surgical debridement must be delayed or is not possible or appropriate.

Surgical site infections (SSIs) is the number one hospital-acquired infection in the United States. SSIs are associated with increased hospital stay and cost. Incisional management is paramount to prevent SSIs and improve healing outcomes. Solventum™ Prevena™ Peel and Place Incision Management System provides up to seven days of continuous NPWT at -125mmHg.[7] This system helps hold incision edges together, reduces lateral tension for sutured or stapled incisions and removes fluid and infectious material from the incision.[7]

Additionally, Solventum™ V.A.C.® Peel and Place Dressing provides more efficient and effective NPWT for patients. Its unique design can reduce dressing changes by up to 67% per week and reduces application time by up to 61% (ready to apply in less than two minutes).[8] Compared to traditional Solventum™ V.A.C.® Dressings, V.A.C.® Peel and Place Dressing has been found to provide 2.4-times greater granulation tissue thickness and 33% greater wound volume reduction.[8]

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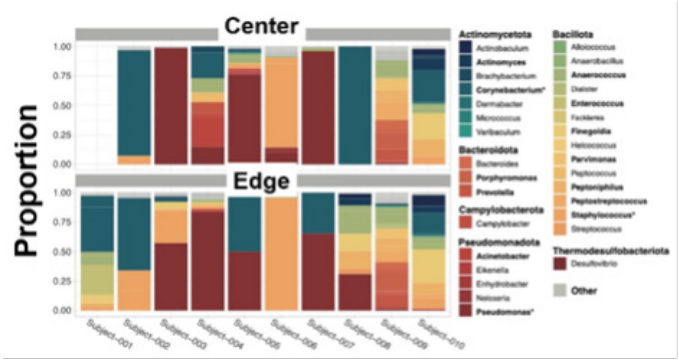
Urgo Medical Sponsored Learning:

What is Slough And What To Do About It?

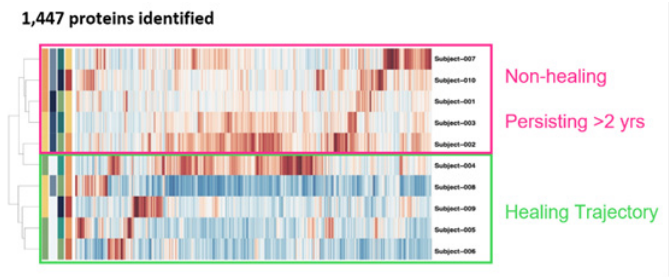
Presenters: Dr. Lindsay Kalan PhD and Christie Cowan RN NSWOC WOCC(C)

What is Slough?

Slough is devitalized tissue commonly found in acute, and especially hard-to-heal/chronic wounds.[1,2] It is a, "complex mixture of exudate proteins, degraded extracellular matrix proteins, white blood cells and multiple species of organisms in planktonic and biofilm phenotypes".[3] The clinical appearance of slough is highly variable and can range in consistency, colour, odour, and attachment to the wound bed.[1] The presence of slough does not necessarily indicate healing trajectory.[2]



Kalan et al. collected samples of "yellow" tissue from ten wounds and evaluated the appearance of the slough, microbial burden, microbial taxonomic composition and host protein composition.[2] They found that the slough samples had high bioburden and were polymicrobial.[2] They also discovered approximately 1,500 types of proteins in the samples, including an abundance of bacterial proteins indicative of metabolic activity.[2] The slough protein profiles were different depending on the healing outcome: Samples from persistent, non-healing (>2 years) wounds demonstrated a greater amount of proteins related to immune activation, inflammation and cell motility.[2] Whereas in healing wound samples, a greater proportion of proteins related to skin growth, gene expression and metabolic and biosynthetic processes were observed.[2]



Why Do We Care So Much About Slough?

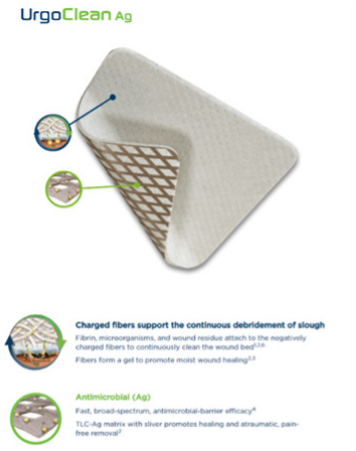
Slough in the wound is like weeds in the garden – it takes up space and saps nutrients from the wound, and stalls healing. Slough contributes to wound bioburden and facilitates biofilm formation.[3] It also contain a high concentration of pro-inflammatory regulatory proteins which causes excessive or prolonged inflammation.[3]

Regular weed removal is essential to a healthy garden; Similarly, slough must be continuously removed (i.e., debrided) for proper wound healing to occur. Wound debridement can reduce microbial and non-microbial components; promote new tissue grow; reduce inflammation; and improve effectiveness of topical treatments.[3] In essence, regular debridement removes the barriers that stall, or delay wound healing.

The Concept Of Integral Debridement:

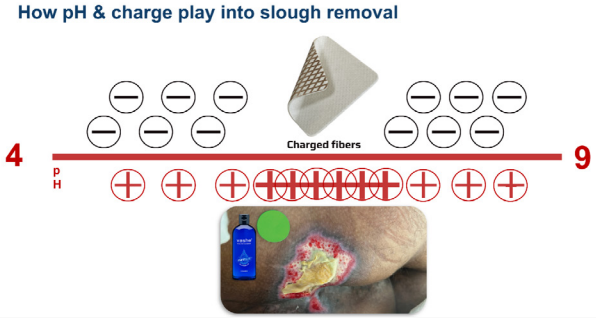
Conservative sharp wound debridement (CSWD) is long considered the 'gold standard'. However, CSWD requires practitioner expertise, and is not always indicated. It can be painful for the patient and must be performed regularly (weekly or more) to promote wound healing.[4] Moreover, studies have shown that biofilm and associated wound debris begin to reform

in 24 hours after sharp debridement.[5-7] Enzymatic debridement is costly and requires frequent dressing changes. Mechanical debridement can be painful. Autolytic debridement is slow and can be costly and wasteful. Standalone debridement is simply not enough to combat bacterial growth and biofilm formation. Integral debridement is the use of different methods of debridement on the same wound (e.g., CWSD with autolytic debridement).[3] It emphasizes a holistic, patient-centered approach to wound healing. The choice of debridement must be effective, accessible to patients and caregivers, easy to perform by practitioners and comfortable for the patients.[6]



UrgoClean Ag™is a dressing that contains charged fibres that can support continuous debridement of slough. The negatively charged fibres interact with the positively charged necrotic debris (i.e., slough) via electrostatic attraction.[8-10] UrgoClean Ag™ has a higher density of negatively charged particles compared to other alginate and hydrofibre dressings on the market,[11] rendering it more effective in slough removal. UrgoClean Ag™ also consists of a technology lipidocolloid (TLC) matrix which creates a bio-friendly gel that promotes healing and atraumatic, pain-free removal while maintaining its integrity up to seven days.[8-10] UrgoClean Ag™ is infused with silver and has been found to reduce 99.99% of biofilm in just 24 hours and blocks biofilm reattachment for up to 7 days.[8-10] It has also been found to improve wound healing after two weeks, reduce exudate level and increase healthy granulation tissue and reduce slough and necrotic tissue in three weeks.[10]

As part of wound hygiene, wound cleansing should be performed prior to (and after) wound debridement. Wound cleansing can minimize bioburden and eliminate surface contaminants.[12] Vashe®, a pure hypochlorous acid (pHA) wound cleanser, can be used to amplify various standalone debridement. Vashe®-soaked gauze can be applied to soften necrotic tissue. At a pH of 5.5, Vashe® can create a more acidic wound environment, "super-charging" the positively charged slough, making it easier to remove by negatively charged dressings (e.g., UrgoClean Ag™).



References available on request

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Dr. Lindsay Kalan PhD has always been interested in microbial interactions. During part of her PhD work, she studied how antibiotics are made in the environment. She first got exposed to the field of microbiology as an undergraduate student at the University of Alberta in Canada.

Christie Cowan RN NSWOC WOCC(C) has over 15 years of nursing experience. She has been an NSWOC since 2017 and has been a RN since 2009.Her career blends both community and acute care settings, providing her with a comprehensive understanding of patient needs across various environments

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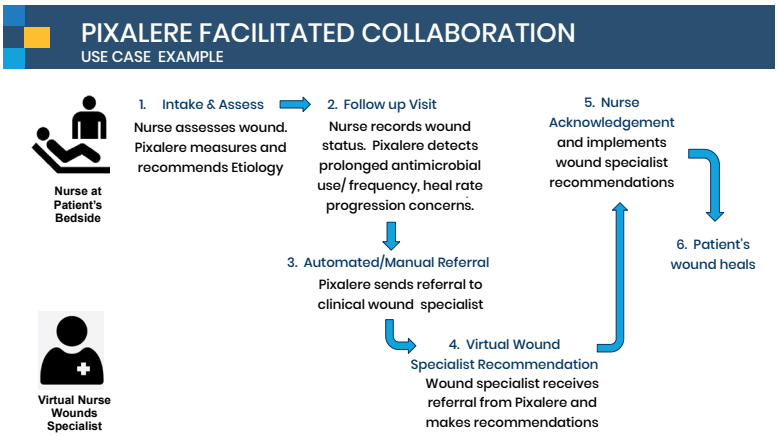
Pixalere™ Sponsored Learning:

How Digital Wound Management Technology Has Transformed Clinical Practise and Patient Health Outcomes

Presenters: Dr. Sharon Goodwin, RN, DHA

Healthcare systems worldwide face a growing shortage of wound care specialists, leading to delayed treatments, higher costs and poorer outcomes. There is an urgent need for digital health solutions that improve productivity, knowledge sharing, mentorship, and best practice adoption to enhance results for patients and providers.



Pixalere™ Decision-Support Platform

Pixalere™ is an advanced digital wound and skin management solution inspired by clinicians to streamline workflows, facilitate asynchronous and synchronous collaboration and support evidence-based decisions.

Pixalere™ uses a rules-based, protocol-driven approach to wound care with escalation triggers and product selection pathways. Unlike generic EMRs, it enables detailed wound assessments, dynamic care plans, automated AI wound measurements, image tracking and embedded decision support essential for consistent, high-quality care based on best practise guidelines.

This workflow example demonstrates how Pixalere supports collaboration between nurses and wound specialists.

Dr. Sharon Goodwin RN DHA is a senior health care executive with broad-based health and community experience in the hospital, community, telehealth and primary health care, in both the private and public sectors. Sharon is a registered nurse with a doctorate in healthcare administration and was awarded the prestigious national award for Nursing Leadership in 2020, from the Canadian College of Health Leaders.

Benefits of Pixalere™

Pixalere™ enables the centralization of wound care expertise, improving access, productivity, and clinician satisfaction. Specialists spend less time travelling and more time providing expert care and mentorship. For example, at Interior Health, Wound Specialist productivity rose from 7 to 52 visits per day. Improved healing rates enhance patient outcomes, quality of life, and engagement in care. Pixalere™ integrates with existing EMRs and supports product formulary management, cutting wound care costs by up to 40%. Its remote collaboration tools empower rural clinicians with timely specialist guidance, advancing equitable access to expert care.

References available on request

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MIMOSA Sponsored Learning:

Imaging: The Catalyst for Change in Wound Care Delivery

Presenter: Dr. Karen Cross MD PhD FRSC

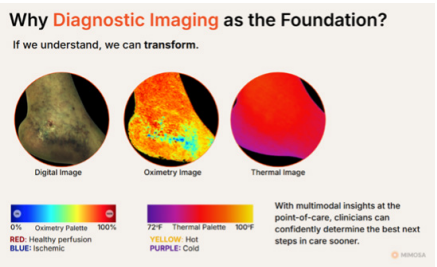
The Wound Care Challenge[1-5]

Patients living with wounds often have to wait for months if not years to see a specialist – clinicians are often overwhelmed by the volume of patients they manage. Clinicians have been found to spend 40% of their time on documentation.. There is also an overwhelming amount of data.

The Power of Diagnostic Imaging[6-12]

Imaging technologies enable clinicians to confidently connect the right patients to get the right care at the right time. The standardization of mammography for breast cancer screening in 1985 was monumental. Mammography made it possible for breast cancer to be detected and treated earlier, thus lowering mortality rates. It also allows clinicians monitor treatment progress and make adjustments as necessary.

Arterial duplex ultrasound is considered the gold standard for non-invasive peripheral arterial disease (PAD) detection. However, it is not always accessible. Non-invasive testing, like ankle-brachial index, is the often the next-best option. The sensitivity for ABI in detecting PAD is like flipping a coin (57%).



