

Demonstration Project for Community Patients with Lower Leg and Foot Ulcers

A Collaborative Project of the University of Toronto,
Women's College Hospital, Registered Nurses' Association of Ontario,
Toronto CCAC and Peel CCAC

A supplement to *Wound Care Canada*, Volume 5, Supplement 1, spring/summer 2007

R. Gary Sibbald, BSc, MD,
FRCPC (Med) (Derm), ABIM, DABD, MEd;
and Douglas Queen, BSc, PhD, MBA

Funded by the
Primary Health Care
Transition Fund Unit,
Primary Health Care Team,
Ontario Ministry of
Health and Long Term Care

Canadian Association
of Wound Care



Association canadienne
du soin des plaies

Contents

Integrating Evidence into Clinical Practice and System Policy.....	52
Wound Care Best Practice in Action: A Provincially Funded Initiative.....	57
Services for Lower Leg and Foot Management Available in Home Care or Community Settings across Canada.....	510
An Audit of Leg and Foot Ulcer Care in an Ontario Community Care Access Centre.....	517
Best Practice: Development, Implementation and Current Status Across Canada.....	528
A Transprofessional Comprehensive Assessment Model for Persons with Lower Extremity Leg and Foot Ulcers.....	534
A Client's Perspective in the Management of Lower Extremity Ulcers.....	548
The Importance of Sharp Debridement in the Community Care of Foot Ulcer Care: A Cost-benefit Evaluation.....	551
A Cost-utility Evaluation of Best Practice Implementation of Leg and Foot Ulcer Care in the Ontario Community.....	553
Primary Care Reform Project: Concluding Discussion and Recommendations.....	557

Integrating Evidence into Clinical Prac

R. Gary Sibbald, BSc, MD, FRCPC (Med) (Derm), ABIM, DABD, MEd; Doris Grinspun, RN, PhD(c);
and Camille Orridge, RN

As Canadians we live in an environment of change, which has a significant impact on our health. As the population ages, chronic ulcers are becoming a greater impediment to the quality of life of affected individuals and are an increasing problem for the health-care system. There has been a shift in the care of chronic wounds from institutional settings to home-care services. Ontario was divided into 42 Community Care Access Centres (CCACs), and now 14 CCACs within the Local Health Integration Networks (LHINs) will administer community care. All of these factors impact on both the provision and quality of health-care delivery.

The care of the population with wounds is compounded by the fact that leg and foot ulcers are highly associated with age. The incidence of wounds in the elderly in Canada is much higher than for the general population and is reported to be in the four per cent range.^{1,2} Therefore, as the Canadian population ages, the number of individuals requiring care will dramatically increase. Unless we work on reducing the prevalence and complications of leg and foot ulcers, we will have to confront serious health-care challenges, including the cost of paying for such care.

Diabetes has been described as the new epidemic in health care. Although only five to six per cent of the population has diabetes mellitus, this condition is increasing in our aging society. Affected clients with diabetes are responsible for a disproportionately high 50 per cent of all non-traumatic lower limb amputations. Many of these amputations are preventable, and a majority of the amputations are preceded by foot ulceration. The overall cost for each amputation is estimated to be \$40,000 or higher according to the Ontario Government publication *Diabetes in Ontario* (www.diabetes.ca).

Fifty per cent of admissions to hospital in persons with diabetes are due to complications of foot ulcers.³ Around 7.2 per cent of clients with diabetes and neuropathy will develop a foot ulcer⁴ on an annual basis. Persons with diabetes are very prone to developing neuropathy, and the insensate foot sets the stage for ulceration. Three factors are very important in preventing amputations: adequate vascular supply, controlled bacterial burden and infection, and pressure downloading with shoes and orthotics.^{5,6}

The Canadian Approach to the Care of Lower Extremity Ulcers

Home-care authorities are struggling to determine the best

way to meet the demand that individuals with leg and foot ulcers are placing on the health-care system. Inefficiencies in the Canadian approach to this demand pose significant challenges. For example, care co-ordinators often have incomplete assessments of clients and are not able to link home-care requests with best practice recommendations as outlined in the evidence-based literature. The need for a tightly co-ordinated team approach at the community level, following standardized best clinical practices, is essential to the cost-effective management of wound complications. Presently, this crucial standard is not usually nor consistently applied across Canada. Change is required to provide cost-effective care.

Ontario, with its leadership and focus on best practices and demonstrated clinical and health outcomes, has a unique opportunity to lead the nation in a paradigm shift. Moreover, joint clinical decision-making, which is the most substantive form of teamwork, is integral to the nation's effort to shift practices toward teamwork and bodes well for client-centred care.⁷ We suggest pilot projects focused on wound care, including leg and foot ulcer prevention and treatment that would serve to trigger a co-ordinated evidence-based team approach, which would replace the current compartmentalized community service. These teams must integrate the CCAC care co-ordinator with the family doctor, nurse practitioner, family practice nurse and community wound-care nursing expert, as well as with other health-care professionals involved in wound care.

Ontario is undergoing positive transformations that invite reflective practice, systematic thinking, and intersectoral and interdisciplinary models of care delivery. It is a challenging time for family doctors. Unfortunately, most physicians continue to be rewarded for individual client visits and not for the complexity or length of time required to complete a full assessment that will facilitate an evidence-based approach to care. Performing an integrated assessment may take many hours but it could save many months of home-care services.

The same problem applies to most home-health-care nursing services, which are usually paid per visit and not for the complexity of the detailed assessment to support a holistic treatment plan. As a result, home-care records often do not have specific diagnoses on lower extremity ulcers, and the case manager is often working with incomplete assessment

tice and System Policy

documentation. In addition, case managers do not have the specific knowledge and skills (i.e., knowledge gap) to differentiate wounds from the associated diseases. For example, a person with a foot ulcer is simply classified as diabetic, rather than more precisely identifying the cause, such as neuropathy, ischemia, infection or a combination of associated factors. Alternately, the converse exists where the records often document a leg or a foot ulcer without any information available on etiology or other complicating factors.

Timely, co-ordinated care would result in a decrease in ineffective and unnecessary home visits and a better utilization of health services. The underlying philosophy of this Primary Care Reform Project was to optimize wound healing by forging better linkages between family doctors, nurse practitioners, family practice nurses, CCAC case managers, home-health-care nurses and other health-care professionals who provide specialist services. The goals were to streamline the process by reducing the number of providers and specialists involved, and to create an environment in which a specific diagnosis was used consistently to direct evidence-based care and appropriate bench-marking to guide follow-up care.

Primary Care and Interprofessional Education

To address this knowledge gap, Canadian wound-care leaders have developed a comprehensive educational package with six levels of educational opportunities (Figure 1).

The Canadian Association of Wound Care (CAWC) addresses the first three levels: Levels 1 and 2 are covered through seminars. Level 3 is a reflective learning and practice portfolio involving attitude development with self-assessment, including learning needs, goals, resources and outcomes.

Levels 4 and 5 are addressed at the University of Toronto. Level 4 is the International Interprofessional Wound Care Course,⁸ which delivers a certification for key opinion leaders who have a special interest in wound care, including family doctors, nurses and other transprofessional wound-care team members (www.ceutoronto.ca).

Level 5 is a professional master's course that adds the

educator role to a health-care-system-change course.

Level 6 is participation in high-level educational and research activities such as the World Union of Wound Healing Societies' evidence-based summary process, which will bring together the science of wound care with expert opinion and client preference that will enable client-centred outcomes (www.wuwhs2008.ca).

Other organizations, such as the Registered Nurses' Association of Ontario (RNAO), are also active in the establishment and implementation of guidelines.^{9,10} The RNAO's success in developing, disseminating and supporting the adoption of clinical best practice guidelines¹¹ is recognized

across the nation and abroad. The associations' framework has also provided solid elements of education.

