

A Patient Navigation Model to Improve Complex Wound Care Outcomes

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ABSTRACT

OBJECTIVE: To create a blended format model to navigate interprofessional team assessments of patients with complex wounds during COVID-19 as a quality improvement process.

METHODS: During clinical assessments, patients were interviewed in their homes with representation from their circle of care and primary nurse on site linked to a live virtual interprofessional blended remote team model (wound care nurse specialist, advanced wound care doctor). Eligible patients had completed a wound care clinical pathway without wound closure. Palliative patients with complex wounds and patients without precise/accurate diagnoses were also included. This process addressed the components of Wound Bed Preparation 2021: manage the cause, address patient-centered concerns, determine the ability to heal, optimize local wound care, and evaluate outcomes on an ongoing basis.

RESULTS: Since April 2020, 48 patients were referred to the Home and Community Care Support Services patient navigation interprofessional team. Patients' home-care services were initiated between 2012 and 2021. The team provided closure in 29% of patients and the wound surface area reduced in 66%. Pain was reduced in 73% of patients and appropriate infection management was implemented in 79%. In addition, nursing visits were reduced by 73% and there was a 77% decrease in supply usage.

CONCLUSIONS: This project validated the Wound Bed Preparation Paradigm 2021 as a process for assessing patients with complex wounds using a blended virtual and home-based assessment. Patient navigation with this blended model benefited patients and improved healthcare system utilization with projected cost savings.

KEYWORDS: blended model, chronic wounds, COVID-19, interprofessional team, patient navigation, project ECHO, wound healing

INTRODUCTION

Patient navigation models (PNMs) facilitate patient care with optimal use of healthcare resources. However, for systems to change, policymakers and politicians must be aware of inconsistencies and inequities facing wound care patients and providers as the first step toward improving patient-centered wound care.

Like other healthcare systems around the world, Canada's healthcare system is complex and often lacks coordination among providers. This can lead to challenges that may result in individuals having poor outcomes, especially after a care transition. Although PNMs have emerged as a method to help with care coordination and access, they have been slow to develop in the context of wound care. This concept has the potential to improve access and efficiency to wound care and health outcomes. Consequently, wound care providers and researchers should be encouraged to assist with the implementation of PNMs within healthcare delivery systems, providing an opportunity for improved wound care, especially for patients with complex wounds.

The incidence of chronic wounds is increasing as the population ages and is impacting patient and home-care resources both in Ontario, Canada, and worldwide. Governments need to recognize the effect that chronic wounds have on their healthcare expenditures. Minimal provincial changes in the home-care structure could improve patient outcomes and deliver substantial savings to the healthcare system.^{1,2} The involvement of interprofessional team members is required for optimal wound care patient outcomes. A chronic wound is only one component of a person's medical status and an interprofessional team is needed to coordinate all elements of care that relate to the causes and cofactors that may affect healing. As a result, wound care

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assessment clinicians require training in holistic care and implementation processes.³

In 2007, a reform project developed a new community primary care model for persons with lower extremity ulcers including leg and foot ulcers.⁴ This important initiative, funded by the Primary Care Reform program of the Ontario Ministry of Health and Long-term Care, demonstrated the benefits of coordinated interprofessional care. After the implementation of the best practice approach, an estimated savings of \$338 million CAD in direct medical costs for this patient population was projected.⁵ These savings resulted from faster healing, a reduction in admissions for subsequent infections and amputations, reduced nursing visits, and more efficient use of each patient's medical supplies.⁶ Care through this best practice implementation could potentially result in a 66% reduction in costs when compared with standard community care.⁷

Project ECHO (Extension Community Healthcare Outcomes) Ontario Skin and Wound Care is a key driver of system change. This situational learning project is aimed at moving knowledge, not patients. Interprofessional teams situated in their own community present anonymized patient cases from their spoke to the other spokes and hub teams. These cases are formatted with the Wound Bed Preparation 2021 (WBP 2021) 10-consensus-statement format to emphasize holistic patient care.⁸ Treating the cause of the chronic wound as well as patient-centered concerns, including pain, optimizes patient care and is complemented by local wound care best practices. The principles from each presented ECHO case are generalizable for each spoke and their other chronic wound patients. Several key issues that

have hindered optimal chronic wound patient care as well as potential improvements are listed in Table 1.

Transitioning across healthcare settings (eg, moving between care settings and/or providers) can be daunting for patients and their family caregivers.⁵ Such transitions may take place from the hospital to inpatient rehabilitation facilities,¹⁵ outpatient centers, or even the patient's home^{16,17} and can lead to suboptimal outcomes that may conflict with patient values.¹⁸ Focusing on patient care and experience, including the commitment to improving access, transitions, and coordination for patients, is one of the key building blocks of Ontario Health Teams.¹⁹ At maturity, Ontario Health Teams are expected to offer 24/7 coordination and system navigation services for patients, families, and caregivers who need them. These services include individualized care planning, care pathways, health literacy support, digital access to care information, and shared decision-making.²⁰ Navigation is an intervention that was initially developed to meet cancer care needs^{21,22} but should be (and often is) part of a regulated health professional's role.¹⁷