What if there was technology analogous to mammography in wound care? What if tissue perfusion can be measured and visualized at the bedside? What if clinicians can make prompt treatment decisions based on assessments at point-of-care.

MIMOSA Diagnostics – Making The Invisible, Visible[13]

The MIMOSA Pro is a US FDA and Health Canada approved handheld imaging device that delivers 4 insights to wound care clinicians at the point of care. In seconds, the non-contact device can capture tissue oxygenation (perfusion), thermography (potential infections & high pressure areas), wound measurement (wound area reduction), and an HDR digital image for standardization over time. From assessing pressure injuries and monitoring diabetic ulcers to guiding offloading strategies, the MIMOSA Pro empowers clinicians to make confident, data-driven decisions about next steps in care. Clinicians also report that the device enhances patient engagement, as real-time visualizations help patients see the immediate effects of treatment. In one hyperbaric oxygen therapy clinic, integrating the MIMOSA Pro led to a 37% increase in patient engagement.

References available on request

To access the full presentation, click here:

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Dr. Karen Cross is a Surgeon Scientist at Dalhousie University and the Innovator in Residence at the Nova Scotia Health Authority (NSHA). She provides expertise and assistance to NSHA to advance innovations in medicine and surgery throughout the continuum of care. She is a Plastic, Reconstructive & Aesthetic Surgeon with a specialization in Advanced Tissue Injury & Wound Care.

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NanoTess Sponsored Learning:

Catalyzing Change: When Clinicians Unite, Innovation Thrives

Presenters: Dr. Dante Morra MD MBA, Dr. Robyn Evans BSc Med CCFP FCFP, Megan Leslie BSc BCom, Rosemary Hill RN BSN CWOCN FNSWOC WOCC(C) and Michele Smith ACP BHSc

Disruption in healthcare can be uncomfortable, even intimidating, but it's also where transformation begins. Canada has the talent to lead, not just adopt, and Canadian-made solutions are proving that innovation born here can set global standards in wound care.

Minimizing Evaluation Overlap; Lean On Your Peers

An important step to adopting innovation is to minimize evaluation overlap. As a starting point, lean on your peers and leverage resources that have already been created by other systems (e.g., CLWK sheet) and focus on patient impact by reaching out to colleagues on where they have evaluated and seen the most benefit. Secondly, if you want to further enrich the clinical insight for the versatility and opportunity to impact patient outcomes; diversify your evaluation in different areas of practice along the continuum of care.

Dr. Dante Morra MD MBA is the Founder and Chair of the CAN Health Network. He has revolutionized how Canadian medtech companies succeed in the health-care sector, fostering innovation and economic growth.

Dr. Robyn Evans BSc Med CCFP FCFP is the Medical Director of the Wound Healing Clinic at Women's College Hospital. She is also a full-time family physician in the community.

Megan Leslie BSc BCom holds two degrees in Mechanical Engineering and Finance. Her professional work experience has focused on designing and implementing enterprise-wide strategy and workforce transformations.

Rosemary Hill RN BSN CWOCN FNSWOC WOCC(C) has devoted 35 years to nursing. Her contributions to the profession have been recognized with the Award of Excellence in Practice from the Association of Registered Nurses of British Columbia.

Michele Smith ACP BHS has over 15 years of experience as an advanced care paramedic, community paramedic, and healthcare leader at Alberta Health Services.

Implementing Innovation

Every great innovation comes with a change management process for adoption. Implementation of innovation in healthcare rarely fails because of science but because of scale. Every team, every region, every clinician has a unique context – policies, supply chains, training, even skepticism. The power of innovation is not when it stays as a pilot project or in endless evaluation phases but when it actually becomes a part of everyday practice. Small wins are better than big launches. Change is like wound healing. It isn't one single event – it's a cascade of carefully coordinated steps. Innovation is in our hands to keep Canada at the forefront of health-care excellence!

Peer references available on request

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The Association Between Sleep Disorders And Diabetes-related Foot Ulcers

By Jonathan Brocklehurst MIRL MRCPod MSc

How to cite: Brocklehurst J. The association between Sleep disorders and diabetes-related foot ulcers. Wound Care Canada. 2025;23(2): 84-90. DOI: 10.56885/226564qeshlx

Diabetes-related foot ulceration (DFU) is a disabling global health issue which can significantly impact an individual's health-related quality of life (HRQOL), standard of living and risk of lower limb amputation. Sleep disorders are complex and may contribute as a predictive factor to indicate the likelihood of developing a DFU and impact across the different stages of wound healing: haemostasis, inflammation, proliferation and maturation.

Chronic sleep deprivation is a frequently associated symptom of sleep disorders with various effects on pathophysiological processes. This important health issue has garnered political attention in recent years paving the way for future health-care reform in this area. In 2019, The Department of Health and Social Care in the United Kingdom prioritised sleep health within its consultation document: *Advancing our health: prevention in the 2020s*. The shift towards incorporating sleep health into the existing health-care system is crucial to the prevention and management of chronic conditions, such as DFUs. Understanding the associations between sleep disorders and DFUs is arguably vital to the implementation of a holistic and effective multi-disciplinary care plan for patients with the goal of improving overall health-care outcomes.

Sleep Disorders

Sleep disorders are defined as a spectrum of conditions which may affect sleep quality, timing and duration, limiting an individual's ability to properly function when they are awake.[1] Sleep time, sleep efficiency and wakefulness after sleep onset comprise the key attributes of sleep quality.[2] Sleep time with oxygen saturation is a key symptom of sleep disordered breathing which can lead to hypoxia, an important risk factor for impaired wound healing.[3,4] There are various treatments depending

on the type of sleep disorder. For example, Restless Legs Syndrome is often treated with gabapentin or dopamine agonists.[5] Insomnia, however, is currently reported to be the most prevalent sleep disorder and is treated with either Cognitive Behavioural Therapy and/or medication.[5,6]

Importantly, the spectrum of sleep disorders is wide ranging and encompasses various pathophysiological complexities often requiring multi-disciplinary interventions.[7] For example, the National Institute of Neurological Disorders and Stroke has classified Restless Legs Syndrome (RLS) as both a movement condition and a sleep disorder.[8] Moreover, sleep disorders have also been reported to impact the development of systemic conditions such as cardiovascular disease.[9] This can have a significant consequential impact on a person with diabetes' sleep-related QoL and standard of living.

DFUs are defined by Van Netten et al. (2020) as a "break of the skin of the foot that involves, as a minimum, the epidermis and part of the dermis in a person with currently or previously diagnosed diabetes mellitus, usually accompanied by associated comorbidities such as peripheral neuropathy, peripheral arterial disease (PAD) and chronic kidney disease in the lower extremity".[10,11]

The most common precipitant of DFUs is accidental trauma; there are many processes and factors which contribute to defective healing.[12] A recent review of causes, prevention and management of DFUs spotlighted "predisposition, precipitation and perpetuation" as suitable subcategories for factors which may contribute to the development and continued morbidity of DFUs.[13] In other words, factors that may contribute to susceptibility, triggers and the continuation of a disease. In this case, DFUs. This paper will employ these three stages to explore the association between sleep disorders and DFUs using inference to the best explanation.

Table 1: sleephealthfoundation.org.au/

Sleep Disorders
Sleep Aphnea
Restless Legs Syndrome
Parasomnias
Cicadian rhythm disorders
Insomnia
Disorders of Hypersomnolence

Predisposition: How might sleep disorders contribute to the *susceptibility* of an individual to the occurrence of DFUs?

Results from a study in 1999 by Spiegel et al. highlighted that sleep deprivation may be a risk factor for the development of insulin resistance by the impairment of glucose tolerance through the activation of increased night-time cortisol levels by the hypothalamic– pituitary–adrenal axis.[14] Therefore, these impaired metabolic processes may increase an individual's susceptibility to DFU-related comorbidities such as peripheral neuropathy and atherosclerosis.[15,16] Therefore, sleep disorders, alongside other intrinsic and extrinsic factors such as PAD and inadequate footwear respectively, may predispose an individual with high blood glucose levels to DFU occurrence.[17-19]

Sleep disorders, such as RLS, may predispose a person with diabetes and peripheral neuropathy to mechanical or trauma-related injuries (i.e., DFUs).[20] These wounds are typically detected on vulnerable tissue situated on arthritically prominent joints such as the 1st Metatarsophalangeal Joint (MTPJ) or dorsal aspects of interphalangeal joints (i.e., the second toe) as symptoms are reported to worsen at night when monitoring and visibility are reduced.[21] 'Habitual foot tapping' has been reported in the literature as an associated symptom of RLS.[22]

Table 2: Khalil et al. (2020)

Most prevalent sleep disorders associated with diabetes:

1. Unspecified sleep apnea
2. Obstructive sleep apnea
3. Restless Leg Syndrome

A systematic review by Khalil et al. (2020) revealed a high prevalence of sleep disorders for individuals with diabetes, however, there was reportedly considerable heterogeneity in the overall literature.[23] This could be in part due to the variety of sleep disorders, including the differences between variations of the same condition such as unspecified and obstructive sleep apnea.[24] These nuances reveal the limited existing primary evidence assessing these sleep disorders and need to investigate the association of, and differentiate between, individual sleep disorders (i.e., unspecified sleep apnea) and DFUs.[25]

Existing evidence has established the most prevalent of sleep disorders associated with diabetes: unspecified sleep apnea, obstructive sleep apnea and restless leg syndrome.[23] According to estimates from a literature-based analysis of the global burden and prevalence of sleep apnea, nearly 1 billion adults aged between 30–69 years worldwide may have a diagnosis of obstructive sleep apnea, and the number of people with moderate to severe obstructive sleep apnea is estimated to be almost half that figure at 425 million.[26] Further, obstructive sleep apnea has been associated in existing literature with higher levels of inflammation, insulin resistance and negative impact on beta cell activation in patients with type 2 diabetes.[27,28]

Further research is required to establish the most prevalent of sleep disorders in patients with DFUs. Moreover, establishing primary data on the topic could precede a unique point of discussion on limb preservation for the International Working Group on the Diabetic Foot in the future.

Precipitation: How may sleep disorders contribute to factors that could *trigger* impaired wound healing of DFUs?

Sleep disorders which involve an element of repetitive trauma or mechanical force have been documented in the literature to trigger impaired DFU healing.[4] This may have a significant consequential impact on a person with diabetes' HRQOL and standard of living, as anxieties over uncontrollable health-related factors such as RLS may cause negative impacts on an individual's long-term mental health.[29-31]

Previous research has explored the effects of sleep deprivation on wound healing processes such as haemostasis with results concluding that chronic sleep deprivation may delay thrombin generation activity in plasma.[32] This is important for understanding the precipitation of DFUs as the delay of the haemostatic processes and negative impact on the cardiovascular system could increase the likelihood of infection and precipitate further complications.[33]

However, previous studies have alluded to the oscillating interactions of sleep disorders and impaired haemodynamics, endothelial function and coagulation, suggesting that it may challenging to determine a direct cause and effect sequence.[34] A psychometric tool may aid clinicians to determine the extent to which sleep disorders directly or co-operatively trigger impaired DFU healing, however, robust evidence is required to support this.[35]

Further, existing studies have suggested that sleep disturbances can cause alterations in glycaemic control.[36,37] A recent systematic review by Lane et al. (2020) concluded that hyperglycaemia increases the likelihood of lower extremity amputation in patients with DFUs.[38] The association between poor glycaemic control and the precipitation of DFUs is well documented in the literature.[39] Therefore, it could be inferred that the conflation of sleep disorders, hyperglycaemia and mechanical pathogenesis could precipitate DFUs and perpetuate delayed healing.[40] This suggests that sleep disorders are supplementally

important in the advocation of limb preservation.

Current research has pointed to the association between sleep and inflammation as bidirectional; for example, inflammatory activation can affect the quality of sleep through overproduction of pro-inflammatory mediators, such as prostaglandins and cytokines and vice versa.[41] Therefore, the communication between the central nervous system and immune system are critical to counteracting the inflammatory process of wound healing.[41] It could be inferred therefore, that by improving the balance of this bidirectional relationship between sleep and inflammation, DFU healing outcomes could be optimised. However, studies investigating these inferences are required to establish the extent of the impact of sleep and haemostasis or inflammation on DFUs.

Perpetuation: How might sleep disorders contribute to the *continuation* and *chronicity* of DFUs?