Effective education for family doctors should promote situational practice-based learning with simple reminders and a support system (enablers and reinforcing strategies). Strategies that are most likely to effect change have been systematically reviewed by Davis et al.^{12,13} It is important that family doctors and nurses learn from their clients and translate the existing evidence

base into everyday relevant care.¹⁴ More emphasis needs to be placed on implementing evidence-based guidelines into practice¹⁵ as well as integrating preventative strategies. Successful programs require client-education programs and the inclusion of the client in the team decision-making process.

Many primary care providers, specifically family doctors, are often inundated with guidelines and experience information overload for multiple medical conditions. Wound care is an increasing issue for many of these practitioners, yet their baseline knowledge is usually inadequate, and new evidence and expert opinion are evolving quickly. For example, family doctors are not acquainted with the evidence base of high compression therapy as the gold standard in systematic reviews for venous leg ulcers or the importance of pressure downloading in individuals with neurotrophic foot ulcers.

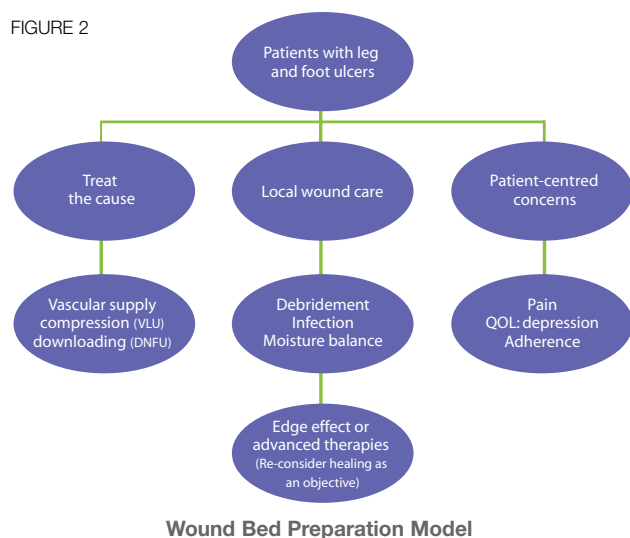
Co-ordinated Care

Caregivers are frustrated with the current health-care

FIGURE 1



FIGURE 2



system when the system rewards frequent visits and the health-care providers are discouraged financially from performing comprehensive assessments. As a result of incomplete assessments, often no specific diagnoses are recorded, therefore making it impossible to link treatment to the associated causes. If a diagnosis is made then the cause(s) must then be related to the evidence base and to appropriate management strategies.

Implementation of an appropriate care plan must be created in co-operation with the primary care physician, nurse practitioner or family practice nurse, community nurse and home-care co-ordinator along with other identified team members. The care co-ordinator needs more information about critical care management issues. This must be seen as part of the initiation of home care and not after many months of stalled healing or client deterioration. It is important to decrease the inefficient use of home care yet at the same time develop community health-care teams that support the efforts of home-care providers, including the client and family members.

Family doctors, nurse practitioners and family practice nurses must be encouraged to develop key opinion-leader skills in wound care, and they must be integrated into the home-care system. As well, the case manager needs a closer, hands-on connection with the critical-care management issues to make informed decisions on resource utilization. There is an urgent need to embed wound-care expertise and advanced education methods with appropriate clinical practice supports.

A Canadian model has been developed to provide a common language for wound assessment and treatment (Figure 2).

The Wound Bed Preparation Model provides a systematic approach to support evidence-based care.^{16,17,18}

Teams need to assess the ability of wounds to heal prior to developing treatment plans for optimal resource utilization. Resource utilization needs to be linked to outcome benefit and client-centred factors, and needs to provide as much care as possible. This will allow tertiary wound-care clinics to service home-care more efficiently and to assess clients that are benchmarked locally as not responding at the expected healing rate.

It is important to create a paradigm where nursing services contracted through CCACs are not rewarded for frequent and incomplete visits but rather for improved healing (outcomes). The wound-care expert team needs to train a smaller number of contracted nurses to develop and deliver expert wound-care treatment plans. Wound-care expertise, the ability to efficiently case-manage clients and the relief of pain and suffering are all required as components to translate the new evidence into day-to-day client care.¹⁹

There is much to be gained by a system that supports the delivery of best practice and co-ordination of services. The development of a comprehensive assessment at the home-care level will improve access to specialized wound-care clinics for those clients with complex, multifactorial chronic wounds requiring tertiary expertise. This plan can eliminate delays caused by the processing of many clients in tertiary centres with less complex wound-care challenges.

One should also assess the feasibility and cost-effectiveness of providing wound-care treatment in the client's home. At times, it might be more effective to bring the client to the clinician in the form of outpatient clinics. However, this method may pose difficulties and compromise wound healing as many of these clients are housebound, find travel awkward and may require hospital transport or other help to attend. A cost-effective method of bringing the client to the clinician could involve the use of telemedicine. A clinic centred around images and dynamic video of a clients' environments and their wounds would enable the clinician to review more wounds during a single clinic without travel involved by either party. It would also prevent uncomfortable and difficult travel arrangements for clients while enabling their wounds to be reviewed regularly by an expert.

The images and videos also provide a useful record of the wound-healing progression. The use of telemedicine will be one efficient way to reach more remote communities.

Client Concerns

Clients with lower leg ulcers have to make profound changes in their lives. The ulcer impacts all of their daily activities of living, which often take more effort, energy and time. Added to this are issues of pain, wounds with drainage and wounds with odours. Mobility may be affected; as a result, clients are often housebound. Clients are also very busy with nursing visits and doctor's appointments. Attending medical appointments is sometimes very difficult and often the only reason they leave their home. Transportation arrangements and payment is an issue for many clients. The resulting social isolation further impacts quality of life. Indeed, the lives of clients with wounds are often complex and many times involve multiple challenges. The life of a client with a wound is not an easy one!

Clients with multiple medical problems also consider their ulcers to be the cause of the changes in their life. They seem to have adapted or adjusted to the other medical conditions and their resultant effects, but they feel the ulcers are the cause of their impediments.

Client Barriers

There are several client-centred concerns that must be addressed to achieve successful wound-care outcomes. Clients with venous leg ulcers must be educated on the importance of edema control and management, including compression therapy. The recurrence rate of venous ulcers has been as high as 75 per cent without support stockings and as low as 25 per cent per year with compression hosiery.¹ There is a need to supply this hosiery if clients are unable to purchase the stockings with their own funds. An assistive device program needs to be created that will provide stockings on a graduated income scale in conjunction with home care.

There is also a need to ensure that every client receiving home-care services for plantar foot ulcers has appropriate pressure-downloading footwear. This is a cost-effective procedure and should be considered for an income-related assistive device benefit. Alternatively this may be covered in the home-care envelope, but there is a danger that if this benefit is linked to home care, individuals who are

self-sufficient will be registered with home care simply to obtain protective footwear. Alberta Aids to Daily Living (AADL) covers support stockings and pressure-downloading footwear under specified circumstances. We should consider best practices be implemented locally, provincially and across the nation.

The management of chronic wounds in the community is complicated by the fragmentation of services and lack of connected health-care professionals working in an inter-professional team to assess and treat lower extremity skin ulcerations. The care of individuals with chronic leg ulcers is both time-consuming and not cost effective in a fee-for-service formula for primary care physicians and community-based nurses.

It is hoped that by optimizing care we can improve client outcomes and satisfaction as well as decrease costs. In a time of transformation we must ensure we change home care and engage this sector in primary, secondary and tertiary prevention. We believe that home health care can and must play a key role in prevention and expert treatment for persons with leg and foot ulcers. Doing so would result in improved client outcomes and a lower cost or cost-neutral outcome for the system.