Wound Care PNM Pilot

As part of the ongoing ECHO Ontario Skin and Wound approach, the interprofessional team implemented and evaluated a PNM. This article provides details of the model within an ECHO stakeholder organization. The authors collaborated with an existing ECHO client, Local Health Integration Networks (LHIN), to determine the impact of this approach. The team worked with Waterloo Wellington LHIN to retrospectively analyze

Table 1. IMPACTFUL WOUND STUDIES TO IMPROVE PATIENT OUTCOMES AND HEALTHCARE SYSTEM UTILIZATION

Etiology	Outcome/Findings
HS ⁹	An interprofessional team approach can facilitate early recognition of HS (average delay from onset to diagnosis is 9 y) and optimize management with evidence-informed strategies.
DFUs: Somayaji et al ¹⁰ and Guyana Diabetic and Foot Ulcer Project ¹¹	Interprofessional care teams are associated with improved diagnostic acumen and wound healing outcomes over conventional community care services. Initiatives including interprofessional diabetic foot care pathways are recommended. ¹⁰ The Mississauga Halton project had 49 patients with DFUs. Only three patients had a precise DFU diagnosis related to etiology at the time of referral compared with 32 patients following initial assessment ($P < .001$). The most common referral diagnosis was unspecified DFUs (77%). Following assessment, the diagnosis was further refined into ischemic, neuropathic, and mixed etiologies. Offloading footwear assessment was performed in 100% of patients compared with 30.6% before referral ($P < 1.001$). Notably, 36.7% (18/49) reported improved quality of life after the second interprofessional encounter. ¹⁰ The Guyana Diabetic and Foot Ulcer Program modeled on the primary care reform project reduced lower limb amputations by 68%. ¹¹
Chronic wounds ¹²	Patients with complex chronic wounds often lack accurate wound-related diagnoses, and healability is often not determined before initiating treatment. These assessment gaps likely delay healing and impair optimal healthcare resource use. Team-based interprofessional care should be viewed as a necessity for complex wounds not healing at the expected rate. Care requires a coordinated and integrated approach.
Pressure injury ¹³	Optimal pressure injury management by the interprofessional team requires appropriate healthcare system and organizational resources, infrastructure, and policies.
Peripheral arterial disease ¹⁴	Awareness at all political and administrative levels is a prerequisite for coordinated, integrated care and actions need to be delivered for best practices and policy changes.

Abbreviations: DFU, diabetic foot ulcer; HS, hidradenitis suppurativa.



the best interprofessional team practices for the assessment and management of persons with difficult-to-manage chronic wounds. This analysis included preimplementation data.

Primary care navigation programs can be delivered with several different organizational models: (1) nursing professionals for patient populations with complex needs; (2) “lay” navigators who are nonregulated health professionals to address social determinants of health; or (3) a team comprising health professionals and lay navigators.²³ The present PNM involved three advanced wound care nursing professional navigators working within the Waterloo Wellington LHIN and an advanced wound care key opinion leader physician. The most common responsibilities of navigators are to provide care facilitation and coordination, assist with appointment scheduling and other logistical support (eg, transportation, health insurance, etc), assist with health literacy, provide patient education and psychosocial support, and link patients/families to resources/services. Navigators require health education knowledge, problem-solving capabilities, conflict management skills, and negotiation techniques. Their responsibilities are accomplished through effective communication, collaborative teamwork, cultural competence, case management, efficient planning, and knowledge of related healthcare system requirements.

In addition to in-person healthcare, the COVID-19 pandemic has increased virtual care. Wound care providers can implement the expansion of virtual patient navigation. Clinicians with virtual wound care experience could help inform the development of a virtual PNM. Few studies have shown the positive impact of virtual wound care patient navigation, and further research is needed to evaluate the impact of virtual rehabilitation patient navigator programs.

Project Aims

This project aimed to virtually co-navigate (wound care expert physician and advanced wound care nurse) an in-

the-home team diagnosis (primary treating nurse, patient, and family or close friend support) and treatment of patients with chronic, complex wounds during the COVID-19 pandemic. This project is based on ECHO Ontario Skin and Wound Care’s situational learning of deidentified patients, translated to the bedside and facilitated by live patient navigation for optimal care. The eligibility parameters included patients who had completed a wound clinical pathway without achieving wound closure, palliative patients with complex wounds, and patients without an accurate and precise diagnosis or with best-practice care gaps.

METHODS

The pre-intervention process is detailed in Table 2. Because of COVID-19, several nonurgent medical services were curtailed; the proactive change was to provide a comprehensive interprofessional assessment along with navigation of appointments for additional consults and procedures. A structured follow-up ensured care continuity.