While studies investigating the association between sleep disorders (i.e., sleep apnea) and diabetes are important, establishing the association between individual sleep disorders and DFUs is vital for limb preservation.[19,23,42] For example, the American Diabetes Association has suggested that conditions affecting blood glucose levels overnight, such as The 'Dawn Phenomenon', waning insulin and the Somogyi effect, could be linked with long-term sleep disorders.[43] This was supported by a recent study in China investigating sleep-disordered breathing which concluded that, "Sleep fragmentation" may be a strong predictor and perpetuator of DFU recurrence.[4] Further, an existing study by Maltese et al. (2018) concluded that elevated obstructive sleep is associated with a continuation of poor healing in DFUs.[44] Therefore, it could be inferred that dysregulated blood-glucose levels, sleep fragmentation and continuation of delayed DFU healing could be interlinked, however, primary literature is required to support this inference.

Sleep fragmentation may contribute to the continuation of impaired DFU alongside other behavioural factors, such as diet and metabolic conditions such as diabetes mellitus, affecting local immune response.[4] The concept of interactions between biological and behavioural risk factors contributing to the perpetuation and recurrence of DFUs is supported in existing literature.[45] These factors collectively can create conditions for decreased production of regulatory proteins such as interleukin-2 which boosts the immune system, while increasing the production of proinflammatory cytokines which promote inflammation.[46] Assessing sleep disorders in relation to other crucial factors such as diet and existing comorbidities may assist clinicians and multi-disciplinary teams to holistically address individuals with DFUs by targeting areas of regression in sleep hygiene and diet collectively to improve wound healing outcomes for individual's with DFUs.[44] This could be achieved by introducing a psychiatrist and dietitian into existing multi-disciplinary diabetic foot teams in acute settings.[47,48] The inclusion of these two areas of health-care expertise could lead to pathways involving long-term specialist care plans from mental health dietitians.[49]

While sleep disorders themselves are integral to this discussion, it should be noted that psycho-socioeconomic biobehavioural factors are important in framing the different contexts and perspectives influencing the perpetuation of these conditions.[50]

For example, recent studies have found sleep disorders to be closely linked with environmental determinants such as safety, neighbourhood disorder, noise and pollution levels.[51] These complex factors are intrinsically linked to the onset of sleep disorders and require occupational assessment and psychological intervention to improve sleep health outcomes.[52]

Future studies integrating these factors into the association between sleep disorders and DFUs is important in forming a detailed appreciation of the influencing role of different contexts and perspectives in this area.

Table 3: Vision for future MDFT

Multi-disciplinary diabetic foot team (MDFT)
Consultant Diabetologist
Vascular Surgeon
Diabetes Specialist Podiatrist
Psychiatrist
Dietitian
Tissue Viability Nurse
Diabetes Specialist Nurse
Microbiologist
Orthotist
Plaster room technician

A study by Earley et al. (2014) suggested that sleep disorders affecting the lower limb such as RLS may have pathogeneses of iron deficiencies and neural damage in the brain, peripheral sensory neuropathy, hypoxemia and hypoxia.[53] In turn, these etiologies may perpetuate immune deficit and a loss of protective sensation from invasive external stimuli.[53] Therefore, DFU healing is likely to be delayed, creating wound bed conditions which may be conducive to biofilm formation and infection.[54,55]

Conclusion

Existing evidence spotlighting the wide-ranging impact of mental health on DFU outcomes and limb preservation has revealed an upsurge in diagnosed sleep disorders, particularly since the Covid-19 pandemic.[56]

The association between multifaceted pathophysiology of sleep disorders and the predisposition, precipitation and perpetuation of DFUs is complex with limited existing studies requiring further research.[13] Primary studies investigating the association between DFU-related sleep disorders, such as unspecified sleep apnea, obstructive sleep apnea and RLS are crucial to establishing international guidelines to advocating limb preservation in this area.[57] Moreover, larger sample sizes are required to establish more meaningful data highlighting the association between sleep disorders and the development or exacerbation of DFUs.[58]

This could be achieved through the establishment of a psychometric tool to evaluate a patient's perception of their own sleep hygiene and overall mental health at various stages of their DFU care, in view of the association between sleep disorders and DFUs.[33] Scrutinization of the validity and reliability of such a psychometric tool could provide a foundational basis for clinical application and future preliminary case studies.[59]

Therefore, an initial scoping review of the literature is required to define the nature and scale of the evidence along with a detailed appreciation of the influencing role of different contexts, intersectionality, vulnerability and perspectives in this field.[60] This will allow for the identification, prioritization and categorisation of DFU-associated sleep disorders to be addressed and the interpretation of the resulting evidence and the validation of research methods and findings.[61]

Finally, the need to educate and promote sleep health in DFU management is crucial to efforts by multi-disciplinary teams and individual clinicians to advocate limb preservation for enhanced HRQOL in the long-term.[62]

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Reframing Amputation Prevention: A Call For Earlier Action In Wound Care

By Cassandre Voltaire DO ABWMS

How to cite: Voltaire C. Reframing Amputation Prevention: A call for earlier action in wound care. Wound Care Canada. 2025;23(2): 92-94. DOI: 10.56885/579516iidzpj

Despite advances in wound care technology, diabetic foot amputations remain persistently high. A growing body of research suggests that delayed vascular assessment plays a significant role in poor outcomes. Early vascular intervention, improved patient education on offloading and stronger interdisciplinary collaboration can help reduce preventable amputations.

So Many Lost Limbs

In medicine, there are moments when we fool ourselves into believing we have solved a problem, only to find that the problem has quietly evolved, adapting to our solutions. We have better tools, sharper imaging and more advanced dressings than ever before. And yet, the amputations continue. The numbers do not celebrate our progress; they confront us with a paradox: How can we have come so far, yet lost so many limbs?

For years, it seemed logical that advancements in wound care—better dressings, imaging and offloading techniques—would naturally lead to fewer amputations. We have more tools than ever to manage diabetic foot ulcers. Shouldn't' that mean fewer limbs lost?

And yet, the statistics tell a different story. Diabetic foot-related amputations remain alarmingly high, with some studies indicating that up to 85% of lower limb amputations are preventable with timely intervention.[1] If technology alone is't solving the problem, what's missing?

A Pattern That Keeps Repeating

A closer examination of patient care patterns reveals a consistent issue: intervention happens too late. Patients often see multiple providers before a thorough vascular assessment is conducted. Throughout this process, they may receive antibiotics, undergo surgical debridement and try various dressings—yet their underlying circulation issues may go unaddressed. By the time ischemia is recognized, treatment options become more limited. This delay

is a critical failure, as early vascular intervention has been shown to dramatically improve wound healing rates and reduce amputation risk.[2]

The Cost of Delay: A Deeper Look

It is tempting to assume that when a patient loses a limb, it was inevitable. That there was no moment in time when a different choice—an earlier vascular referral, a clearer explanation of offloading—could have changed the course of events. But this assumption is dangerous because it excuses inaction. Studies suggest that early arterial screening and intervention could reduce major amputations significantly.[3] Yet, vascular assessments are often overlooked, delayed, or deprioritized amid other pressing concerns. If we are serious about prevention, we must challenge the systems that allow these delays to persist.

What Needs To Change?

- *A non-healing wound is a vascular emergency until proven otherwise.* If a diabetic foot ulcer isn't improving within four weeks, it's not just slow healing—it's a red flag. The Society for Vascular Surgery emphasizes the need for early arterial screening, as timely revascularization can significantly reduce the risk of major amputation.[3]
- *Offloading isn't a given—it's a continuous conversation.* Patients may receive total contact casts, walkers or specialized footwear, but that doesn't mean they're using them consistently. Research suggests that patient adherence to offloading devices is often lower than clinicians estimate.[2] True offloading requires reinforcement at every visit, assessing for proper use and ensuring that education translates into action.

A Shift in Mindset: Wound Care As Vascular Advocacy

Diabetic foot ulcers are't just wounds; they are symptoms of systemic dysfunction—vascular disease, neuropathy and metabolic imbalance. Managing the wound without addressing circulation is like treating smoke while ignoring the fire.

As wound care providers, we must become active vascular advocates. This means:

- Making vascular screening routine—not an afterthought.
- Escalating care the moment healing plateaus—not waiting for ulcers to worsen.
- Strengthening collaboration across specialties so patients receive comprehensive care.

Early vascular intervention
+
Patient adherence
+
Interdisciplinary collaboration
=
fewer amputations

Key Takeaways: Reframing Amputation Prevention

- *A Non-Healing Wound is a Vascular Emergency.* If a diabetic foot ulcer isn't improving within four weeks, vascular status must be evaluated immediately.
- *Routine Vascular Screening Must Be Standardized.* Delayed vascular assessment leads to preventable amputations. Early revascularization improves healing rates and reduces major amputations.
- *Offloading Compliance Needs Continuous Monitoring.* Patients often underuse offloading devices, which significantly impacts healing. Reinforcing proper use at every visit increases adherence and better outcomes.
- *Stronger Collaboration Between Specialties is Critical.* Many patients aren't referred for vascular evaluation soon enough. A team approach, including wound care specialists, primary care providers, endocrinologists and vascular surgeons, is essential.

- *We Must Shift The Mindset From Wound Treatment To Root Cause Management.* Treating wounds without addressing circulation is ineffective. Wound care providers must advocate for earlier intervention and interdisciplinary care.

Simply stated; early vascular intervention plus patient adherence plus interdisciplinary collaboration results in fewer amputations.

Conclusion

We have the knowledge, research and technology to intervene earlier and more effectively. But systemic delays, lack of routine vascular screening and gaps in interdisciplinary communication are costing patients their limbs.

Amputations don't have to be inevitable. They will continue to happen unless we shift our mindset from treating wounds to treating the underlying causes of poor healing.

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* Compared to 3M traditional NPWT foam dressing.

3 Source: Allen D, Robinson T, Schmidt M, Kieswetter K. Preclinical assessment of novel longer-duration wear negative pressure wound therapy dressing in a porcine model. Wound Rep Reg. 2023;31:349-359. Information contained within conducted animal studies has not been evaluated by the U.S. Food & Drug Administration.

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Appropriate Bedding On Low Air Loss Mattresses: A Clinical Practice Change

By Paulette Dugas RN IIWCC and Nancy Kuta-George RN IIWCC

How to cite: Dugas P, Kuta-George N. Appropriate bedding on low air loss mattresses: a clinical practice change. Wound Care Canada. 2025;23(2): 96-99. DOI: 10.56885/060080jmokdg

The intent of this article is to share an academic project for the International Interdisciplinary Wound Care Course (IIWCC). The project was to develop a practice change in appropriate bedding on Low Air Loss Mattresses (LALM) in Long-Term Care (LTC) facilities within the authors' catchment areas in Nova Scotia (see Table 1).

Background

In some LTC facilities, it was observed that a lack of consistent approaches to appropriate bedding used on LALMs exists. Linen layers have the potential to impact skin microclimate in the following ways; by reducing airflow, affecting pressure redistribution, increasing friction coefficient, drying or macerating skin and increasing skin temperature.[1]

Table 1 Project Catchment Areas:
Nova Scotia Eastern Zone: Eastern zone of Cape Breton in the Cape Breton Regional Municipality
Western Zone: Queens and Lunenburg Counties

When inappropriate bedding is applied to LALMs, there is a high risk of complications, such as moisture associated skin disorder (MASD) and pressure injuries (PIs).[2] It was identified that there was a knowledge gap among members of the multidisciplinary team regarding inappropriate bedding that was often found on the mattresses.[3] Recognizing this gap, from knowledge to practice, was the starting point for the project.