References

1. Moffatt CJ, Oldroyd MI. A pioneering service to the community: The Riverside Community Leg Ulcer Project. *Prof Nurse.* 1994;9:486, 488, 490.
2. Baker SR, Stacey MC, Jopp-McKay AG, Hoskin SE, Thompson PJ. Epidemiology of chronic venous ulcers. *Br J Surg.* 1991;78:864-7.
3. Krentz AM, Acheson P, Basu A, Kilvert A, Wright AD, Natrass M. Morbidity and mortality associated with diabetic foot disease: A 12-month prospective survey of hospital admissions in a single UK centre. *Foot.* 1997;7:144-47.
4. Abbott C, Vileikyte L, Williamson S, Carrington A, Boulton A. Multicenter study of the incidence of and predictive risk factors for diabetic neuropathic foot ulceration. *Diabetes Care.* July 1998;21:1071-5.
5. Browne AC, Sibbald RG. The diabetic neuropathic ulcer: An overview. *Ostomy/Wound Management.* 1999;45(11):6S-20S.
6. Orsted HL, Searles G, Trowell H, Shapera L, Miller P, Rahman J. Best practice recommendations for the prevention, diagnosis and treatment of diabetic foot ulcers: Update 2006. *Wound Care Canada.* 2006;4(1):57-71.

7. Grinspun D. Healthy workplaces: The case for shared clinical decision making and increased full-time employment. *Healthcare Papers Special Issue*. 2007;7(Feb):85-91.
8. Sibbald RG, Orsted H. The International Interdisciplinary Wound Care Course at the University of Toronto: A 4-year evolution. *International Wound Journal*. 2004;1(1):34-37.
9. Registered Nurses' Association of Ontario (RNAO). 2006 Clinical Best Practice Guidelines. Toronto: RNAO. 2006.
10. ——. 2006. Healthy Work Environments Best Practice Guidelines. Report of the Review and Implementation. Toronto: RNAO.
11. Grinspun D, Virani T, Bajnok I. Nursing Best Practice Guidelines: The RNAO Project. *Hospital Quarterly*. 2002;5(2):54-58.
12. Davis DA, Thomson O'Brien MA, Oxman AD, Haynes RB. Changing physician performance: A systematic review of the effect of continuing medical education strategies. *JAMA*. 1995;274:700-5.
13. Davis DA, Thomson O'Brien MA, Freemantle N, Mazmanian PE, Taylor-Vaisey AL. Impact of formal continuing medical education. *JAMA*. 1999;282:867-874.
14. Nelligan P, Grinspun D, Jonas-Simpson C, McConnell H, Peter E, Pilkington B, Balfour J, Connolly L, Lefebvre N, Reid-Haughian C, Sherry K. Client-centred care: Making the ideal real. *Hospital Quarterly*. 2002;5(4):70-76.
15. Davis DA, Taylor-Vaisey AL. Two decades of Dixon: The question(s) of evaluating continuing education in the health professions. *J Contin Educ Health Prof*. 1997;17:207-213.
16. Sibbald RG, Williamson D, Orsted HL, Campbell K, Keast D, Krasner D, Sibbald D. Preparing the wound bed: Debridement, bacterial balance and moisture balance. *Ostomy/Wound Management*. 2000;46(11):14-35.
17. Sibbald RG, Orsted HL, Schultz GS, Coutts P, Keast DH. Preparing the wound bed 2003: Focus on infection and inflammation. *Ostomy/Wound Management*. 2003;49(11):24-51.
18. Sibbald RG, Orsted HL, Coutts PM, Keast DH. Best practice recommendations for preparing the wound bed: Update 2006. *Wound Care Canada*. 2006;4(1):R6-R18.
19. Davis D, Evans M, Jadad A, Perrier L, Rath D, Ryan D, Sibbald RG, Straus S, Rappolt S, Wowk M, Zwarenstein M. The case for knowledge translation: Shortening the journey from evidence to effect. *BMJ*. 2003;327:33-5.

Wound Care Best Practice in Action: A Provincially Funded Initiative

R. Gary Sibbald, BSc, MD, FRCPC (Med) (Derm), ABIM, DABD, MEd

Leg and foot ulcers are often recalcitrant to healing, tend to recur, and become long-term chronic health-care problems. Many clients living with chronic leg and foot ulcers experience diminished quality of life, pain, psychosocial maladjustment, limited work capacity, and physical disabilities. The Ontario point prevalence of lower limb ulcers is estimated to be 0.18 per cent in all age groups and as high as 12.6 per cent in persons above age 70. The number of clients suffering from leg and foot ulcers in Canada is comparable to those reported in other international studies. It is obvious that as the population ages, leg and foot ulcers are becoming more prevalent and constitute a significant disease burden on the health-care system—particularly home-care nursing services.

To better comprehend the scope of the wound-care issue, the Community Care Access Centre (CCAC) in Peel has been audited for the prevalence of chronic wounds on three occasions: in 1997, 2000, and 2006. The number of home-care clients serviced with open wounds increased from 413 individuals in 1997, to 648 in 2000 to 878 in 2006. Of interest, 25 to 30 per cent of clients had chronic wounds that remained open for longer than six months. Some of these clients were receiving daily home care without specific ulcer etiologies or diagnoses identified. Most CCACs in Ontario have recognized wound care as their greatest increasing client-service expense. The plan of care for these clients is often limited to local dressing changes and the frequency of nursing visits.

Health-care professionals and clients must be cognizant of the fact that not all chronic wounds have the ability to heal. To put this in a meaningful context, this healing or non-healing type of wound classification system helps clinicians and clients to identify common realistic outcomes.

The optimal care of individuals with chronic leg and foot ulcers is complex and time-consuming. Evidence-informed management of these ulcers involves detailed examination, investigation, and discussion of results with clients. However, inadequacies in the current health-care system do

not allow health-care providers (family doctors and visiting nurses) to be financially remunerated for the extended visits and lengthy comprehensive assessments usually required to provide specific diagnoses and optimized treatment. The management of a chronic wound in the community is further complicated by the fragmentation of services between acute care, chronic care and home care. There is a lack of connected health-care professionals, especially in the home-care setting, leading to a need to evolve to an approach where co-ordinated, interprofessional teams assess, treat, and monitor outcomes of lower extremity leg and foot ulcers. Our hypothesis is that if clients receive

a comprehensive interprofessional assessment on admission to home care, outcomes can be improved with less frequent and more effective nursing visits.

In the Primary Care Reform Project, we had a unique opportunity to conduct a paradigm-changing demonstration by establishing decentralized interprofessional teams to facilitate efficient client assessment and translation of evidence-informed knowledge for optimal client care. Our formalized but flexible interprofessional structure was designed to dissolve individual silos, thus forging

links between compartmentalized community services.

Our integrative teams were led by either a nurse practitioner or a physician and created a practice climate that is practical, transprofessional (merging professional boundaries), patient-centred, and outcome-focused. This integrated transprofessional team approach with appropriate modification may form the basis for new care-delivery paradigms. This entire model incorporates a four-stage approach—including quality improvement—designed to sustain the primary care change (see Figure 1).

We have completed the first three phases (pre-audit, and weeks 0 to 4 comparative audits) of this project. We are attempting to demonstrate an improvement in client care with this transprofessional, comprehensive approach that may be generalizable to other therapeutic areas (see Table 1).