Wound Bed Preparation 2021⁸ is a paradigm to optimize chronic wound treatment. This holistic approach examines both the treatment of the cause and patient-centered concerns to determine if a wound is healable, a maintenance wound, or nonhealable (including palliative patients). For healable wounds (eg, those with adequate blood supply and a cause that can be corrected), moisture balance is indicated along with active debridement and control of local infection or abnormal inflammation. In maintenance and nonhealable wounds, the emphasis changes to patient comfort, pain relief, odor control, infection prevention by decreasing bacteria on the wound surface, conservative debridement of the slough, and moisture reduction including exudate control. This process is designed to provide clinical guidance for improved patient outcomes at a lower cost to the healthcare system.

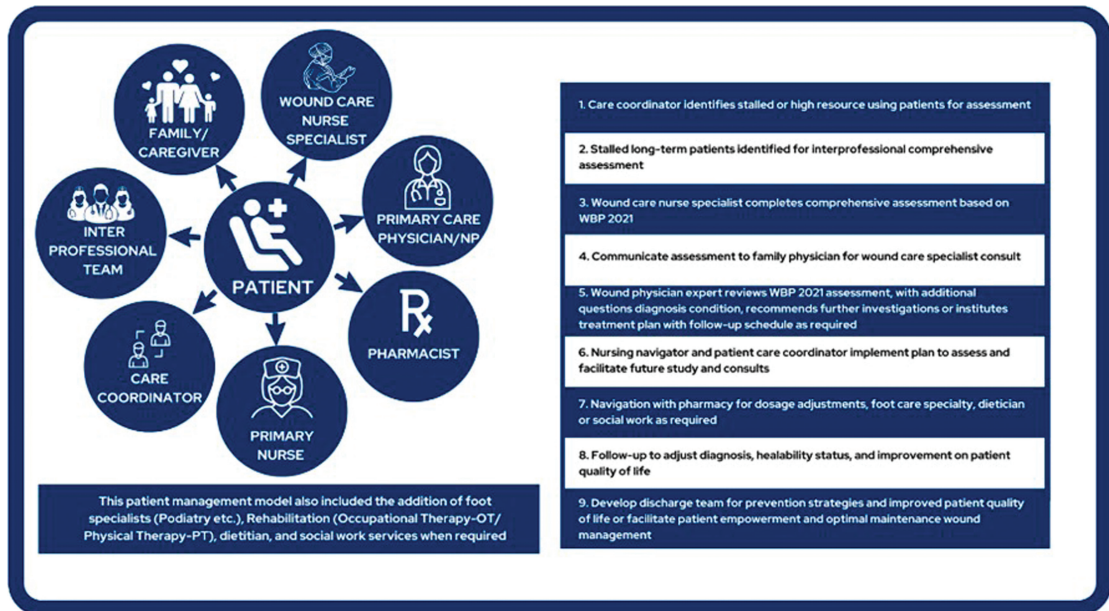
Concerted effort has been made to emphasize the importance of early, continuous assessment of the wound healing trajectory. Intervening before wounds become chronic offers benefits for the patient, providers, payers, and policy-makers. Early intervention is especially relevant now with mounting healthcare costs and aging populations. The following key components of this best clinical practice were implemented and measured in the PNM pilot:⁸

- Manage the cause with interprofessional consultation blood supply, cofactors impacting healing)
- Address patient-centered concerns (pain, activities of daily living, circle of care for patient support)
- Determine healing ability (healable, maintenance, or nonhealable)
- Provide optimal wound care (debridement, prevention of infection/prolonged inflammation, moisture management)
- Evaluate outcomes (healing, interprofessional team reassessment, adjunctive therapies)

Table 2. PREINTERVENTION PATIENT MANAGEMENT PROCESS

- Local Health Care Integrated Network receives a request for local wound care
- Intake team processes request and assigns to a service provider agency
- Service provider agency assesses patient, matches patient wound characteristics with clinical pathway, and initiates pathway with expected outcomes
- 20% of patients make up 80% of the cost due to a lack of integration of home care nursing with medicine and rehabilitation/foot care/allied health care professionals
- A certified wound nurse may do one or two consults for a pathway patient but often does not have the ability to diagnose or perform/order diagnostic testing

Figure 1. PATIENT NAVIGATION TEAM



This PNM was based on similar approaches in cancer care. Using this knowledge and the experience of previous coordinated wound care programs, a patient navigation team (PNT; Figure 1) and patient navigation process (Figure 2) were designed. Wound Bed Preparation 2021⁸ has been the cornerstone of coordinated wound care for over 20 years²⁴ and provided a roadmap for the process design.

The wound care specialist nurse in conjunction with the care coordinator acted as an implementation team, assessed wound progress, and conducted patient follow-up. The documentation sheet was a computerized program that was modified from a primary billing system to interpret the assessment steps outlined in WBP 2021.

The patient's primary nurse was in regular contact (every 1 to 2 weeks) with the wound care specialist nurse. The specialist nurse would facilitate care coordination with the assigned care coordinator and arrange follow-up with the wound care specialist physician. Stakeholders were informed of patient progress through regular sharing of the LHIN report.