The International Interdisciplinary Wound Care Course (IIWCC)
The International Interdisciplinary Wound Care Course (IIWCC) is a comprehensive educational program designed for wound care specialists. It aims to translate new evidence-based knowledge into practice and is based on adult learning principles. The course consists of two mandatory educational sessions, self-study modules, and skills workshops. It is accredited by the University of Toronto's Continuing Professional Development (CPD) and is open to practitioners with a health professional degree or a minimum of five years of relevant experience. The course is delivered by wound care experts and is based on evidence-informed practice. For more information visit: https://woundpedia.com/iiwcc/

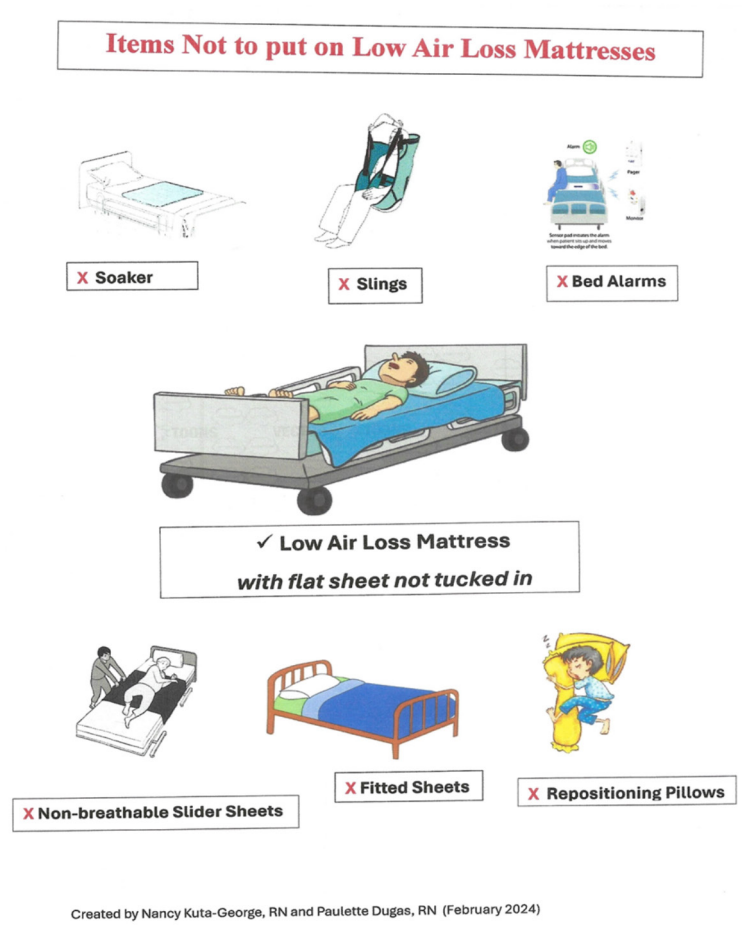
Methodology

A meeting with the LTC management team was held and approval to support the project was agreed upon. A four-week implementation plan was established, and a polling questionnaire was developed to give further insight into the gaps that existed. The questionnaire was completed with different levels of staffing in the chosen LTC facilities.[4] A total of 51 surveys were distributed to staff pre- and post-education sessions on LALMs. (See Appendix A.)

A 'Staff Enabler' was developed to put at the bedside to reinforce the inappropriate application of bedding on LALMs (see Figure 1).

A post-questionnaire was distributed to staff following the education sessions. (See Appendix B.) Random monthly audits were conducted for a period of four months to capture the number of layers of bedding on the surfaces. (See Appendix C.)

Figure 1 Staff Enabler: Items Not To Put On Low Air Loss Mattresses



On-site training was prepared and delivered by a product specialist, and on numerous occasions hands-on participation involving staff and residents was completed.[5,6] Videos and online materials were provided to the sites for staff unable to attend the onsite sessions.[6,7]

Results

The results of an initial audit identified that there was a 100% failure, with most of the surfaces having fitted sheets and quilted soaker pads. Feedback from staff identified that hands-on training sessions at the bedside were the most effective. Staff expressed that barriers to practice included the lack of interest in self-directed online learning and the lack of time available for online learning during the workday. The survey prior to the implementation of education sessions identified only 11 individuals answered all questions correctly and 24 responded correctly on what sheets to use on a low air loss mattress.

Forty-two surveys were completed post-educational sessions, with 27 individuals answering all questions correctly. Seventy-four per cent of participants answered correctly on what sheets to use on a low air loss mattress. This showed an increase of 50% in correct answers for the appropriate bedding, indicating our education program had achieved a measurable level of success. Staff reported that their overall knowledge had increased due, in part, to the continued support and guidance which we provided as reinforcement of the best practice at the bedside.

Implications For Practice

The staff identified their knowledge, and confidence had increased through continued support and guidance. Clinical practice change can be a challenge, and it was our experience that these challenges were experienced due to inconsistencies with staffing and a lack of communication and transfer of knowledge. This project reinforced the need for ongoing monitoring and support to staff if practice change is to be sustained. The next phase of implementation will be conducting future surveys,

using resources such as Survey Monkey™, to capture more stakeholders, such as shift workers, casual staff, and travel nurses. Overall, this project required a great deal of work and effort to implement but was rewarding, with a positive result.

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Appendix A

Pre-Education Survey Data Sheet
(pre-education survey)
Low Air Loss Mattress Polling Questions
(51 surveys completed)

Please choose the appropriate answer for each of the following questions.

11 surveys answered all questions correctly

1. What is a low-air loss mattress used for?
   a. To allow for easy transfers while in bed
   b. Used to prevent and treat pressure injuries (49)
   c. When a resident does not want a firm mattress
   d. All of the above (2)

Number of correct answers = 49/51 (96%)

2. True or False?
   All residents should be on a low-air-loss mattress.

Number of correct answers = 46/51 (90%)

3. Which of the following sheets are appropriate to use on low air loss mattresses?
   a. Fitted sheets (11)
   b. Quilted reusable soaker pads (0)
   c. Flat sheet not tucked in (12)
   d. All of the above (28)

Number of correct answers = 12/51 (24%)

4. The tiny holes found in the low air loss mattress serve what purpose?
   a. To provide the client with a fan effect (1)
   b. To adjust the mattress to accommodate the residents over 250 pounds
   c. To keep the skin dry and wick away moisture (46)
   d. All of the above (4)

Number of correct answers = 46/51 (90%)

Appendix B

Post-Education Survey Data Sheet
(post-education survey)
Low Air Loss Mattress Polling Questions
(42 surveys completed)

Please choose the appropriate answer for each of the following questions.

27 surveys answered all questions correctly

1. What is a low-air loss mattress used for?
   a. To allow for easy transfers while in bed
   b. Used to prevent and treat pressure injuries (40)
   c. When a resident does not want a firm mattress
   d. All of the above (2)

Number of correct answers = 40/42 (95%)

2. True or False?
   All residents should be on a low-air-loss mattress.

Number of correct answers = 39/42 (93%)

3. Which of the following sheets are appropriate to use on low air loss mattresses?
   a. Fitted sheets (5)
   b. Quilted reusable soaker pads (0)
   c. Flat sheet not tucked in (31)
   d. All of the above (6)

Number of correct answers = 31/42 (74%)

4. The tiny holes found in the low air loss mattress serve what purpose?
   a. To provide the client with a fan effect (0)
   b. To adjust the mattress to accommodate the residents over 250 pounds
   c. To keep the skin dry and wick away moisture (40)
   d. All of the above (2)

Number of correct answers = 40/42 (95%)

Appendix C

Random Monthly Audits
Random Monthly Audits counting the number of layers of bedding on surfaces

- February – 2 facilities with total of 18 low air loss mattresses = 100% failure

(mostly had quilted soaker pads and fitted sheets)

- March – 2 facilities with total of 18 low air loss mattresses = 44% failure

(this was done after the staff education, beds still had quilted soaker pads, fitted sheets, and a sling used for mechanical lift transfers)

- April – 2 facilities with total of 16 low air loss mattresses = 38% failure

(beds continued to have quilted soaker pads, some fitted sheets and blankets provided by family members)

- May – 2 facilities with total of 19 low air loss mattresses = 53% failure

(higher number of travel nurses noted this month at one facility, as well as beds continued to have quilted soaker pads and fitted sheets.)

Mepilex® Up has better fluid handling capacity than other foam dressings[1]*. This means it can contribute to:

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*When comparing lab test result for Smith & Nephew Allevyn Gentle, Coloplast Biatain® Sillicone NB, Convatec Aquacel® Foam, Essity Cutamed® Siltec®, according to EN13726:2023 annex E

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Using Indigenous Knowledge To Improve Persons Quality Of Life When Living With Skin Conditions: A Qualitative Narrative Inquiry

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How to cite: O'Donnel L, Kuhnke JL, Bierenstiel M, Taylor C, Walsh A. Using Indigenous knowledge to improve persons quality of life when living with skin conditions: a qualitative narrative inquiry. Wound Care Canada. 2025;23(2): 101-109. DOI: 10.56885/768174vnppjz

Background

Traditional medicine and herbal therapies have been used for centuries for the treatment of skin disorders. More than one in four Canadians live with a chronic skin condition, such as actinic keratosis, psoriasis, rosacea and skin cancer.[1] For these conditions there are different treatments (e.g., oral, topical [cream, lotion, soap], injectable) for patients and their care providers to consider, including prescription medications,[2] over-the-counter drugs, natural and herbal folk medicines.[3,4] Of interest to this study is the role of birch bark extracts that have been used around the world "in traditional and folk medicines"[5] for conditions such as acne.[3]

Folk medicine producers and researchers have a long history of engaging in the creation and use of skin care extracts (e.g., topical creams, ointments).[3,7,8] Some medicines are based on the rich history of using birch bark from trees (genus Betula) which has shown great utility for treating skin conditions in societies of temperate and boreal climate zones.[9,10] Researchers also acknowledge that some herbal and folk medicines have scientifically-confirmed effects but have yet to undergo high, quality clinical trials.[3]

Territorial Acknowledgement

The authors respectfully acknowledge that they live, work and play in Mi'kma'ki, the ancestral and unceded territory of the Mi'kmaq People.

In Canada, production of natural health products (NHP) is regulated by Health Canada to ensure safe, high quality and effective use through production and labelling.[11] Each NHP is identified by species, part of species and processing method either under NHP or cosmetic regulations. Currently, there are more than 60 birch species known with different methods of obtaining birch extracts from various parts of these trees, such as from bark, root and leaves.[3,12] Commonly used terms such as birch bark extract, birch oil, or birch bark oil often complicate accurate assessments as the chemical composition and thus medicinal modes of actions can vary greatly.[9] Despite the wealth of knowledge of birch extract (Betula Pendula) for skin treatments (creams, ointments, soap and lotion), this may not be comprehensive, as traditional, Indigenous folk medicines utilizing birch bark extracts have been under-reported and under-researched.[3,13]

Maskwio'mi: maskwi = birch, o'mi = gathering or oil

Studies (in vivo) have identified birch bark extract as being used to treat a variety of skin conditions including epidermolysis bullosa (EB),[14-17] actinic keratosis,[3,18,19] superficial burns[20] and burns requiring partial-thickness skin grafts, with up to 28-days healing,[21] as well as surgical skin lesions,[2,23] dry skin,[24] diabetes-related wounds[24,25] and necrotizing herpes zoster.[27]

In Atlantic Canada, maskwio'mi, is known as a traditional Indigenous skin remedy of the L'nu (Mi'kmaq) people.[13] It is a way to bring western and L'nu ways of knowing together, and understand the benefits of traditional medicine.[28,29] L'nu peoples' stories state the traditional birch bark remedy was based in bear grease or goose fat.[13] Today, birch bark extract is prepared by harvesting the bark (see Figure 1) and then traditionally preparing it by a pyrolytic process using a 'can-over-can' fire method with the outer bark of Betula Papyrifera, commonly known as paper birch.[13,30] The bark is thermally broken down in a low oxygen environment inside a metal container and as a viscous oil called maskwio'mi; it drips out at the bottom of a perforated container into a receptacle. This oil is the concentrated form of the extract and subsequently co-formulated into creams or soaps in concentrations of 1-15 weight percentage (wt%). Maskwio'mi is a complex, organic matrix consisting of over 200 chemical compounds, it is safe for topical treatment regarding trace amounts of cresols and has shown in vitro broad-spectrum antibiotic properties.[30]

Figure 1: Harvesting birch bark in Unamak'i

As part of funding provided by the Canadian Institutes of Health Research (CIHR, 2019-2024), a team of researchers at Cape Breton University adapted the traditional 'can-over-can' Maskwio'mi production to utilize a proprietary, electric extractor method to produce birch bark extract more consistently and in larger quantities.[13] This product is regulated within the International Nomenclature Cosmetic Ingredient (INCI) category of Betula Papyrifera bark extract[31] and the Chemical Inspection and Regulation Service,[31] and is available for market in the community under cosmetic regulations, as there is no equivalent NHP entry. In the community, the birch bark extract is called maskwio'mi, the term we use in this paper.. It has been available over the counter for over four years as a cream, ointment, or soap.[32]

Aim

We sought to understand the perspectives of adults (18+) living in community and utilizing birch bark - maskwio'mi (cream, ointment, soap) - as part of their topical skin care regime, treatment and or management of a diagnosed skin condition.

Methods and Procedures

Design and Sample: This narrative inquiry study[33,34] explored the lives of individuals (adults 18+) living in community with skin conditions such as acne, psoriasis, eczema and or dry skin. Participants may have used the birch bark cream, ointment or soap. In this study, the importance of stories[35] and creating a space and place where persons could share their narrative was crucial. We also appreciate the emotional and social impacts of living with skin disorders.[36]

Individuals living in the community and utilizing maskwio'mi were invited to describe their skin care routines and journey with a skin disorder. Twelve participants (aged 18+) living with a skin condition responded to the recruitment posters. Participants resided in rural and small communities in two provinces. We collected rich data that reflected perspectives of persons living with skin issues and using maskwio'mi. As well, collecting these stories was important as we know that 'the truths' of the stories are held within the life context of the storyteller"[35] Therefore collecting data was done in a quiet place of the participants choice.