FIGURE 1

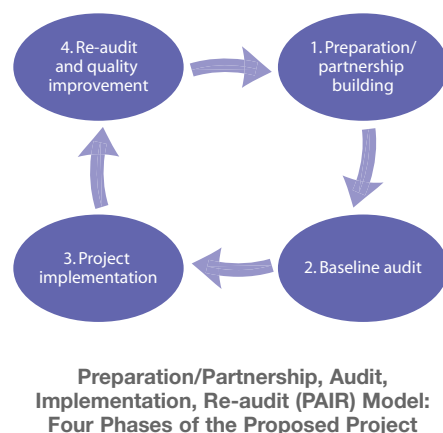


TABLE 1

Key Objectives and Outcomes of this Study

Phases	Objectives	Outcomes
Phase one	Select best practice guidelines.	Best practice guidelines from RNAO, CAWC QRGs
	Develop partnership.	Partnership with RNAO and CCAC
	Develop prevalence audit tool.	Tool developed in consultation with Peel CCAC
	Establish interprofessional teams at CCACs.	Team assembled and trained with International Interprofessional Wound Care Course (nurse practitioner/physician leader, foot-care specialist, co-ordinator, and special consultant as needed)
Phase two	Audit prevalence and incidence of lower extremity ulcers.	Audit completed and reported in this issue
	Examine cost-effectiveness models.	Completed and reported in this issue
	Develop team assessment protocols.	Tools developed
	Pilot assessment tools.	Acceptable to clinicians and clients
Phase three	Assign home care co-ordinators to identify all new and continuing clients with leg and foot ulcers.	Co-ordinators facilitated optimal access to needed support services
	Send assessment team members as appropriate for baseline assessment and order treatment(s) for the cause at the beginning or on admission to home care (new clients, clients with stalled healing, chronic long-term clients).	Two teams were established in Toronto and Peel regions
	Co-ordinate appropriate foot-care services to deliver regular debridement and downloading in clients with neurotrophic foot ulcers.	Chiroprapist services established within the home-care framework
	Optimize compression therapy based on a combination of physical examination, Doppler testing, toe pressure, client preference and level of pain, other medical conditions.	Compression for clients with leg ulcers after arterial compromise was ruled out
	Follow-up assessments at four weeks to monitor progress.	91.9 per cent of clients were reassessed at week 4
	Transprofessional team members were included when required for formalized vascular studies (vascular surgery consultation); PT, OT, dieticians, and CCAC co-ordinator for clients requiring complex off-protocol services.	Appropriate referrals were made
Phase four	Re-assess and fine tune roles to enhance interprofessional practice (clinical, educational)	To be analyzed with all partners
	Recommend embedded successful interventions in the system by negotiating alternate payment scheme for team members with CCAC and Ministry of Health.	Report to Ministry of Health
	Compile client and provider satisfaction surveys.	Pending future funding
	Quality Assurance Audit and new policy for the delivery of wound-care services for leg and foot ulcers	Future project
	Establish transprofessional team knowledge and skill programs and longitudinally establish new teams in the community with an expert support network.	Pending funding

Review of Project

The Wound Healing Clinic of Women's College Hospital—along with our partners the University of Toronto, Registered Nurses' Association of Ontario (RNAO) and Toronto CCAC—received funding for this Primary Care Reform Project to develop a new community primary care model for persons with lower extremity ulcers. There was an award of \$1,588,000 from the Primary Care Reform initiative of the Ontario Ministry of Health and Long-Term Care.

The project highlighted the following needs:

- co-ordination across the continuum of services, particularly between the family doctor, home-care nurse, CCAC care co-ordinator and other team members
- creation of a specialized team that can perform initial

assessments and treatment plans with patient-centred concerns incorporated

- benchmarks for initial wound characteristics for timely re-assessment by appropriate team members
- modification of the assistive devices program to include criteria-based immediate acquisition and enable the ordering of these devices by all members of the transprofessional team. The devices that need to be made available include
 - deep-toed shoes and orthotics
 - specialized pneumatic walkers
 - ankle-foot orthotics
 - compression stockings for prevention of recurrent of leg ulcers

- ongoing monitoring of outcomes from the health-care-provider service and client satisfaction points of view. These satisfaction levels should consider co-ordinating teams and care, facilitating initial assessment, benchmarking, accessing timely specialized services where appropriate, and including the client in the process.

This report attempts to explain some of the benefits and problems associated with implementing evidence-based guidelines to improve wound management. Our project and other Canadian initiatives are compared to provide the reader with opportunities to address common problems and with various implemented solutions to improve the lives of clients and standards of care.

Budget Impact for Ontario Ministry of Health

The annual costs of the treatment of lower extremity ulcers within the community is estimated to be \$511 million based on a prevalence of 90,000 neurotrophic and other foot ulcer clients and 15,000 leg ulcer clients. After implementation of a best practice approach, an estimated saving

of \$338 million in direct medical costs is possible. These savings result from faster healing and a reduction in infections and amputations.

Approximately \$24 million alone can be saved by reducing hospitalizations as a result of infection and amputation. The remainder will result from reduced nursing visits and better use of medical supplies in each client's care.

In Ontario, the improved clinical outcomes and quality-of-life benefits from best practice implementation in the treatment of foot and leg ulcers were associated with a favourable cost-effectiveness ratio. Care through best practice implementation results in a 66 per cent reduction in costs when compared with standard community care. Such an approach also produces a 33 per cent to 57 per cent reduction in infections and lower extremity amputations, resulting in improved client outcomes and quality of life.

The interprofessional change in approach leads to improved client outcomes, enhanced client satisfaction and health-care savings. This is a win-win situation for all the stakeholders in health care.

Services for Lower Leg and Foot Management in Community Settings across Canada

Heather L. Orsted, RN, MSc; Douglas Queen, BSc, PhD, MBA

Many clinical settings have wound-management programs that have not been effective at producing positive changes for a variety of reasons. Much like the multi-pronged care required when healing a chronic wound, a multi-pronged approach is required when creating an environment in which best practice wound care can be delivered. This article reviews the responses to best practice-related questions from community-care nurses that address disparities in practice that occur not only across Canada but also between provinces.

Community Nurses in Wound Care

The most frequent contact with health-care professionals that clients with wounds have is with community nurses, who may have varying degrees of wound-care knowledge and skill. Ideally, home-care and community-care services should employ nurses with advanced practice skills in the role of wound-care nurse or enterostomal therapist to support and mentor a best practice approach to wound care. In an effort to determine the range of care and gaps in services for clients with leg and foot ulcers across Canada, a survey of community home-care nurses who specialize in wound care was completed. Sixteen acknowledged community wound-care nurses, from British Columbia to Newfoundland, participated in this survey. These nurses were selected based on opinion-leader criteria:¹

- They possessed knowledge and training related to their area of expertise (wound care).
- They are acknowledged by their peers as leaders in their specialty area.
- They are employed in their area of expertise.

The survey addressed two of the three basic underlying principles of lower leg and foot ulcer management that enable best practice to occur: (1) treat the cause and (2) local wound care.^{2,3,4} The third principle, client-centred concerns, will be addressed within this report by Katherine McAuliffe on page S48.

Q. Who are these nurses and what skills do they offer the community?

One half of the respondents are enterostomal therapy (ET) nurses, and the other half are clinical practice nurses or nurses in leadership roles in education or management (Figure 1). Their level of expertise regarding wound care

varied, with one half identifying themselves as knowledgeable in wound care and over a third considering themselves expert nurses. Seven were enterostomal therapists with advanced training in wound care, and most of the others had completed additional training in wound care such as the International Interprofessional Wound Care Course through the University of Toronto (Figure 2).