This PNM pilot was created because COVID-19 closed down interprofessional wound care assessment clinics and resources were not available on a routine basis for diagnostic tests. This program provided a way to bridge the gap for chronic disease management. No comprehensive assessment by an existing interprofessional wound care clinic was available during COVID-19. As such, the

Figure 2. PATIENT NAVIGATION PROCESS

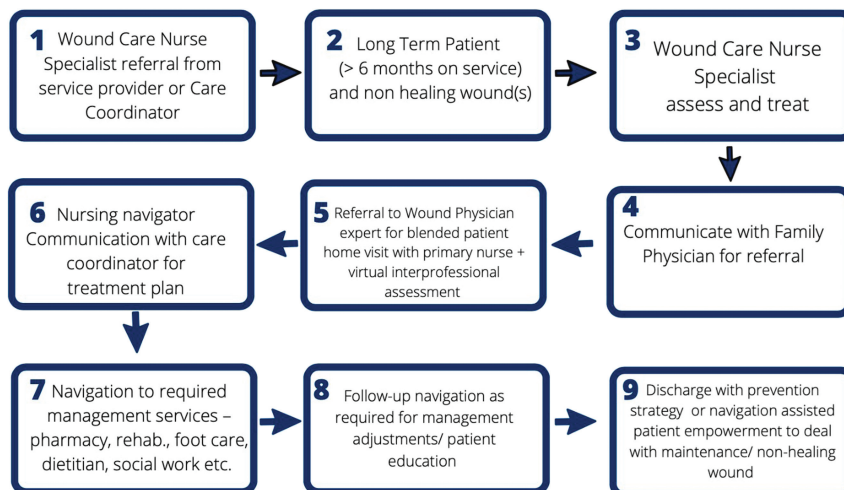




Table 3. PLAN-STUDY-DO-ACT APPROACH

Element	Action
Plan	An integrated team operationalizes WBP 2021 ⁸ into practice.
Study	Local integrated health network advanced wound care nurses visit the patient at home and perform a detailed evaluation of the person based on treating the cause of the wound, patient-centered concerns, healability, local wound care, and advanced wound care modalities for stalled but healable wounds. They produce a report of their findings.
Do	The care coordinator identifies clients who have been on home care for long periods, with high resource utilization, high number of nursing visits, and inconsistent outcomes.
Act	The patient and their circle of care (family member, close friend) are invited to attend a visit with their primary nurse on site and then connected with the wound care specialty team and a key opinion leader wound consultant. A 1-h consultation visit is accompanied by a comprehensive care plan to address all the components of WBP 2021. The advanced wound care team arranges all diagnostic testing and necessary consults, and a time is determined for follow-up and new integration of findings into the comprehensive care model: This may include pharmacy consultation, vascular testing (audible handheld Doppler is performed in the home) comprehensive pain assessment, and documentation of the mnemonic for local infection (NERDS) and deep and surrounding infection (STONEES). The healing trajectory in patient progress is monitored for improvement.

Abbreviations: NERDS, nonhealing, exudate, red friable tissue, debris (discoloration), and smell; STONEES, size increasing, temperature elevation, os (probes to bone), new breakdown, erythema/edema, exudate, and smell; WBP 2021, Wound Bed Preparation 2021.

process was changed to that presented in Figure 2. These steps were key to organizing and facilitating a team assessment. Not all team members were necessary for every patient. The patient had direct contact with their primary nurse, case manager for supplies, and the clinical wound care specialist for treatment alternations in conjunction with the expert wound doctor. The Plan-Study-Do-Act approach followed is presented in Table 3.

The rigor in this process was determined by:

- WBP 2021
- Management empowerment of wound care specialist nurses to link virtually with wound care expert physician
- Changing the billing system to facilitate ongoing patient management and documentation
- Ability of the wound care specialist nurses to link with service provider nurses for comprehensive assessment and continuity of care at the bedside
- Patient navigation links for necessary investigations and consultations in a timely fashion for comprehensive interprofessional care
- Ability to follow up patients prospectively for improved outcomes

RESULTS

Since April 2020, 48 patients on service from 2012 to 2021 were referred to the Home and Community Care Support Services wound care nurse specialist for holistic virtual assessment and treatment (Table 4). Through the implementation of a coordinated PNM, patients who were not responding to existing care were referred to the wound care PNT.

The typical consult was conducted with the patient in their home, and both the patient and primary nurse were part of the interprofessional team. The most important aspect of the PNM was to determine the correct diagnosis (accurate and precise) with appropriate diagnostic

testing and other investigations. Optimal pain management (including the treatment of nociceptive and neuropathic pain) along with the management of infection was also often missing pre-consultation. Addressing these issues significantly improved patients' satisfaction and activities of daily living.

This patient management model also included the addition of foot specialists (eg, podiatry), rehabilitation therapists (occupational therapy, physical therapy), dietitians, and social work services when required. These measures expanded the care team for optimal coordination and planning. Follow-up case conferencing was utilized for more complex patients.