Data Collection: University Research Ethics, Indigenous Ethics Watch board and the Chief and Council of Membertou were sought and each group approved the study. Participants were recruited from May to August 2023 using purposeful sampling. We posted recruitment posters in English and Mi'kmaq languages in community pharmacies, libraries and public spaces. As well, participants learned of the study via word-of-mouth ('snowballing'). Individuals wanting to share their story in English or Mi'kmaw contacted the Research Assistant to read a Letter of Information and an Informed Consent form. Data collection included phone interviews, face-to-face interviews and field notes.[33] Interviews were in English and lasted 45-60 minutes and follow-up phone calls with participant to clarify any questions. Interviews were recorded and transcribed, read and re-read by the researchers prior and during analysis.[34]

We were deeply aware of the private nature of conversations about skin issues as participants shared suffering and shame experienced. Therefore the interviews with 12 participants were completed using a gentle, non-directive interview approach to respect the importance of stories participants chose to share. Participants could stop the interview at any time. An open-ended question format was used to initiate the conversation and build trust: "Can you share with me your experience of using maskwio'mi for your skin disorder" and "anything you are comfortable sharing?" Additional questions were asked to clarify information. Participants were also asked to provide their rating (0-4) of satisfaction with the birch bark extract (maskwio'mi) (0-not at all satisfied, 1-a little improvement, 2-moderate or some improvement, 3-a lot, 4-extreme improvement). Upon completion of the interviews, the data were transcribed verbatim and stored onto a password protected laptop. Each participant interview was saved using a code and anonymized. See Table 1 for details of each participant.

Data Analysis: Thematic analysis was used to analyze the data including reading and re-reading the stories. We used Atlas.ti to assist in the management and coding of the data.[37] Alongside this, we engaged in a constructivist, reflexive analysis as it helped to understand the co-creation of new knowledge through interaction with the participants' stories.[38-41] As well, we recognized stories are important in the interpretation of findings, hence we share stories in this study as it reflects the multiple social and health realities.[42]

Table 1: Participants Maskwio'mi Use

Person	Skin Condition(s)	Length of Product Use	Skin Symptoms	Symptom Location	Improvement Timeline	Frequency of Product Use
1	Seborrheic Dermatitis Eczema "dark spots"	One year	Dryness Itch Hot to touch	Face Fingertips Chest Back	Two days of use	Twice daily for maintenance and increase as needed during a flare up
2	"Covid spots" following Covid illness	Unknown	Red spots Flake/crusts Itch	Arms	Three to four days	Twice daily as needed
3	Rosacea Skin allergies Acne Sunburn Bug bites	Approximately 22-24 months	Redness Itch Burning Bumps	Face Feet	Immediate relief from itch following application	Twice daily for maintenance
4	Heat rash	Two years	Redness Itch Bumps	Feet Knees Hands Wrists Inner thighs	Immediate relief from itch	As needed
5	Scratches Mosquito bites Heat rash Anaphylactic rash	As needed	Inflammation	Trunk Arms Face Legs	Unknown as band aid/ dressing covered the site	As needed for inflammation
6	None	Unknown	Redness Dryness Cracks	Hands	One week	Twice daily as needed
7	General irritation Questionable Rosacea	Unknown	Redness Itch	Face	Three days	Once daily as needed
8	General irritation	One year	Redness Dryness Itch	Abdomen	Immediate relief from itch Improvement in redness in two days	Twice daily as needed
9	Atopic Dermatitis Eczema	Unknown	Itch Burning	Face Arms Trunk Knees	Immediate relief from itch Less redness and dryness within a few days	Once daily as needed
10	Tinea Versicolor Dyshidrotic Eczema	Approximately 22 to 24 months	Clear viscous fluid build-up Scaly patches Itch	Hands Wrists	Immediate relief from itch One week to soften skin	A few times per week
11	Psoriasis Arthritis	Unknown	Redness	Armpit Groin	Following three applications (once day)	As needed
12	Sun damage (unable to describe the skin's appearance)	Unknown	Dryness Flaking Pain	Scalp Ear	A few days	Twice per day routinely

Results

Participants (n=12) in this study were nine females and three males, English-speaking, non-Indigenous, aged 38 to 71 (average age 51). Ten participants lived in Nova Scotia and two participants lived in Ontario. Participants all accessed birch bark product for the self-treatment of skin conditions. Five self-reported skin symptoms while seven people described a diagnosed skin condition by a dermatologist or general practitioner.

Diagnoses included: eczema, psoriasis, dermatitis, rosacea, acne, sun damage (with surgical removal) and tina versicolor. Others self-identified as having heat rash, general rashes, bug bites, scratches and allergies. The skin conditions were located in various parts of the body, including hands, wrists, arms, axilla, face, ears, abdomen, back, groin, knees and feet. Skin symptoms included feeling hot to touch, burning sensation, itching, redness, dryness, cracking, scaly patches and pain. We did not interview any person with open wounds (e.g., burns, split-thickness grafts, epidermolysis bullosa (EB), or diabetic foot ulcers.

Results of the thematic analysis were shared in a story format. The stories suggest participants quality of life was affected when living with a skin condition and were challenged to self-treat and manage skin conditions with the plethora of options available from health-care providers, including non-prescription and over-the-counter medicines. In this study, no participants were not offered traditional medicine as part of their treatment plan. Participants described the effects of living with chronic skin condition as, "hard on their self-esteem and quality of life". They described self-care skin regimes and were hopeful when a "traditional option was offered", "like an encouraging moment in their life". Participants stated, "any of the self-treatment options do not historical include L'nu knowledge" and they were encouraged to know of access to a locally produced product (Participants stories).

Four key themes emerged from the participant stories: 1) They wanted to feel hopeful that their quality of life would improve when using a traditional medicine for their skin condition; 2) They varied in their use of the maskwio'mi depending on their skin condition; 3) They wanted to try traditional medicine as part of their self-management regimes; and 4) They provided practical feedback on traditional medicine and maskwio'mi.

Improved Quality of Life: Participants shared that living with skin condition(s) evoked feelings of shame, feeling unattractive or self-conscious, being watched or looked at in public. Participants shared that for many were unsuccessful in finding treatments to consistently manage their skin conditions. They shared that accessibility to solutions were not always affordable.

Several stated that skin care treatments, prescribed, over-the-counter, or from a private health-care, were often a financial burden. On participant stated, "many skin care regimes are not covered by my [health] benefits". As well another stated, "traditional medicine was not offered to me as an option".

Participants shared that there is a public element to living with a skin disorder and for some this was a barrier to participating in social events. This included descriptions of suffering and shame and self-blame for having a skin disorder. For example a participant shared, "When I am in a public setting, people can see me itching, the redness of my skin and inflamed areas draws attention".

One participant who was initially reluctant to try maskwio'mi shared:

> **"There is no message that the beauty industry could have to convince me that the product [birch bark extract] was worthwhile trying. It is a health-care product and that is how it should be sold; not as a beauty product. I don't have the vocabulary to describe how life changing the product was for me in my life."**

Another participant with a history of long-term facial and ear sun damage resulting in surgical removal of the damaged skin shared the following:

> **"I have had trouble with dryness on my scalp for many years. The doctor told me it was the result of long-term sun damage. As a result, I tried many products to try to keep the dryness under control. I recently tried the traditional cream and there is now definitely improvement. It used to get sore, so sore, and now it does not get at tender. As well, the tenderness is not spreading anymore. The cream keeps things under control which is fine by me. It is serving a purpose... I had a number of surgeries on my ear and side of my face from sun damage and it can get irritating. I like to think maskwio'mi helped with it too."**

Another participant kept a photographic record of their skin journey. They stated:

> **"It was crazy finding the 'before' photo because it brought me back to a dark time emotionally. It was all over my neck and there was a couple of weeks where I was self-conscious, and I would try to hide my neck during interactions in public and in meetings. I would intentionally put my hands on my neck to hide the spots…just hyper-aware and so self-conscious. I was a little depressed over it. I felt like it was just going to continue to get worse…I was really low, had low self-confidence and low self-esteem. I tried the maskwio'mi and my skin cleared. I now do not think about my skin anymore…I am more self-confident."**

Maskwio'mi Used to Respond to Individuals' Need: Participants identified as using the maskwio'mi ointment for short-term 'flare ups' of their skin conditions and using the cream and soap as a 'maintenance' product to keep the skin clear from irritation.

One participant stated, "I do find a difference between the cream and the ointment. I find the ointment is stronger and works good for the breakouts.

Eleven participants had used the soap and cream either daily or twice per day to manage their skin conditions and one participant used it three times per day.

Overall, five participants identified using a small amount of cream or ointment per application. One participant described this as, "less than a dime" while another stated, "a table spoon of ointment per month." A participant described the pattern of application as,"A dot on my forehead, cheeks, chin and rub it in. Sometimes I will dab a little on my eye lids." All participants stated they did not knowingly use any other skin care products while using maskwio'mi.

An Option to Self-Manage the Skin Condition: The participants reported a reduction in symptoms related to their skin condition upon topical application of the maskwio'mi. Improvements including, "a relief from the itch", "a soothing feeling", "less irritation on my skin", less pain when I touch my skin" and a "reduced redness". One participant further stated, "the first thing I noticed is the itch would go away, and it calmed the skin down". Another described the journey of first trying the soap that resulted in, "immediate relief. It didn't take the redness out right away, but the bumps and itch were reduced." Finally, one person stated "I tried one coat of cream over a rash and the itchiness was reduced. There was immediate relief, it was unbelievable."

The participants were asked to report on a satisfaction scale (0-4) on how maskwio'mi effected their skin condition (0-not at all, 1-a little improvement, 2-moderate or some improvement, 3-a lot, 4-extreme improvement). Seven individuals rated their skin as extremely improved (less itch, pain), two individuals rated their skin as mostly improved,

and three individuals rated it as moderate to some improvement following use of maskwio'mi. One participant stated, "…I noticed a quick improvement in the appearance of my skin….it was a matter of days! It was surprisingly very short. I would say almost immediate." The remaining eleven participants noticed an improvement over one to two weeks.

Traditional Medicine: It Plays a Role: Overall participants were satisfied with the access to and application of the traditional product on their skin. They described the consistency of the cream and lotion as soothing. One participant stated, "I really liked the feel of it, it is not greasy. It has almost a velvety texture." Another said, "sometimes I just put it on my face as a moisturizer. It spread well for a cream. Normally, I use lotion, but this spread so easily and evenly." Another participant compared it to a general over-the-counter lotion, "when lotion is applied, it warms and liquifies and moves away from where you want it. Maskwio'mi doesn't move around, it stays where you put it."

Participants who used the soap were satisfied with how their skin felt following use.

Traditional Medicine Produced Locally: Three participants were pleased that the birch bark extract – maskwio'mi product was being produced locally and that it was harvested and produced from local birch trees. One stated: "Anytime there is a natural product that comes out on the market that doesn't have long-term side effects, it piques my interest." Another stated "I think more people are headed towards traditional, alternative or natural products."

Seven participants stated they did not initially like the smell of the product. They identified it as a smoky smell. Yet, two stated they enjoyed the fragrance as, "it reminds me of my childhood, being at my grandparents where they had a wood stove." The other stated, "the first thing that occurred to me is that I like the aroma, but it is pungent." Another participant specifically purchased a fragrant cream and stated, "the fragrance is appealing; I like the lavender and sweetgrass." Overall, although some participants stated they did not like the fragrance, they would still continue to use the product.

Eleven participants had recommended maskwio'mi to a friend or family member. Three participants identified a need for others to know about the usefulness of the product.