FIGURE 1

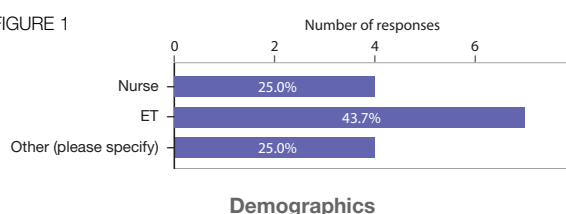
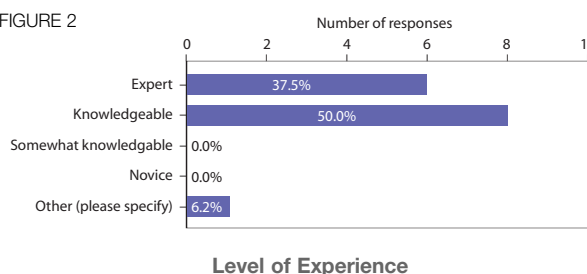


FIGURE 2



Q. Is there a multidisciplinary team approach to chronic wound care in your clinical setting?

The literature has demonstrated that multidisciplinary teams are effective when considering the complex nature of the chronic wound environment.^{2,3,4,5,6} Armstrong⁷ enrolled 16,000 clients in an aggressive, multidisciplinary diabetic-foot-care program and demonstrated the following results after 12 months:

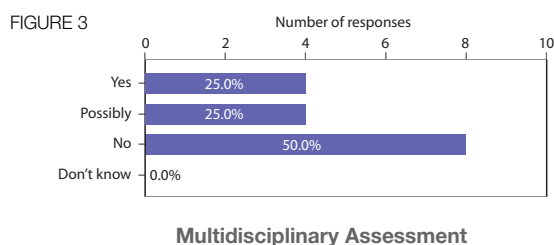
- a 66 per cent decrease in hospital admissions
- a 74 per cent decrease in hospital days
- a 53 per cent decrease in nursing home admissions

Though a complete, holistic, interprofessional assessment is required to first diagnose and then treat lower leg and foot ulcers, half of the respondents stated they had no comprehensive team assessment available for clients. The other half was split between a complete or questionable assessment available for clients (Figure 3).

The voice of community wound-care nurses:

gement Available in Home Care

“In all honesty, there are not comprehensive assessments. Most lower limb wounds are initially assessed by the regular district nurses. I am then consulted prn (as needed) and the other nurses consult with the family practitioner, and refer to the home care dietitian, specialists, and community physiotherapy and occupational therapy prn.”



“Our skin and wound assessment and treatment team (SWAT) developed a lower leg assessment tool. The assessment team may involve various disciplines, depending on the needs of the patient. For a non-complex standard assessment, the PT and RN/ET/SWAT nurse work together. For more complex lower leg assessments, such as persons with diabetes and a wound, the team could include PT, OT, ET/RN, pressure redistribution footwear team and physician(s): wound physician, dermatologist, ortho.”

“We do not have access, in community, at this time to all the disciplines.”

“I and a vascular surgeon, an ET and a family doctor are a working group that is putting together criteria for lower leg assessments and compression ... which will involve a team nursing assessment form and flow sheet rewrap assessment form and flow sheet procedure guidelines outcome indicators.”

Q. Is there support of program initiatives and designation of funds from health-care budgets to support a best practice approach to wound care in the community?

Management is responsible for coupling organizational policy recommendations and health-care clinician best practice.^{6,7}

The respondents identified no specific additional funding to support a team approach to wound management. There was a disconnect between policy support and the implementation of key principles of wound management.

“Wound care is included in global funding. There is no additional funding allocated specifically to the interdisciplinary wound team.”

“Provincial government funds all home care and physician services. The exception is podiatry. There is one office that requires client payment in addition to government funding. The other podiatrists are all in private practice.”

“Funding is mostly provided by CCAC, but we also have private pay clients and insurance claims.”

“All funding is provided by the provincial medical program (MSP) for clients receiving care at the community clinics or through the at-home provision of the program.”

“We are funded as nurses working in home care. It comes from the provincial government. The funding comes from our health region government dollars for the professional services.”

Q. Do you provide footwear and offloading devices for clients with diabetic or neurotrophic foot ulcers?

The largest gap identified in the survey was related to the provision of footwear and offloading devices for clients with diabetic foot ulcers. Eighty-seven per cent of the respondents did not have appropriate access to resources. This is very unfortunate since the most common reason for delayed healing of neurotrophic foot ulcers is inadequate downloading.^{4,6,7}

“This is an area of concern as soliciting funds is a time-consuming business. The responsibility is the client's or social services' if means-testing allows that option.”

“This is a problem for which we have not found a solution. Funding for any of these therapeutic devices comes from the patient, or his insurance and sometimes the government (rare).”

“Footwear is subsidized for persons with diabetes through a provincial government agency, Alberta Aids to Daily Living. A pilot project was conducted re: providing appropriate footwear for patients at risk. The outcomes of the project indicated not only a cost savings to the 'system' but improved QOL for the patients who may not have been

able to afford to purchase the needed footwear to heal or to reduce further trauma/risk for amputation.”

Q. Is sharp debridement part of your home care program?

The removal of non-viable tissue is a key management component related to local wound care.^{2,4,6} Sixty-two of the nurses stated it was a task performed within their home-care program by ETs and RNs with advanced wound skills.

“All RNs who have attended the wound-care orientation program, have attended a hands-on demonstration with the ET, and completed a satisfactory return demonstration of the skill are allowed to do conservative sharp debridement level 1 and 2.”

“This practice is under review with the new Provincial Scope of Practice. Guidelines are being set by regional committee of expert practitioners and the criteria for designated staff are being set with the College of Nurses (College of Registered Nurses of British Columbia).

“Nurses who have successfully completed the teaching learning module/workshop and exam and return demonstration. The policy states that it is conservative sharp debridement of visible devitalized tissue, or saucerization of a peri-wound callus.”

Sharp debridement training

Nurses who are required to perform sharp debridement should ensure they meet the following debridement criteria:⁸

- must be within their scope of practice
- must have proven knowledge, skill and a preceptorship
- must have facility approval and a debridement policy in place
- must be accountable for their actions

“Education involves a debridement module with a skills lab component on pigs’ feet. It is recommended that the participant take the S-Series prior to taking the debridement module. Precepting involves the use of sharp debridement on devitalized/dead tissue on patients requiring debridement. The learner is required to debride several wounds of various etiologies with a focus on the diabetic foot. SWAT Level III PT and RN can precept but it is often myself as clinical

educator that precepts the learner and signs the competency off. I debride diabetic foot ulcers that have sufficient perfusion down to vital tissue causing slight bleeding, but I document that this is my plan before I start and refer to the literature if needed to support this practice.”

“ET – mentoring with physician in hospital setting and signed off by physician HCN-trained as part of SWAT training and mentored and signed off by the clinical specialist for skin and wound management.”

Q. List the challenges to providing best practice wound care in your community-care setting.

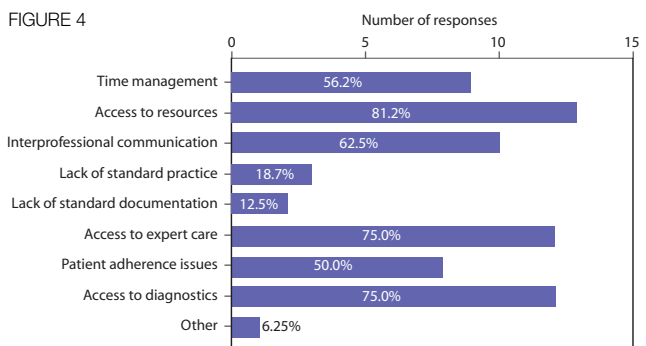
The top community-care challenges faced in chronic wound management are (Figure 4)

1. access to resources
2. access to expert care – access to experts quickly is needed rather than waiting for two months
3. access to diagnostics
4. interprofessional communication – it is difficult to have good communication with physicians in the community
5. time management
6. patient adherence issues

“We need an interdisciplinary clinic for diabetic and lower leg wounds.”