The PNM pilot results are illustrated in Figure 3. To contextualize the results:

- Nursing visits were reduced with coordinated and evidence-based care. As the patients' wounds progressed toward healing, nursing visits decreased in frequency because of improved treatment of the cause (eg, optimizing compression or plantar pressure redistribution), improved pain control, evaluation of local wounds for infection or persistent inflammation, and prescribing topical and oral therapy based on evidence-informed wound care principles in WBP 2021.
- Reduction in supply cost was driven by efficient, appropriate care and the elimination of unnecessary dressings/products. Improving the diagnosis of infection led to decreased dressing changes and accelerated healing.
- Pain reduction was achieved through prompt infection management and optimal treatment of both nociceptive and neuropathic pain with a huge impact on patient activities-of-daily-living outcomes and the ability to apply adequate compression therapy. Many nursing professionals do not have the diagnosis of infection in their scope of practice. Using the STONEES (Size increase, Temperature increase, Os, New breakdown, Exudate,

Table 4. PATIENT DATE OF HOME CARE SERVICE, YEAR OF TEAM ASSESSMENTS, DIAGNOSES, DEMOGRAPHICS, AND SIGNIFICANT COFACTORS CONTRIBUTING TO NONHEALING

Service Start Date	First Assessment Date	Wound Diagnosis	Patient Sex, Age	Primary Diagnosis and Significant Cofactors That Could Impair Healing
2012 June	2021	Venous lymphedema	Male, 60–69 y	OA, chronic back pain with previous spinal fusion
2014	April 15	Lymphedema	Female, 60–69 y	IDDM, CVA, HTN, malignancy, dyslipidemia, anemia
	June 16	Lipoedema	Female, 70–79 y	HTN, CHF, pulmonary HTN, COPD, obesity, anemia
	September 18	Elephantiasis with venous lymphedema	Female, 70–79 y	IDDM, CVA, HTN, PVD
2015 February 19	2020	Venous lymphedema-associated with secondary bacterial infection and DFU	Female, 50–59 y	NIDDM, HTN, chronic kidney disease, CHF, PVD
2016	April 7	Venous insufficiency	Male, 30–39 y	Protein C deficiency, PG
	June 27	PG and possible calciphylaxis	Female, 60–69 y	AF, anemia, HTN, obesity, B ₁₂ deficiency
	November 10	Venous lymphedema	Female, 80–89 y	HTN, dependent edema, OA right shoulder and right hip
2017	February 8	Subacute infection and PG	Female, 60–69 y	Ulcer, colitis, malignant melanoma, autoimmune hepatitis, PVD
	March 13	Small vessel disease	Male, 40–49 y	Cerebral palsy affecting all four limbs
	March 28	Nontraumatic osteomyelitis	Male, 60–69 y	Hernia, osteomyelitis, idiopathic peripheral neuritis
	June 9	Contact allergic dermatitis with mixed venous/arterial etiology	Female, 70–79 y	PVD, chronic nerve damage with chronic pain syndrome
	July 13	Eczematous disorder	Female, 70–79 y	PVD, Morgellons disease (intense itch with secondary skin damage)
	July 18	Lymphedema of the scrotum	Male, 80–89 y	HTN, CHF, osteoarthritis bilateral knees, obesity, bilateral leg lymphedema
	July 28	Necrobiosis lipidica diabetorum and potentially PG	Male, 30–39 y	NIDDM, HTN, dyslipidemia
	November 2	Black or gangrenous left foot	Male, 80–89 y	Bilateral ischemic stroke, AF, HTN, coronary artery disease, PVD, and iliac artery stents
	November 7	Infected hardware, left knee replacement	Male, 70–79 y	NIDDM, PVD, chronic anemia, AF
2018	January 3	Venous leg ulcer	Male, 80–89 y	Parkinson disease, PVD
	February 22	Chronic scalp inflammation	Female, 90–99 y	Malignant melanoma scalp and back, HTN, iron deficiency
	May 23	Granuloma	Female, 60–69 y	NIDDM, HTN, PVD, postamputation of left 4th and 5th toes, neuropathy
	August 29	Hidradenitis suppurativa	Female, 30–39 y	Stage 4 Ca breast, hyperhidrosis
	November 7	Venous leg ulcer/lymphedema	Male, 50–59 y	Obesity, Crohn disease, lymphedema
	November 15	Mixed venous/arterial etiology	Male, 80–89 y	Malignant melanoma, spinal stenosis, PAD, HTN, benign prostatic hyperplasia, end-stage CHF
	December 4	Venous lymphedema	Female, 60–69 y	NIDDM, lymphedema bilateral leg, chronic pain, obesity
	December 31	Primary congenital lymphedema	Female, 60–69 y	Lymphedema, chronic pain, COPD, obesity
2019	January 8	Pretibial leg ulcer	Female, 90–99 y	CHF, breast malignancy
	January 18	Lymphedema	Female, 70–79 y	CHF, COPD, HTN, dementia, lymphedema
	February 11	Venous lymphedema	Female, 70–79 y	Diabetes mellitus, AF, hyperparathyroidism, aortic abdominal aneurysm, hypothyroidism, obesity
	February 22	IAD with severe contact dermatitis	Male, 80–89 y	IDDM, AF, CHF, COPD, eczema
	March 22	Scleroderma	Female, 70–79 y	Breast malignancy, chronic pain, HTN, AF, polymyalgia rheumatica
	March 28	Gout	Male, 70–79 y	NIDDM, Ca bladder, CAD, pulmonary HTN, CHF, gout, RA
	April 4	Pyoderma gangrenosum	Female, 80–89 y	IDDM, CHF, CRF, CAD, COPD, gout, hypothyroidism
	April 18	Venolymphedema/sarcoid granuloma	Female, 60–69 y	Obesity, fibromyalgia, depressive disorder