Discussion

This study focused on sharing the voice of 12 adults who lived with a skin condition and using a traditional birch bark extract, maskwio'mi. The collected stories were of persons in two Canadian provinces. The stories shared reflect the human suffering experienced and the yearning for a treatment that works for each person's skin condition. The findings of this small, narrative inquiry study also reveal that there are social (employment), mental health and financial implications affecting one quality of life; it is these factors that impact a person's ability to self-treat and manage their skin condition (e.g., acne, dermatitis).[36]

Our results provide new insights into the lives of individuals utilizing a traditional birch bark extract, maskwio'mi as part of their skin care. The findings remind us of the human suffering, stigmatization and emotional and physical pain and loss of hope that results when living with a skin condition. We learned that participants felt empowered and hopeful, to consider using maskwio'mi in self-treatment for a wide range of diagnosed skin conditions (e.g., eczema, psoriasis, dermatitis, rosacea, acne, sun damage, tinea versicolor) and for self-diagnosed conditions, such as heat and general rashes, bug bites, scratches and allergic reactions.[3,24] It was interesting that none of the participants in this study discussed the known antimicrobial properties of birch bark extract, such as the activity against bacteria such as "gram-positive bacteria, including *Cutibacterium* acnes, *Staphylococcus epidermidis* and methicillin-resistant *staphylococcus aureus* (MRSA).[3,43] As well, none discussed the antioxidant properties of the birch bark extract; through this body of research is growing it may not be public knowledge.[43]

Quality of life: Similar to the literature, our study showed that individual's quality of life (social stigma, embarrassment, self-loathing) was affected by living with chronic skin conditions such as psoriasis[6,44-46] and acne related depression and anxiety.[47-49] The participants tendency to use complementary and alternative treatments to manage their skin disorder was purposeful, as they wanted to improve the visibility of their skin condition.[50]

In this study the participants experienced increased skin comfort through a reduction or elimination of symptoms (e.g., burning, itchiness, redness, drying, cracking, scaly patches and pain) within a few days of maskwio'mi application. Some described the reduction in skin irritation and pain as resulting in an enhanced quality of life and their ability to live day to day with less discomfort, especially in a public forum. Further, it was self-reported that their self-esteem and confidence improved as the appearance of the skin symptoms improved.

Efforts to self-treat condition: Participants strived to have the skills and products to self-manage their skin conditions and at times this was challenging.[2] Many described the journey of living with a chronic skin condition as affecting their sense of self-worth, self-esteem and confidence, especially when the skin condition was visible publicly.[36]

Financial burden: The burden of paying for skin products not covered by provincial or employer health benefits added to their burden of care. The inability to pay for recommended skin treatment or products increased emotional stress. Participants described the additional financial burden as being managed by themselves or their family members. Long term, participants shared that improved access to affordable treatments should be improved, and more traditional products should be covered by health-care benefits.[36]

Study Limitations

In this small study we focused on adults and did not identify any persons living with open diabetes-related wounds, burns or epidermolysis bulosa. We collected the stories of persons using a birch bark extract in several forms (cream, ointment, soap). More research is needed to explore each skin condition and with the use of each birch bark extract product. Finally, we did not include any person under 18 years of age.

Implications for Practice

The role of traditional medicines, though used for centuries, are not fully accepted in mainstream healthcare. It is important to continue research into the use of traditional medicine for skin conditions. Assessment of an individuals quality-of-life while living with the skin issue long-term is important.

Funding/Acknowledgement: *The authors wish to acknowledge the funding provided by the Canadian Institutes of Health Research (CIHR) project grant (2019-2024). The project received REB approval by Cape Breton University and Membertou Ethics Watch approval. The authors are very grateful to Tuma T Young and the L'nu community of Membertou First Nation in Sydney, Nova Scotia for sharing their traditional knowledge of maskwio'mi and allowing research and dissemination of the results.*

Conflict of Interest: *The authors declare no conflicts of interest.*

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Bioengineering Computer Models For Efficacy Research In Preventative And Treatment Wound Dressings

By Professor Amit Gefen

How to cite: Gefen A. Bioengineering computer models for efficacy research in preventative and treatment wound dressings. Wound Care Canada. 2025;23(2):112-116. DOI: 10.56885/163137gwryry

Wound healing is a dynamic, multifactorial biological process influenced by various biomechanical, biochemical and environmental factors. Effective wound care relies heavily on dressings that are not only protective barriers but also active components in promoting tissue regeneration processes.

Modern dressings must be able to manage a variety of exudate types, maintain a moist wound healing environment, have antibacterial effect, regulate temperature, minimize trauma to the wound bed and peri-wound skin and deliver medications if needed. The design, optimization and evaluation of these complex devices have increasingly integrated bioengineering approaches, especially computational modeling and simulation approaches. Computational models provide a powerful, cost-effective alternative to traditional experimental trials by simulating dressing performance under real-world conditions which are known and controlled through the simulation protocols.[1]

In silico studies, using finite element analysis (FEA), computational fluid dynamics (CFD) and multiphysics simulations, offer key insights into how dressings interact with skin, wounds and surrounding tissues.[1-3] These models allow for the prediction of mechanical strain and stress distributions in soft tissues, temperature changes, exudate absorption, retention and spread and even drug release kinetics (see Figure 1).

For instance, swelling-induced tissue strains from superabsorbent dressings or the mechanical impact of adhesive removal on frail skin can be quantitatively evaluated through modeling and simulations.[3] Prevention-focused dressings are evaluated for their ability to alleviate soft tissue stress concentrations and reduce tissue shear exposures, while treatment dressings are studied for their fluid handling and drug delivery efficacy (if applicable).[1,4,5]

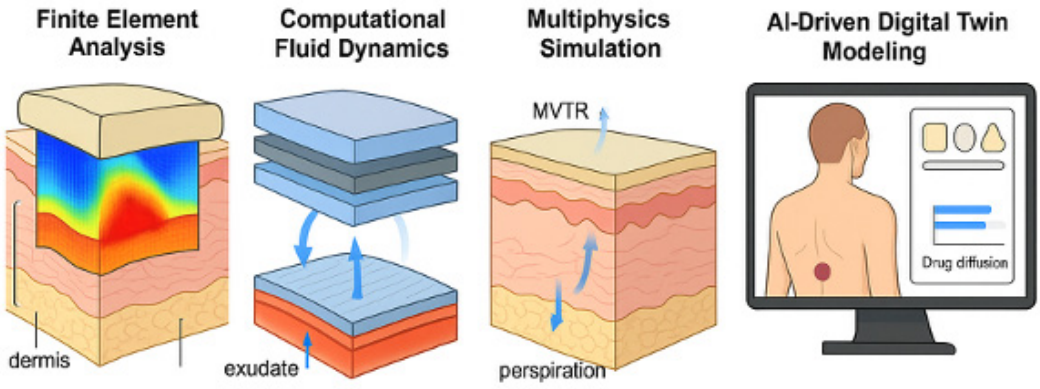

Figure 1: Potential applications of computational modeling in (left to right): (1) Modeling wound bed and peri-wound tissue stress states under dressings. (2) Modeling the exudate movement between and within the layers of a multilayer wound dressing and the dressing saturation patterns in order to avoid skin maceration. (3) Evaluating dressing performance in microclimate regulation and thermal management such as moisture-vapor transmission rate studies. (4) Artificial intelligence (AI)-powered modeling and simulations for personalized dressing selection and patient outcome predictions.

Artificial intelligence (AI) and machine learning (ML) are becoming integral to modeling simulation workflows.[6-8] These tools automate parameter optimization and facilitate predictive modeling based on vast datasets of clinical and biomechanical information. [6-8] The digital twin concept, creating a virtual patient-specific model, has opened the door to personalized dressing recommendations and real-time care simulations.[8] The growing role of computational modeling empowered by AI / ML in the development, evaluation and personalization of wound dressings, has direct implications for dressing research and development (R&D), as well as regulatory frameworks and pathways.[7] Specifically, these computational tools are especially valuable in the early stages of product development where multiple dressing formulations or configurations can be evaluated quickly and non-invasively.[7]

For instance, through modeling and simulation supported by experimental laboratory testing, researchers can predict how different dressing materials mechanically interact with each other and with skin, and also, how they influence the wound microclimate, balancing heat dissipation and moisture retention.[7,9,10] This eliminates the need for iterative physical prototypes and supports rapid innovation. Furthermore, computational modeling aids in understanding the biomechanical environment of the wound (for different wound etiologies), which is vital for preventing secondary complications like maceration, pressure ulcers / injuries and delayed healing. As these technologies become more accessible and integrated into industry workflows, their adoption is expected to expand beyond academic research institutions into standard industry R&D practice.

Computer Modeling And Simulations Of Dressing Performance

Computer models are now instrumental in understanding the functional behaviour of wound dressings across various clinical contexts. One of the earliest and most impactful applications is the use of finite element analysis (FEA) to study the mechanical protection offered by foam or multilayer dressings. For example, simulations show how silicone-foam dressings reduce peak strain energy densities at the sacrum or heel during prolonged bed rest.[1,2] If adequately constructed, prophylactic dressings are able to protect the skin and underlying tissues, preventing superficial and deep tissue injury by absorbing bodyweight or medical device-induced shear forces.[1] Adhesive dressing simulations use FEA to evaluate how dressing removal techniques influence skin deformations and strains.[3] In these models, computational representations of the skin

are subjected to peeling forces, revealing for example that soft silicone adhesives significantly reduce the risk of skin stripping compared to acrylic options.[3]

Computational fluid dynamics simulations can further aid in optimizing dressing design by simulating fluid movement within the porous structures of absorbent materials. This is essential for understanding how exudate is absorbed, retained, or evaporated. Such CFD modeling can predict for example dressing saturation points, capillary action across layers and moisture vapor transmission rates (MVTR), which are all critical for avoiding maceration and promoting healing. Diffusion models simulate drug-eluting dressings that deliver antibiotics, analgesics, growth factors or skin protector agents.[5] These models consider release rates, concentration gradients and tissue penetration depths, offering insights that guide dosage design without clinical trial repetition. A notable example includes the modeling of sodium pyruvate (NaPy) skin protectant release into sacral tissues, demonstrating clinically relevant delivery within hours.[5]

Multiphysics computational models go a step further by integrating FEA, CFD and heat transfer into one system. These simulations are used to study real-world scenarios, such as how perspiration impacts adhesion or how device-related heat buildup increases pressure ulcer risk. For instance, under continuous positive airway pressure (CPAP) masks, dressings with thermal conductivity closely matched to skin reduce local overheating, as confirmed by recently reported simulations and clinical observations.[9] Soon, AI-powered simulations will be able to predict dressing behaviour under varying patient conditions and adjust the dressing designs accordingly.[7]

Digital twin simulations allow clinicians to test dressing options on a virtual patient before applying them in practice, thereby minimizing trial-and-error. In the context of surgical wounds or diabetic foot ulcers, simulations can be used to model the interface between dressing materials and irregular tissue surfaces, thereby allowing clinicians to anticipate potential points of high pressure or shear that may impair healing.

Another key application is the simulation of fluid absorption in polymicrobial environments, where computational models can be used to predict how well a dressing can sequester harmful bacteria while maintaining optimal hydration. Such computational assessments inform both dressing selection and clinical protocols, particularly in high-risk populations. Additionally, these simulations can be adapted to represent specific clinical environments, such as intensive care units, operating rooms or long-term care settings, thereby increasing their translational relevance and optimizing their performance to the specific clinical context.

Regulatory And Clinical Translational Work

Computational modeling is gaining formal recognition as a scientifically valid component in the regulatory evaluation of medical devices in general, and wound dressings in particular.[11,12] The US Food and Drug Administration (FDA) and European regulatory bodies have issued guidance on the use of in silico trials and simulation data in medical device submissions. The *FDA Modernization Act 2.0* and similar frameworks explicitly support the use of virtual, computer modeling as a partial or full replacement for animal testing. This has major implications for wound dressing development, particularly in accelerating innovation cycles and reducing testing costs.

The Prophylactic Dressing Standards Initiative (PDSI), led by the author in collaboration with experts in this field, is currently developing international benchmarks for evaluating dressing efficacy using computational techniques.[13] Key metrics such as the protective efficacy index (PEI), the protective endurance (PEN) and the prophylactic trade-off design parameter (PTODP) provide standardized ways and quantitative metrics to assess how well a prophylactic dressing performs under bodyweight or medical device-generated forces, as well as environmental exposure such as presence of moisture.[1]

In clinical settings, computational modeling results are increasingly integrated into digital decision-support tools, where clinicians can simulate different dressings for a given patient based on their wound type, location and risk profile. For example, a digital twin of a sacral pressure ulcer / injury can predict how various dressings will interact with the wound, enabling the clinician to choose the most protective and least disruptive option.[2] Such modeling tools can also simulate long-term outcomes, such as time to saturation or risk of medical adhesive-related skin injuries (MARSIs), guiding dressing change intervals and removal protocols.[3] Importantly, these simulations must be validated through real-world data, including bench-top bioengineering and clinical studies.

Standardization of model assumptions, parameters, and output metrics is crucial to ensure reproducibility and regulatory acceptance.[13] Collaborations between bioengineers, clinicians and regulatory scientists are essential to bridge the gap between modeling predictions and bedside applications.[13] The integration of these models into real-world decision-making also supports economic efficiency. For example, by reducing the frequency of dressing changes or minimizing complications like MARSIs, hospitals can reduce costs and improve workflow efficiency. Computational modeling platforms are also beginning to support real-time simulations, which enable dynamic assessments of wound healing progress based on sensor data embedded in smart dressings.[7,14] These systems can alert clinicians to early signs of saturation or temperature shifts that may indicate infection or poor healing trajectories.