“In Vancouver we do not have a regional wound clinic to refer clients to. There is a clinic at VGH, but the physician attached to the service is only in clinic one day a week and his mandate is to only see healable wounds.”

FIGURE 4



Challenges in the Community

“Other health-care professionals, (mostly surgeons), who disagree with our practice and insist on using things like Jelonet and wet-to-dry dressings to treat wounds, and veto anything we may be doing to improve healing time, and use of resources. Also, quick access to doctors who will deal with acute diabetic feet or surgical debridement for things like pressure ulcers. The waiting lists are long, and nobody seems to get priority, and I don’t feel we are [taken] seriously.”

“Time management is a problem for many reasons. Our population has become the working wounded therefore difficult to get clients willing to be available for appointments and work load is heavy with a lot of time spent documenting and communicating after hours with the MDs. Access to resources—great access for wound products but difficult to download a wound for a diabetic or get them into footwear and orthotics if they do not have the money. Interprofessional communication—done but a lot occurs after hours, which adds to the day. Access to expert care—would love to be able to have access to second opinions in difficult cases. Many of our local wound-care champions are too busy and the ability to joint visit is just not there. Patient adherence—one of my BScN students put it best. It is amazing to see the number of clients who want us to fix everything for them but who don’t want to take ownership for their own health care and progress.”

“Access to expert care and the communication that follows that care/assessment when it is provided. Expert/specialists often are difficult to reach for discussion of shared clients and/or are unwilling to work collaboratively with other team members.”

“I would say that the hardest aspect of care involves a patient who I know is not getting the appropriate care. This problem is faced by many nurses. In one centre the MD treats his vascular ulcers in one way, which is contrary to the practice espoused by the CAWC. My opinion did not count nor did the patient change his MD even though we offered. There is a delicate line to follow when the MD is actually responsible for the care of his or her patient. It can be very frustrating when I know that the time of healing can be shortened by other techniques. Our other top challenge is not getting the right diagnosis or getting [APBI]

results. Many clinics do not give us this information as they feel that they are the ones treating the patient and not us.”

“We have an excellent and well-developed program. We did experience all of the challenges identified above initially. It has been almost 15 years that the SWAT Team has been in place and the remaining challenge yet to be overcome is collaboration with physicians over interventions and care.”

“No regular nurse ... nurse doesn’t know the products and how to use them. Nurse afraid to ask the opinion of specialist, doctor that doesn’t want the help of nurses and thinks she or he knows best (e.g., wet-to-dry, Bactroban for life, Dakin for one year).”

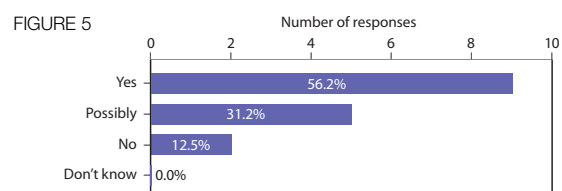
“The top challenge we face in central Newfoundland, with the high prevalence of people with diabetes (seven per cent of the population), is access to chiropodist/podiatrist for assessment of feet for appropriate footwear, offloading, insoles. Several places do assessment and supply shoes and insoles, but they are not held accountable for their work.”

Q. In your home-care agency, is there quality monitoring of wound care?

Evaluation needs to be an ongoing step in the wound-healing process. The clinician needs to address three key issues:

1. How do you know if your treatment plan has been effective?
2. How do you currently evaluate wound healing?
3. Is wound closure the only successful wound-care outcome?

The “edge of the wound” is an assessment step in the Pathway to Assessment/Treatment of Diabetic Foot Ulcers to determine if epidermal cell migration has begun.⁴ A clinical study demonstrated that a 50 per cent reduction in wound surface area at four weeks is a good predictor of wound healing at 12 weeks.⁹ Only a little over half of the respondents knew they were monitoring outcomes (Figure 5).



Monitoring of Wound Care

“We currently do our wound documentation on Pixalere (electronic documentation with photos) and that is providing a method of monitoring.”

“Basic chart audits are used: Not very effective. I would definitely be receptive to hearing what other areas are using to complete this process.”

“We have a wound-care progress tool developed by the ETs and CCAC, filled out q2 to q4 weeks.”

“With the inception of our electronic wound-documentation system we are getting closer to an opportunity to assess outcomes. Dates of care initiation, care plans, products and photos to support evaluation of outcomes are all available on the system to monitor progress. Still room to improve this aspect but we are closer.”

“The nurses have a wound-care sheet that is filled in at each visit. When the nurse sees that the present wound-care procedure is not helping they usually ask for my opinion. In general if the procedure shows no help within two to three weeks, I am asked to see the patient.”

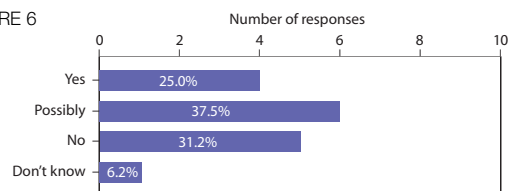
Q. Are wound-care resources monitored to determine cost-effectiveness (Figure 6)?

There is a big difference between the cost of a dressing, the cost of a visit and the cost-effectiveness of care related to treatment outcomes. Shorter healing times, reductions in amputation rates and improvements in quality of life for clients with chronic wounds are examples of ways to determine cost-effectiveness in resource use.¹⁰ Only one-quarter of the respondents stated they monitored for cost-effectiveness of interventions.

“This is a grey zone. Specific cases are when challenges are presented. I am also clinical consultant for long-term-care centres and I log my consults and outcomes through follow-up. In home care this data is contained in the wound clinical-pathway documentation but I have to manually go through all the charts to retrieve this data. We have looked at a tracking system, but to date this is not part of our program.”

“Vancouver Coastal Health has an Interdisciplinary Skin and Wound Committee that is working on standardizing

FIGURE 6



Monitoring Cost-effectiveness

product selection. One reason is to be cost-effective. We are also addressing best practice.”

“Monitored by ET. Reports can be generated by the Pixalere software.”

“The WMPT assesses the effectiveness of the treatment used and has you justify why or how products are used. If we need anything off tender, we need to justify to the CSA for her to get approval re: costs. We do not have a cost factor given to us for the supplies used.”

“This is being looked at, as it is a direction given by the ministry that we must do this and provide the data.”

Discussion

Are the wound-care nurses surveyed concerned about the quality of care they are delivering? Yes, they are!

Nurses need to feel they are giving and can give best practice in their professional environment.¹¹ The literature has told us that successful implementation of best practice is related to the evidence, the context and the facilitation¹²

- The evidence to support a change in practice must be scientifically robust and utilize best practice guidelines.
- The context (or practice environment) must be receptive to change, with management agreeing to initiatives that support the adoption of best practice.
- The change process needs to be appropriately facilitated through clinical, educational and policy-driven actions by a wound-care clinician or opinion leader.