(continues)



Table 4. PATIENT DATE OF HOME CARE SERVICE, YEAR OF TEAM ASSESSMENTS, DIAGNOSES, DEMOGRAPHICS, AND SIGNIFICANT COFACTORS CONTRIBUTING TO NONHEALING, CONTINUED

Service Start Date	First Assessment Date	Wound Diagnosis	Patient Sex, Age	Primary Diagnosis and Significant Cofactors That Could Impair Healing
April 29	2020	Idiopathic diabetic bullae	Male, 70–79 y	NIDDM, dermatomyositis, CHF, chronic renal failure, sleep apnea
May 30	2020	Livedoid vasculopathy	Male, 60–69 y	Lower leg ulcer, Ca prostate
July 8	2020	Contact allergic dermatitis	Male, 90–94 y	CVD, hyperplasia of prostate
July 18	2020	Spinal fistula	Female, 60–69 y	NIDDM, CVD, HTN, vesicovaginal fistula, CRF
December 17	2020	Mixed venous/arterial etiology	Male, 70–79 y	NIDDM, CHF
December 17	2021	Venous leg ulcer	Male, 70–79 y	HTN, obesity, PVD
January 11	2021	Basal cell carcinoma skin lesion	Female, 90–99 y	IDDM, cardiac pacemaker, OA, CVD
2020 February 12	2021	Venous leg ulcer	Female, 70–79 y	IDDM, spina bifida, PVD
April 8	2021	Follicular lymphoma, squamous cell carcinoma	Female, 80–89 y	Gastroesophageal reflux disease, HTN, IDDM, AF, OA, anemia
April 27	2021	Lymphedema, leg edema, and lesions	Female, 70–79 y	IDDM, HTN, obesity, COPD, end-stage renal failure
June 24	2021	Extreme lymphedema/elephantiasis	Male, 40–47 y	Filariasis left leg (still active and needed definitive treatment)
July 27	2021	Venous leg ulcer	Female, 60–69 y	Spina bifida, breast malignancy, hyperparathyroidism, paraplegia
July 31	2020	Vasculopathy post right leg amputation	Female, 80–89 y	Hypothyroidism, HTN, thrombocytopenia/myelofibrosis/polycythemia
August 5	2021	Lymphedema	Female, 30–39 y	IDDM, HTN, acute renal failure, infantile cerebral palsy, obesity
November 4	2021	Secondary venous lymphedema	Female, 70–79 y	HTN, depressive disorder, CHF

Abbreviations: AF, atrial fibrillation; Ca, cancer; CAD, coronary artery disease; CHF, congestive heart failure; COPD, chronic obstructive pulmonary disease; CVA, cerebral vascular accident; DFU, diabetic foot ulcer; HTN, hypertension; IAD, incontinence-associated dermatitis; IDDM, insulin-dependent diabetes mellitus; NIDDM, non-insulin-dependent diabetes mellitus; OA, osteoarthritis; PG, pyoderma gangrenosum; PVD, peripheral vascular disease.

Erythema/edema, Smell) mnemonic, they can record clinical signs for a qualified healthcare provider to diagnose the deep and surrounding infection if three or more of the signs are positive.

- During the COVID-19 pandemic, patients did not have the ability to visit their family physician and were frightened of ED visits for fear of contracting the virus. This left them few options for chronic disease management and its common complication, infection. Most often, oral antimicrobial agents were sufficient, although IV agents were occasionally required.
- Reduced wound surface area and wound closure were achieved by interprofessional care, resulting in more effective treatment of the cause.
- Incorporating a doctor (alternatives could include an NP or diagnostic and treatment clinician) as a regular member of the team instills confidence and the ability to optimize treatment for the patient and their family (ordering appropriate investigations; management of infection, pain, and wound cause), providing greater adherence to the care plan.

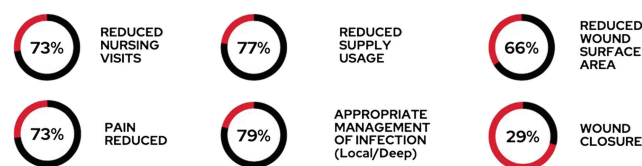
Example Case Studies

Case 1. The patient was a 31-year-old man with a history of venous disease complicated by idiopathic pyoderma

gangrenosum. The wound had been present for 7 years at the time of referral to the PNT. The patient's initial employment required prolonged periods of standing and he was overweight, both of which hindered his venous return. The PNT recognized his unmanaged pain and its impact on both his day-to-day living and the potential treatment approaches for his wound because he could not tolerate compression. At his initial consult time, he could not easily change his current job. Multiple caregivers had tried various dressings over the years without success, resulting in significant frustration and reduced quality of life.