Regulatory agencies are now encouraging manufacturers to include validated computational modeling data in support of product claims, a trend that is likely to expand with further adoption of AI-driven technologies.

Conclusion

Computational modeling and simulations have already transformed the landscape of wound dressing research, development, manufacturing and application. These tools allow for precise assessment of biomechanical, biofluidic, biothermal, and biochemical dressing properties under realistic clinical conditions. From protecting fragile skin to optimizing drug release, in silico methods can now inform every stage of the dressing lifecycle, from design to regulatory approval to bedside use. The integration of AI and digital twins further supports real-time, patient-specific wound care planning, reducing risks and improving outcomes. With growing regulatory recognition and technological maturity, the future of wound care will be increasingly data-driven and personalized.

Moving forward, efforts should focus on expanding modeling capabilities to account for complex pathophysiological variables, enhancing cross-discipline collaborations and developing intuitive tools for clinical use.

As the wound care field continues to evolve and develop, computational bioengineering will remain a cornerstone of evidence-based, safe, clinically effective and cost-effective practice. Embracing advanced computational bioengineering as a foundational pillar in wound dressing development allows for unprecedented control over the quality of dressing products and the therapeutic environment. These technologies empower clinicians with actionable insights, researchers with rapid prototyping tools and regulatory bodies with standardized evidence of efficacy and safety. With multidisciplinary collaborations and continuous validation, computational modeling is positioned to lead the next phase of innovation in wound care, making precision, personalization and prevention through optimized products at sustainable prices the standard of care.

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Do You Hate Policy? If So, Come To The Policy Café

By Jane McSwiggan MSc OT Reg (MB) IIWCC

How to cite: McSwiggan J. Do you hate policy: if so, come to the Policy Café. Wound Care Canada. 2025;23(2): 118-120. DOI: 10.56885/691417nbjgto

"Do you hate policy?" That was my question… followed by, *"If so, then come to the Policy Café"*.

This was my approach to encourage participation at the Policy Café at the *2024 Wounds Canada National Hybrid Conference* held in October in Toronto.

It was a hard sell, especially with the dazzling competition of the sponsors surrounding us in the bustling Exhibit Hall, but we managed to attract enough interested participants to fill the deliberately limited number of spots in four separate Policy Café sessions held over three days. As a result a diverse range of policies from across Canada were presented and enthusiastically discussed within the individual sessions.

According to the World Health Organization, health-care policy involves 'decisions and actions' in order to achieve health-care goals. Now in its second year, the Policy Café provides a forum for sharing experiences of stakeholders across jurisdictions, with the purpose of supporting and driving meaningful policy changes which prioritize skin health and improve outcomes for people who require wound management.

Café Session 1

Holly Calliou, the first presenter, is a Home Care Coordinator at Enoch Health Services, Enoch Cree Nation, Alberta. Holly has identified the need to align practice within the different sectors that serve Enoch Health Services. Home Care Nurses, Public Health Nurses and a Diabetes Coordinator, all have responsibility to provide wound care but the lack of alignment of charting.

Home Care has access to electronic charting, while Public Health does not, which can result in very different treatment plans for the client. The goal of developing a policy is to ensure continuity of care when working with wounds. Issues to address were identified as including facilitating workable charting, capturing images in the same way and working with the generic policies provided by Indigenous Services Canada. In order to develop policies,

Holly has facilitated nursing staff from each of the sectors to create a Policy Statement, Policy Rationale and Expected Outcome. Work is still in progress on Process Guidelines and Tools and Resources, with testing of the policy by end of 2025 and implementation by the beginning of the 2026 fiscal year.

Café Session 2

Tara Schmitz Forsyth, the second presenter is a Clinical Nurse Specialist, and Advanced Wound Care Clinician who divides her time between a facility with a very diverse client population including rehabilitation, long term care and palliative care, and a complex wound care clinic at a tertiary hospital in Winnipeg, Manitoba. Tara outlined the content of the 2025 Skin Health and Wound Care Policy which was developed for the two health-care jurisdictions in Winnipeg. This replaces the previous two iterations of the policy, which was first written in 2014. The updated 2025 policy now includes the roles and responsibilities of health-care aides and rehabilitation assistants. The policy outlines the roles, responsibilities and practices related to staff who have some or all aspects of wound prevention, assessment and treatment with their role, scope and setting.

Holly Calliou (centre), a Home Care Coordinator at Enoch Health Services, Enoch Cree Nation, Alberta led the first Policy Café session.

Educational requirements are defined for staff, however there is a challenge in translating knowledge into practice. While the policy provides guidance on the development of 'wound care champions', in reality, this is difficult to achieve. The feedback is that staff are now more aware of their scope and the hope is that by improving education and defining the need for a wound care plan rather than a physician order, clients will receive timely intervention for the prevention, assessment and treatment of wounds.

Café Session 3

The third presenter, **Dr. Helen Rees,** is a podiatrist who practices in New Brunswick and is the Past President of the Canadian Federation of Podiatrist Medicine. Helen spoke about licensing and scope of practice for podiatrists in Canada. At present, podiatrists are unable to conduct surgeries, except for soft tissue, and none that include bone. The hope is that policies will change across the country so that podiatrists become licensed through the various Colleges of Physicians and Surgeons at the provincial/territorial level.

This current limitation of scope is detrimental to the goal of limb salvage for people with diabetes whose immediate needs are not addressed in a timely fashion, often resulting in limb loss. Discussion after Helen's presentation included concern about the lack of action on the recommendations at a provincial and federal level following the 2024 CIHI Report,[1] and the need for health-care professionals to work within their full scope, which would include training in advanced wound care skills, such as conservative sharp wound debridement. The lack of consistent policy related to wound prevention and wound treatment is a limiting factor, related to scope enhancement and, ultimately, 'gold standard' management of diabetic foot ulcers.

Café Session 4

Our fourth Policy Cafe topic was presented by **Dr. Kathleen Stevens**, Executive Board Member of the Canadian Association of Foot Care Nurses/ Association Canadienne des Infirmières et Infirmiers en Soins de Pieds (CAFCN/ACIISP). Kathleen is a Professor of Nursing at Memorial University, St. John's Newfoundland and Labrador. Kathleen's topic was: Towards Canadian Nurses Association (CNA) Certification in Advanced Foot Care Nursing: Advocating for excellence in advanced foot care nursing (AFCN) across Canada.

The problem which the CAFCN/ACIISP has tackled is the lack of standardization for certification of advanced foot care nurses (AFCNs), which has implications for patient safety, as it is difficult to identify a qualified AFCN. The objective was to support certification development, implementation, coordination and evaluation of programs for AFCNs. To create this process, policy advocacy skills were demonstrated by both CAFCN/ACIISP and CNA. CAFCN/ACIISP developed a Competency Framework through member survey, input, presentation and revisions.

From the CNA policy perspective, collaboration and communication with the CAFCN/ACIISP ensured alignment of the code of ethics and standards of practice for all regulatory designation of nurses, and the standards of practice required by the provincial and territorial regulatory bodies. The outcome of this policy advocacy is that a CNA Portfolio Certification for Advanced Foot Care Nurses will be launched in early 2026.

Acknowledgement: *The author would like to thank Ron Hrynchuk for taking notes during the Policy Café sessions.*

Jane McSwiggan MSc, OT Reg. (MB), IIWCC is Education and Research Coordinator-Wound Care, Winnipeg Regional Health Authority, MB.

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CASE REPORT

Chronic Diabetic Plantar Foot Ulcer Closure Facilitated Through Standard Of Care And Use Of A Catalytic Advanced Wound Care Matrix And Hypochlorous Acid Spray Wound Cleanser

By Alexandru Dobre BSc D Ch

How to cite: Dobre A. Chronic diabetic plantar foot ulcer closure facilitated through standard of care and use of a catalytic advanced wound matrix and hypochlorous acid spray wound cleanser. Wound Care Canada. 2025;23(2): 121-126. DOI: 10.56885/430584ziwtrx

Successfully healing diabetic foot ulcers continues to be one of the most challenging chronic conditions for the medical system to address. In Ontario, many hospitals north of the city of Toronto do not employ chiropodists, and patients often find they do not receive much more than antibiotic and wound dressing care when treated in an ER unit. Recurrence rates of foot ulcer formation in diabetic patients is very high: one source citing 40% within one year, and 65% within five years.[1] Considering that as many as 34% of all diabetics will have an ulcer at some point in their lifetime, this is very concerning and a costly undertaking. Indeed, if improperly addressed, mortality rates vary from 5% in the first 12 months to as high as 42% within five years.[2]

The standard of care has long involved hyperkeratotic tissue/granulation tissue management (i.e., debridement through various methods and wound cleansing), pressure offloading, moisture balance (using a variety of dressings), control of blood

sugar levels/appropriate nutrition and inflammation/bacterial burden modulation/reduction. Wound dressings have been a staple for many years, including: low/non adherent dressings, hydrocolloids and alginate, alongside more niche foams, hydrofibre, protease-modulating matrix dressings and nano particles of silver.[3] They have been used too good effect at moisture/bacterial management, and offloading to some degree, and yet have not demonstrated significant impacts on the healing timeline of wounds.[4]

Advanced Wound Care Treatment Matrix Technology

NanoSALV™ Catalytic Advanced Wound Care Treatment Matrix (NanoTess Inc., Calgary AB) is a medical device authorized for sale by Health Canada that aims to shorten healing times through the application of an advanced catalytic treatment matrix (CTM) that utilizes copper, titanium dioxide and silica suspended within a liquid-to-solid cellulose matrix.[7] It is intended to actively promote wound healing. Beyond the active promotion of wound healing through catalytic modulation by actively reducing the energy thresholds needed to achieve optimal healing timelines and outcomes, the product also simultaneously regulates inflammation, moisture balance, and broad-spectrum microbial/bacterial burden.[6,10,11]

In particular, the CTM technology utilizes copper, a well-known facilitator of angiogenesis and re-epithelialization.[9] Additionally, the cellulose matrix aims to provide a scaffolding effect to facilitate the cellular progression through the wound healing stages.[8]

To date, this product, as a whole, has demonstrated the ability to eliminate yeasts, fungi, viruses and bacteria, including antibiotic-resistant strains, particularly MRSA.[7]

Indeed, it is these combined effects from the CTM technology that has enabled this wound matrix to demonstrate improvement in wound surface area closure rates and timelines for chronic venous leg ulcers, pressure ulcers and diabetic foot ulcers. In a 56 day cross over study sponsored by Alberta Health Services, the use of catalytic advanced wound treatment matrix decreased wound area percentage by 56.6% on average (day 56), compared to a 1% increase on average (day 28 - when the product was introduced) in the incipient phase, using only best-in-class variety antimicrobial silver dressings (i.e. promogran prisma, silver aquacel, acticoat).[7]

Wound Cleansing

Low cytotoxicity and broad spectrum anti-bacterial properties at a reasonable cost have also been sought in the area of wound cleansers as well. A growing body of evidence is signaling hypochlorous acid as the leading candidate in fulfilling all of these demands.[12]

Case Study

In an effort to study the wound healing potential of this combination, the author conducted a case study involving a chronic non healing, worsening ulcer in a diabetic patient.

Background and 1st visit: Patient AA is a 37-year-old male of southeast Asian background with a chronic history of type II diabetes. He presented to a clinic just north of Toronto on September 14, 2024. He was complaining of "calluses that won't go away" and that had become "scabs". They started forming around spring time and became purple and thicker.

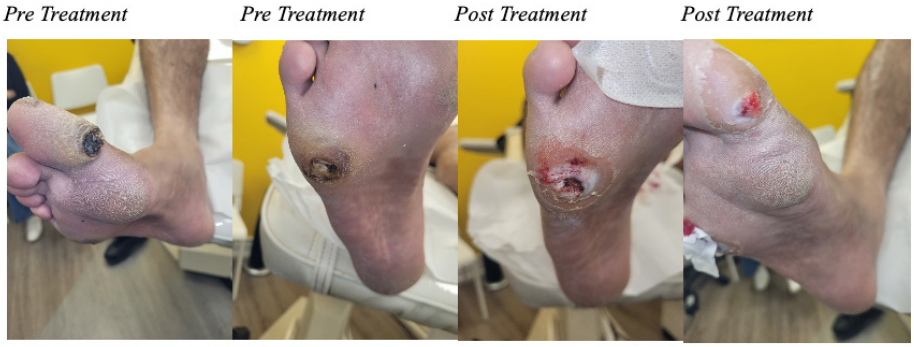

Figure I: Objective first visit findings

Since the scabs started forming, he would have burning pain/pins and needles around the right 5th plantar metatarsophalangeal joint (PMPJ) and the right 1st medial plantar metatarsophalangeal joint, and this has settled down for the prior two weeks. The patient went to his family doctor a few weeks prior and was prescribed Fucidin®, which he put on consistently for five weeks with no improvement in his condition.