The guiding principles of wound care need to be addressed and delivered in order to maintain a workforce that can and wants to provide best practice. The RNAO Best Practice Guideline for the Assessment and Management of Foot Ulcers for People with Diabetes⁶ states that the following 10 principles are required:

1. Diabetic foot ulcers are complex wounds, best treated with a team approach.
2. Nurses and their interdisciplinary colleagues require knowledge and collaboration to provide care.
3. Successful management of foot ulcers can significantly improve quality of life for clients with diabetes, their family and caregivers.
4. Clients are empowered through education and involvement in the planning and implementation of their care.
5. The V.I.P. principle (Vascular supply, Infection, and Pressure redistribution) guides the assessment and management of diabetic foot ulcers.
6. Nurses and their interdisciplinary colleagues demonstrate integration of the best evidence for practice and expertise in local wound care.
7. Clients with diabetes who are aware of their risk category and management strategies can reduce ulcer recurrence. Nurses and their interdisciplinary colleagues have a role in educating their clients about reducing ulcer recurrence and further foot complications. Hence, it is highly recommended by the development panel to implement this guideline in conjunction with the RNAO (2004) Best Practice Guideline entitled *Reducing Foot Complications for People with Diabetes*. (This guideline is available to download at www.rnao.org/bestpractices.)
8. Ulcer healing of clients with diabetes, improvement of quality of life and reduction in amputation rate requires the successful implementation of a comprehensive foot-ulcer program.
9. The development and implementation of a successful diabetic-foot-ulcer program involves collaboration with practice leaders, educators and administrators.
10. Diabetic-foot-ulcer-program outcomes should be evaluated and benchmarked for continuous quality improvement.

Our survey was intended to capture a “snapshot” of the current community-based practices across Canada. This was to highlight similarities and, more importantly, to capture differences.

There was a significant percentage (78.7 per cent) of respondents identified as somewhat expert, and over 87 per cent acknowledged sufficient knowledge in wound care. Despite this comforting statistic, over 50 per cent of respondents identified that 50 per cent of their clients were not seen by a multidisciplinary team. Since the RNAO guidelines

express the importance of this type of approach, this statistic is of worry relating to the quality of care across Canada.

The specific comments from the nurses highlight the inadequacies and, more importantly, the frustrations experienced by qualified individuals who cannot carry out their profession effectively.

The respondents clearly identified management support and funding as the primary roadblocks to success. This was a result of unclear delineation of responsibility and a lack of the necessary funding by the provincial health-care systems across Canada.

Of particular concern was the lack of funding to make essential components of care readily available to the patient population. Without the availability of these interventions, clinical success was limited. This was an area where major geographical differences surfaced. Some provinces (e.g., Alberta) fund the provision of specialized footwear for persons with diabetes, while others do not (e.g., Ontario).

One encouraging finding was the ability of some of our respondent population to carry out one of the key aspects of wound care: debridement. Canada can thank the Canadian Association of Wound Care (CAWC) for their excellent skills-lab training program, which they have rolled out across the country to teach health-care professionals the skills required for debridement. It is important to remember that debridement skills competency still needs to be developed at the bedside with expert supervision.

Wound-care monitoring was completed in a variety of ways, but only half of our respondents were positive that this was done at all—again, an alarming statistic. Wound-care outcomes need to be linked to cost-effectiveness, yet 50 per cent of the respondents did not measure outcomes.

Our most important finding was the universality of the challenges faced by wound-care professionals across Canada. The key challenges faced by all were access to resources, expert care and diagnostics. Interestingly both the lack of standard documentation and practice were not issues with our respondents. This is probably due to the excellent work of both the RNAO and the CAWC with regard to the dissemination and education of best practices.

In spite of this positive finding, much implementation work remains to be done to support the infrastructure—both human and financial—for more effective wound-care in the community.

Our survey shows that wound-care nurses are concerned about best practice and providing high-quality wound care. It also showed that there are gaps in community wound care in many areas: clinical practice, collaborative relationships, resources, administrative support, educational opportunities and patient education and empowerment.

The weakness of this survey was that the respondents were key opinion leaders in wound care, which is not reflective of the types of expertise available in many community-care settings across Canada.

References

1. O'Brien MA, Oxman AD, Haynes RB, Davis DA, Freemantle N, Harvey EL. Local opinion leaders: Effects on professional practice and health care outcomes. The Cochrane Collaboration. Available online at www.cochrane.org/reviews/en/ab000125.html. Accessed January 31, 2007.
2. Sibbald RG, Orsted HL, Coutts PM, Keast DH. Best practice recommendations for preparing the wound bed: Update 2006. *Wound Care Canada*. 2006;4(1):15-29.
3. Burrows C, Miller R, Townsend D, Bellefontaine R, MacKean G, Orsted HL, Keast DH. Best practice recommendations for the prevention and treatment of venous leg ulcers: Update 2006. *Wound Care Canada*. 2006;4(1):45-55.
4. Orsted HL, Searles G, Trowell H, Shapera L, Miiller P, Rahman J. Best practice recommendations for the prevention, diagnosis and treatment of diabetic foot ulcers: Update 2006. *Wound Care Canada*. 2006;4(1):57-71.
5. Registered Nurses' Association of Ontario (RNAO). *Nursing Best Practice Guideline: Assessment and Management of Foot Ulcers for People with Diabetes*. Toronto: RNAO. 2005
6. ——. *Nursing Best Practice Guideline: Assessment and Management of Venous Leg Ulcers*. Toronto: RNAO. 2004.
7. Armstrong D. Is diabetic foot care efficacious or cost effective? *Ostomy/Wound Management*. 2001;47(4):28-32.
8. Canadian Association of Wound Care. Seminar Series – S2 Wound Bed Preparation/Skills Lab.
9. Sheehan P, Jones P, Caselli A, Giurini JM, Veves A. Percent change in wound area of diabetic foot ulcers over a 4-week period is a robust predictor of complete healing in a 12-week prospective trial. *Diabetes Care*. 2003;26(6):1879-1882.
10. Boulton LL, Van Rijswijk L, Shaffer FA. Quality wound care equals cost-effective wound care: A clinical model. *Nursing Management*. 1996;27(7):30,32-3,37.
11. Carpenter D. Going, going, gone? The vanishing ranks of the healthcare workforce. *Hospital and Health Networks*. 2000;74(6):32-42.
12. Kitson A, Harvey G, McCormack B. Enabling the implementation of evidence based practice: A conceptual framework. *Quality in Health Care*. 1998;7:149-158.

An Audit of Leg and Foot Ulcer Care in an Ontario Community Care Access Centre

Kevin Woo, RN, MSc, PhD(c), ACNP, GNC(c); Carvill Lo, MSc; Afsaneh Alavi, MD; Douglas Queen, BSc, PhD, MBA; Arthur Rothman, MD, PhD; Gail Woodbury, PhD; Matthew Sibbald, MD; Peter Noseworthy, MD; R. Gary Sibbald, BSc, MD, FRCPC (Med) (Derm), ABIM, DABD, MEd

Chronic wounds, including leg and foot ulcers, are disabling and constitute a significant burden on clients and the health-care system. It is estimated that venous leg ulcers affect one per cent of the adult population and 3.6 per cent of people over 65 years old.¹ As our society continues to age, the problem is growing. Leg ulcers are often classified by their predominant etiologies and they can be divided into three groups: venous insufficiency (up to 40 to 80 per cent), other vascular ulcers (mixed venous/arterial, arterial, lymphedema), and miscellaneous (inflammatory, infections and malignancy). In a recent Canadian population study, clients with leg ulcers were characterized by advanced age (over 65 years of age) and multiple medical problems (nearly three-quarters had three or more other conditions). Half of the affected population had a leg-ulcer history spanning five to 10 years; a third exceeding 10 years.² Converging evidence suggested that only about half of the clients have healed ulcers in a five-year period and the recurrence rate is as high as 60 per cent to 70 per cent.³ Leg ulcers are often painful and recurrent, and they can have a negative psychological impact on clients and families, thus decreasing their quality of life.^{4,5,6} The cost of treating chronic venous insufficiency was estimated to be U.S. \$750 million to U.S. \$1 billion per year in the United States. Due to the chronicity of venous insufficiency, the average cost of care for an individual with venous disease over a lifetime can exceed \$40,000.⁷ Because this condition often affects people of working age, a reduction in ability to work adds to the cost. An estimated two million workdays are lost annually