After gradual pain control and compression adherence improvements over several months, he was able to work from home. During this period, the patient's clinical visits were more regular, averaging every 3 or 4 weeks, showing commitment to the process. The

Figure 3. PILOT PROGRAM RESULTS



patient was very happy with the outcome and the key learning points were effective diagnosis, the understanding and management of pain, and the ability to wear adequate compression. He had in-person clinic visits with the PNT clinical expert doctor with surgical debridement, biopsies, and bacterial cultures of the wound tissue for precise targeted antimicrobial therapy. The patient enjoyed the team approach because he felt included as part of the care and decision-making process. Overall, this patient accepted the patient navigation approach, was comfortable with the improved clinical outcomes, and had a highly positive experience. His wound is healed after 7 years, and he is free of pain. He is walking and exercising regularly and starting to lose weight.

Case 2. This 72-year-old woman had a 3-year history of lymphedema with circumferential lower leg erosions that were worse on her right leg. She had several complicating factors including type 2 diabetes, severe osteopenia, osteoarthritis of the knees, an abdominal aortic aneurysm, and chronic obstructive pulmonary disease. Her ulcers were painful, especially at night. The patient's primary caregiver was her daughter, who was feeling "burnt out" due to the frequency of the twice-daily dressing changes for excessive wound exudate.

The patient had been seen by a certified wound specialist nurse several times in the past with recommendations that had not achieved closure. The wound nurse identified an unresolved infection and her infectious disease consultant recommended IV antibiotics, but the patient declined. She had repeatedly refused any compression for both legs and often canceled nursing visits. There was documented "allergic reactions" or intolerance to silver and iodine (coexisting thyroid disease) wound care products.

The consultative team visit diagnosed venous lymphedema clinically with an audible biphasic dorsalis pedis waveform bilaterally on handheld Doppler assessment. This is the equivalent to an ankle brachial pressure index >0.9 and much easier to perform in a patient's home as she declined a full vascular study.^{8,25} Recommendations for treatment included the following:

- After washing with mild soap and water, stasis dermatitis was treated with a moderate-strength topical steroid (betamethasone valerate 0.1% cream) to the red areas and an emollient moisturizer to the dry areas.
- Topical chlorhexidine 0.2% in a spray bottle was applied to open areas of the skin, and PHMB (polyhexamethylene biquanide) gauze roll coated with chlorhexidine was applied from the base of the toes to two fingers below the posterior knee.
- Pain (burning, stinging, shooting 5/10 in the day and 10/10 at night) was treated with pregabalin low dose 25 mg BID and nortriptyline 10 mg at night (low doses due to decreased renal function). She had no pain 2 weeks later and tolerated compression therapy, and her high-dose codeine combined with acetaminophen was stopped.
- Compression therapy was applied with a zinc oxide ointment bandage covered with a light tubular bandage. Changes decreased from BID to daily, every 3 days, twice a week, and then weekly. When the edema was controlled, she was shifted to the two layers of an elasticized tubular stockinette (Tubigrip; Mölnlycke, Norcross, Georgia)²⁶ for 4 months. It was rolled down to the ankle each night by her daughter and re-stretched to two fingers below the knee in the morning. Unfortunately, her daughter was ill and hospitalized. Because of adequate pain control, the case patient transitioned to a multilayer nonelastic system for 2 months, and when her daughter recovered, she was placed on the longitudinal circular dressing (EdemaWear; Compression Dynamics, Omaha, Nebraska)²⁶ that was successfully left in place at night.

DISCUSSION

Patient-centered care considers the patient's unique experiences of illness or injury combined with active collaboration for shared care decision-making between patients, their circle of care, and care providers.²⁷ The first PNMs aimed to reduce care barriers and improve the integration of care in the context of cancer;²⁸ they have since evolved to meet the needs of patients with a variety of health conditions.²⁹ Patient navigators ensure equitable access to care and assist with timely access and coordination

Table 5. ECONOMIC IMPACT ANALYSIS WITHIN MISSISSAUGA HALTON LOCAL HEALTH INTEGRATION NETWORK

Etiology	No. Wounds With an Enhanced Diagnosis	Total Pre-Best-Practice Cost Estimate (\$CAD) ^a	Total Post-Best-Practice Cost Estimate (\$CAD) ^b	Cost Efficiency (\$CAD)	Cost Efficiency (%)
Diabetic foot ulcers	46	223,928	75,670	148,258	66%
Leg ulcers	111	616,494	165,612	450,882	73%
Pressure injury	17	188,428	64,073	124,355	67%
Other	79	875,636	105,307	770,329	88%
Total (Insufficient data 53/306)	253	1,904,486	410,662	1,493,824	78%

^aAverage cost per wound: \$4,868 (diabetic foot ulcer); \$5,554 (leg ulcer);⁷ \$11,084 (pressure injury);¹⁴ and \$10,376 (other)¹

^bAverage cost per wound: \$1,645 (diabetic foot ulcer); \$1,492 (leg ulcer);⁷ \$3,769 (pressure injury); and \$1,333 (other)¹



of care services, especially for patients transitioning between care settings.^{30–32}

These provisions may help narrow existing healthcare disparities. Patient navigators can facilitate improved healthcare access and quality for underserved populations.³³ Through advocacy and care coordination, they can also address deep-rooted issues related to distrust in providers and the health system that often led to avoidance of health problems and nonadherence to treatment recommendations. The authors addressed many of the disparities associated with language and cultural barriers, fostering trust and empowerment within the communities.