A diagnosis of Type II diabetes was made many years ago, and the patient notes he doesn't regularly measure his fasting blood glucose level, however, his last hemoglobin A1C % was around 6.0%, five to six months prior. He had recently purchased New Balance® wide fit size 13 synthetic leather running shoes. In terms of his working life, AA is largely working from home but going into the office some days of the week. He has a job working on a computer. He and his wife were expecting their first child in the spring of the new year. AA has been participating in body weight resistance exercise and walking barefoot (10 k steps a day including going up and down stairs), which he started not too long before the calluses started forming.

Dermatological: Right 1st medial interphalangeal (IPJ) joint - 30 mm wide area of HK with pronounced extravasation of blood at base nodule like projection of moderately macerated soft tissue appears to have pinched underneath HK. Right 5th PMPJ - demonstrating similar presentation (30 mm wide area of HK with pronounced extravasation of blood), except more maceration at the base and break down in skin; moderately macerated with denuded area of epidermis about 1/3rd the diameter of the macerated tissue in width and half its length with hypergranulation tissue presenting with malodor but has no exudate, undermining nor tunneling present. There is bilateral forefoot fat pad atrophy

Footwear: Patient is wearing extra long shoes (size 13) for a size 11 foot, in spite of foot being regular D width

Vascular: Bilateral pedal pulses palpable around dorsalis pedis, anterior tibial and posterior tibial artery, gradual cooling from shins to toes, capillary refill time of < 3 seconds around bilateral (B/) 1st apex. Patient denies consistent calf, thigh or buttock cramping when walking, reclined or sleeping at night. Normal pattern of hair growth on dorsal feet (proximal 1st-3rd phalanges and 1st metatarsal region).

Neurological: Vibration C tuning fork - B/ 2/5 boney locations localized (malleoli felt and midfoot/ forefoot felt faintly and very delayed off signal), monofilament: R/ 2/10 locations localized (5th apex and 3rd apex felt), L/ 1/10 (3rd apex), B/ achilles pinch mild to moderate pressure produces pain. B/ lower legs signs of slight muscle atrophy

Initial Treatment Approaches

- Both feet were cleansed with 70% Isopropyl alcohol prior to treatment.
- Debrided HK around R/ 1st medial IPJ and R/ 5th PMPJ
- Pinpoint bleeding point created both areas
- Pressure and gauze required to stop R/ 5th PMPJ
- Cleansed both areas with seaclens and post op iodosorb and 2-4 layers of non woven sterile gauze and hypafix.
- Advised patient to dress similarly at home every 1-2 days (may use Betadine if iodosorb or mefix/ hypafix tape are unavailable); if getting areas wet he was advised to change dressing immediately then try and cleanse wound with sterile saline; if not available, then salt water in basin.

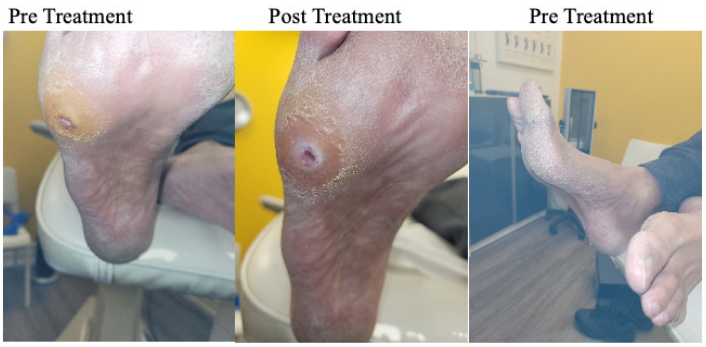

Figure 2: Treatment/Post Treatment A

- AA was educated to start wearing running shoes inside the house; purchase ones with appropriate size 11: D width; to never walk barefoot and inspect feet at end of day for areas of broken down skin and signs of infection.

There were five similar treatment sessions spread out between two and four weeks, depending on the patient's availability. He had been dressing with sterile non-woven gauze and porous medical tape, cleansing with salty water (non-sterile) and using some form of liquid iodine as a topical treatment at home. AA had been working from home for a few days each week, and for a few weeks entirely from home during this period. During the fourth of these five treatment sessions he obtained and started wearing custom foot orthotics through the practitioner with metatarsal padding to offload the tripod stanced pes cavus foot profile and fat pad atrophy that enabled his ulcer formation. On the fifth visit he noted he has been wearing them in Croc-style shoes indoors and his New Balance® shoes outdoors; with no more pain on the R/ 5th PMPJ ulcer present since. The ulcer area post debridement was now 5mm long by 2mm wide by 1mm depth with mild maceration in a small ring around its periphery. The right 1st medial interphalangeal joint now has smooth skin with minimal hyperkeratotic build up/ slight fissuring.

Extreme Tissue Break Down

On the seventh total treatment session for the R/ 5th PMPJ ulcer, AA presented to the clinic noting that until two days prior "everything was progressing fine with no concerns". He reported that he started getting pain/sensitivity around the right central forefoot just proximal to MPJs, where the metatarsal pad is and started limping because of the pain. He got approval to work from home full time. He reported that he was feeling better, but was uncertain what could have caused his spike in pain, as he had not been more active or done anything different.

Assessment: The R/ 5th PMPJ feels warm to touch whereas L/ feels cool and has some palpable fluctuant edema. An area 12 mm x 4 mm of dried hemosiderin stained HK with larger ring of diffuse HK and around is present over it. As the practitioner was debriding it, a significant amount of exudate came out. It appeared largely serosanguinous, with some white haziness to it (no significant malodor) and was of a moderate to large quantity. Post debridement, an area of 24 mm long by 18 mm wide and 12 mm depth, exposed layers of muscle but that did not probe to bone. There was no tunneling or undermining noticed.

Response: New Treatment Approaches

Considering the depth of the wound and its widespread moist nature it was considered that the non-sterile saline solution the patient was using at home to cleanse the wound (he had not tracked down sterile saline), alongside Iodosorb topical in clinic and "Betadine" at home, would no longer suffice to enable a smooth healing transition.

All things considered, it had been 98 days since treatment had started on the right 5th plantar MPJ ulcer and on the previous visit it had still not closed, leading to an environment ripe for infection and which would further slowdown the healing timeline. Povidone Iodine is, after all, considered a cytotoxic topical agent after prolonged use.[13] Thus, evidence for a decreased healing timeline and low cytotoxicity were the main reasons for the decision to switch to using hypochlorous acid and the NANOSalv™ catalytic wound care matrix.[7,12] [Hence called the advanced wound care treatment matrix.]

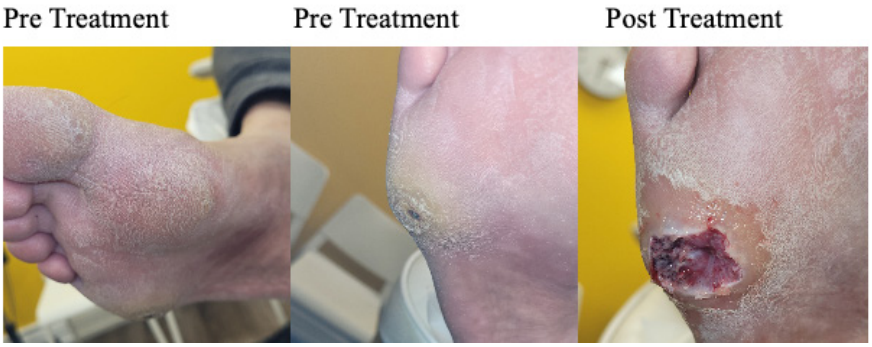

Figure 3: Treatment/Post Treatment B

AA was advised to start using E11ement™ hypochlorous acid spray (0.015%) - an easily accessible, affordable Canadian brand - as the wound cleanser (to be thoroughly sprayed on the wound), alongside applying the catalytic wound care treatment matrix in a paper-thin layer (ideally with sterile Q tip) on the ulcer every one to two days (whenever showering), dressing with four layers of sterile non-woven gauze, and secured with porous tape.

As an indicator of potential spreading infection, AA was to monitor the temperature difference between the bilateral 5th MPJs with a handheld infrared thermometer; if he detected a difference of more than two degrees, he was to seek ER care.

The patient was prescribed an antibiotic (cefadroxil 500 mg) to be taken bi-daily for ten days preventatively, given the depth of the wound and temperature difference between both feet. He was also advised to postpone his wisdom tooth extraction which he had planned for next week.

AA was advised to seek the use of a forefoot offloading surgical shoe on the right foot and a regular shoe worn on the left foot until his orthotics could be adjusted for better fit, and to walk minimally over the next few weeks, as well as to work from home (a letter for his employer was provided).

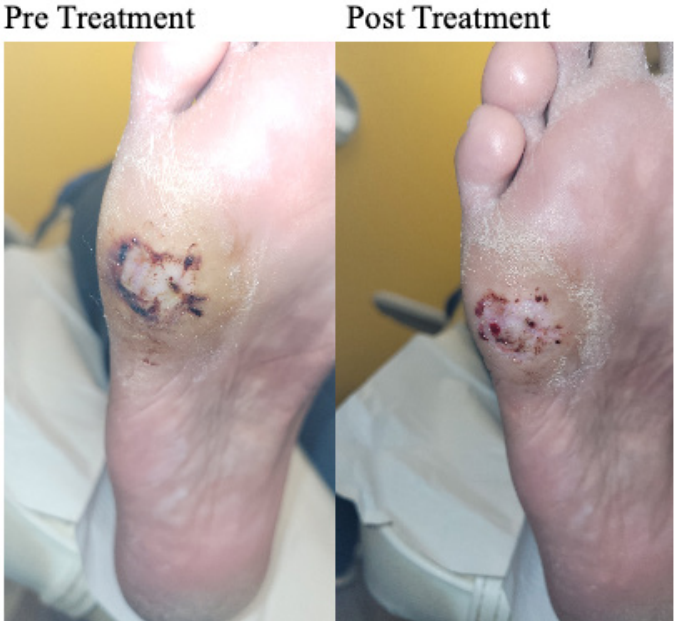

Figure 4: One Week Follow Up

His custom orthotics were retained in order to be sent out to have a thicker, softer 1-5th metatarsal pad put in place to replace the 2-4th firmer one.

AA confirms he has been following the practitioner's advise as noted, except for delaying the use of hypochlorous acid spray as a cleanser until two days post last visit.

Upon assessment, the right plantar 5th MPJ wide area - the same size as the deep ulcer last visit - has now completely filled in, with epithelialized tissue (very thin) and demonstrated only dark hemosiderin staining around the borders with slight hyperkeratotic build up.

Conclusion

Expediently addressing pressure offloading for a chronic diabetic foot ulcer through appropriate dressing materials and footwear, wound cleansing with a low cytotoxic agent and using a topical wound agent, such as an advanced wound care matrix, that facilitates the natural healing process while addressing bacterial burden and moisture balance can prove to provide impressive wound healing results.

Disclosures: *The author has no conflicts of interests to disclose at this time in relation to any of the companies associated with products used in the treatment for the above patient.*

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Editor's note: *In the interests of education, accuracy and disclosure, case reports published in* Wound Care Canada *occasionally, by necessity, mention trade names, commercial products, companies or organizations. Mention of these does not in any way imply endorsement by Wounds Canada, its editors or editorial board.*

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Canadian Consensus Statement:
The management of venous leg ulcers

A panel of 19 Physicians, NSWOCs, Wound Specialists, and Therapists with experience in treating VLUs, using the Muscle Pump Activator device, and advanced wound treatments.

This panel agreed that the geko™ device (Muscle Pump Activator) should be added to the treatment plan when:

- A patient cannot tolerate compression
- A patient is not in optimal compression
- No progress is seen in a wound after 2-4 weeks
- A wound has not healed 30% in 30 days

*The geko™ device demonstrated greater than two-fold **increase in wound healing rate**[1] and a **reported reduction of pain**[2] in venous leg ulcers vs compression alone.*
Harding et al, 2023


Professor Keith Harding

Leads:


Dr Michael C. Stacey


Dr Robyn Evans


Dr Gary Sibbald

- *Dr Asem Saleh*
- *Dr John Hwang*
- *Rosemary Hill*
- *Josee Senechal*
- *Michele Langille*
- *Bev Smith*
- *Carly St Michel*
- *Paulo da Rosa*
- *Amanda Loney*
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- *Sheri McPhee*
- *Allison Luther*
- *Maryse Beaumier*
- *Helen Arputhanathan*
- *Shannon Handfield*

Read the VLU consensus here:
https://sites.google.com/view/VLUconsensus
or scan the QR code below

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