Often the barriers to successful wound healing are related to the health system and not to a lack of provider knowledge. Better coordination of care is needed across the continuum, from acute to chronic care, as well as standardization of formularies and best practices. This could be accomplished through situational wound care practice and education in the patient's home. These changes need to be linked to virtual team learning, changing healthcare systems to facilitate the interprofessional assessment of complex patient problems, and breaking down barriers within and across healthcare organizations.³⁴ Healthcare facilities should invest in wound care resources for interprofessional education, as well as regular review of wound care quality data outcomes.

Patients with chronic wounds often have limited resources and are living in lower socioeconomic conditions. Patient navigation models can facilitate patient referrals and link home care providers with care coordinators to access system resources. However, this is successful only when team members and patients within their circle of care are linked together as part of a coordinated interprofessional model. These changes can increase the value of the healthcare system. Connecting this with a wound-focused PNM would benefit patients, professionals, providers/payers, and policymakers. Patients get better care and outcomes, while funders save money through efficiencies related to improved management. The buy-in by all team members, including the patient and their circle of care, improves efficiencies in the system and negates delays from back-and-forth negotiations between providers.

Economic Benefits of Standardized Care

Several studies over the past 2 decades have demonstrated positive economic benefits from providing a more structured and standardized approach to the interprofessional management of persons with acute and chronic wounds. A previous study in the Mississauga Halton LHIN region of Ontario, Canada, documented that after a comprehensive interprofessional assessment, 100% of patients (N = 308) had the healing status of the wound determined versus only 36% beforehand.¹² A positive healing trajectory was established for 58% of patients

4 weeks after assessment. These assessments demonstrated significant improvement in the assessment and management of this LHIN's patient population, leading to significant cost efficiency.¹² Table 5 outlines economic impact analyses related to specific wound types.

The present study determined that a substantial portion of complex, nonhealing wounds (64%) were not accurately diagnosed and perpetuated ineffective care. Cost efficiencies to the system will be derived from an effective interprofessional assessment that can lead to a significant reduction in long-standing wounds. Currently, the wound care system does not have sufficient capacity to make interprofessional assessments mandatory, nor has it been substantially proven, to date, that such a requirement would be economically self-supporting.

These analyses do not factor in the additional cost efficiencies potentially derived from other, more complex wound-related issues, such as amputation prevention (\$70,000 CAD/amputation),¹⁶ which was documented with a 68% reduction in the Guyana Diabetes and Foot Care Project.¹¹ In addition, preventing infection (eg, surgical site infections, average treatment cost \$25,000 CAD)¹⁷ and reducing unscheduled ED visits (average visit cost \$1,000 CAD) offer additional cost savings.¹⁷ All of the studies discussed above have shown the economic benefits of interprofessional coordinated care that is facilitated by patient navigation.

Clinical pathways are for routine care. Like in the economic studies discussed, the patients included in the current research did not fit into existing pathways or could not heal without expert modification of care or diagnostic tests to determine alternative diagnoses and treatment. The WBP 2021 model was used to facilitate this case management by the wound care expert team.

CONCLUSIONS

Unfortunately, communities with the highest proportions of racial/ethnic minorities are among the most vulnerable to reduced healthcare access and quality. Patient navigation provides an approach for a comprehensive range of healthcare services and support. The interprofessional team PNM presented here is a potentially powerful tool in the arsenal to target wound care health disparities.

Navigators are uniquely positioned to play an integral role in facilitating access to care, as well as addressing language and cultural barriers. Patient navigators can break through literacy barriers, build trust, reduce fear, and support the improvement of patient-provider communication. In doing so, navigators can change the environment to facilitate healthcare delivery for all. Key elements of a wound care PNM should include the following:^{8,35}

- Use of validated tools to identify and treat wound causes, comorbidities, surgical history, skin characteristics, nutrition, and medications

- Optimization of resource management using electronic records
- Review of healability, and patient-centered concerns, including pain control and activities of daily living
- Interprofessional team members maintain and manage skin integrity and optimize patient's overall health and well-being
- Implementation of an evidence-informed, holistic plan of care focused on optimizing the local wound environment, selecting appropriate dressings, and potentially using cost-effective adjunctive therapies
- Evaluation of outcomes to determine whether goals of care have been met, adjust treatment, and support prevention to reduce the risk of recurrence
- Evaluate patients' lived experiences to improve healthcare systems

Finally, the WBP 2021⁸ is an excellent tool to ensure the effective management of persons with wounds. This project validated the use of the WBP 2021 paradigm in collaboration with the interprofessional team, benefiting both patients and the healthcare system overall. ●

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