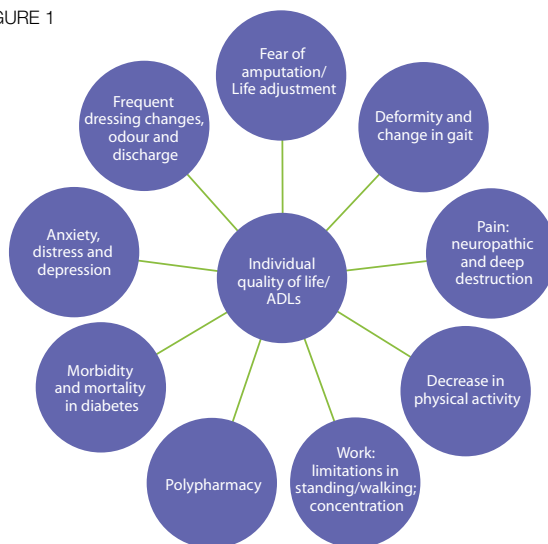
in the United States because of leg ulcers.⁸ Considering the constellation of differential diagnoses and complexity of leg ulcer care, a comprehensive approach must address the evidence and expert opinion for other vascular and miscellaneous causes.

Foot ulcers are one of the major complications of neuropathy, especially in people with diabetes. The loss of protective sensation secondary to neuropathy often results in traumatic injuries and skin breakdown. Of persons with

diabetes, two to three per cent develop a foot ulcer annually, while the lifetime risk of a person with diabetes developing a foot ulcer is as high as 25 per cent.⁹ Diabetic neurotrophic foot ulcers are not inconsequential. In a review of compiled cost data from international studies published between 1994 and 2000¹⁰ (adjusted for inflation and currency conversion), the estimated cost of diabetic foot ulcers not requiring amputation ranges from U.S. \$993 to U.S. \$17,519 (1998 equivalent). In a Swedish prospective study following persons with diabetes (PWD) and persons with foot ulcers

until healing without amputation,¹¹ the topical treatment of wounds accounted for 45 per cent of total costs while inpatient care for another 37 per cent. Compromised circulation can prolong ulcer healing time and increase the risk of amputation. On average, the costs incurred by the care of clients with inadequate vascular status were 11 times higher compared with clients with adequate vascular status (U.S. \$5,233 versus U.S. \$462).¹² Diabetic foot complications are a major cause of hospital admission. Three per cent of

FIGURE 1



The Human Cost of Diabetes to Clients and their Families

hospitalizations among clients with diabetes are attributed to lower-extremity ulcers.¹³ A large 400,000 client study of Medicare claims from 1995-1996 calculated that 24 per cent of clients with lower extremity ulcers required admission with an average hospital cost of U.S. \$14,641. Wounds that remain open for more than four weeks have an increased risk of osteomyelitis and amputation.¹⁴ U.S. figures for 1997 recorded nearly 70 per cent of all amputations in PWD.⁹ Foot ulcers precede 84 per cent of all non-traumatic lower limb amputations in PWD. Diabetics associated lower-extremity ulcers are responsible for 92,000 amputations annually.¹⁵ The economic costs for a minor lower extremity amputation (foot level) were \$43,800 and for major lower extremity amputation (above ankle) \$66,215.¹¹ The overall costs associated with foot ulcers are exorbitantly high. Up to 20 per cent (seven to 20 per cent) of total expenditure on diabetes might be attributable to the diabetic foot based on the following assumptions: an annual incidence of foot ulcers of two to six per cent, a prevalence of three to eight per cent, recurrence rates of 50 to 70 per cent within five years, average healing rates of 11–14 weeks, and one-year amputation rates of 15 per cent. These estimations did not take into account the human cost to clients and their families (Figure 1). The worldwide prevalence of diabetes was estimated to be 2.8 per cent in 2000 and will increase to 4.4 per cent by 2030.¹⁶ The debilitating nature and chronicity of leg and foot ulcers necessitates a consistent and evidence-based-care approach to attain gold-standard clinical outcomes that are cost-effective for the health-care system.

The Process of Setting Standards and Quality Assurance Audits (Leg and Foot Ulcers)

Community-based care for people with leg ulcers is often fragmented and inconsistent, leading to prolonged healing times and ineffective use of resources. Proficient care for people with venous and other types of leg ulcers requires an interprofessional team of physicians, nurses and other health-care providers working together to provide a definitive diagnosis, optimal treatment and client education.

In 1998, the Peel Region Interprofessional Wound Care Advisory Panel recognized the need to standardize wound care across their region. Based on evidence-informed guidelines, expert opinion and previously published summaries of wound-care principles,^{17,18,19,20} the panel developed recom-

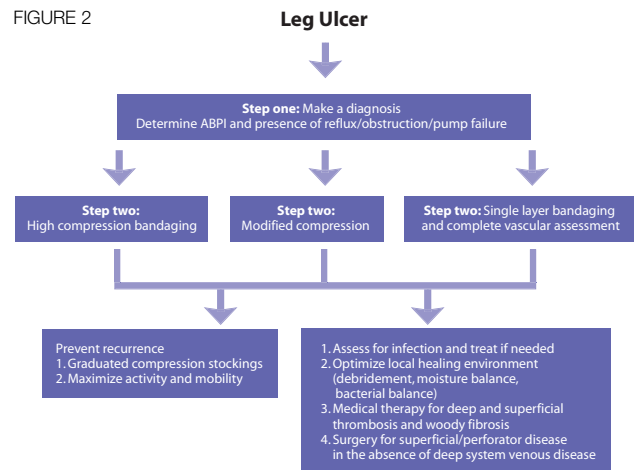
mendations for best clinical practice in the care of chronic venous leg ulcers and diabetic neuropathic foot ulcers.

Recommendations for the Treatment of Leg Ulcers

The first and foremost recommendation was to complete a diagnostic assessment. Part of the assessment for persons with lower extremity ulcers includes an ankle brachial pressure index (ABPI) to detect arterial disease. An ABPI of greater than 0.8 indicates an absence of arterial disease, and in the presence of venous disease, the recommended treatment is the use of high-compression bandages. An ABPI between 0.6 and 0.8 suggests some arterial compromise and in addition to venous disease, treatment requires modified compression bandaging. If the ulcer heals, the client requires compression stockings and regular physical activity to prevent recurrence. For persons with an ABPI of less than 0.6, a complete lower-leg duplex segmental arterial Doppler is necessary to confirm the diagnosis and location of arterial disease. A referral to a vascular surgeon is recommended if there are identified arterial lesions that may respond to dilation, stenting or bypass procedures.

If lower leg ulcers displayed stalled healing, the panel recommended reassessment to check for alternative diagnoses and optimal local wound management with treatment for each of the three major components: debridement for devitalized tissue, treatment of increased bacterial burden/

FIGURE 2



Peel Region Interprofessional Wound Care Advisory Panel
Recommendations for Venous Leg Ulcers

infection, and the establishment of a local moisture balance. It was also suggested that for non-progressing venous ulcers, a full venous Doppler should be performed to examine the deep and superficial venous systems. Surgical intervention may be an option if superficial valvular incompetence is present without extensive deep-system venous insufficiency or thrombosis. These recommendations are summarized in Figure 2.

Recommendations for the Treatment of Foot Ulcers

To facilitate healing of foot ulcers, the panel highlighted the importance of three factors outlined in the mnemonic VIP: Vascular assessment, Infection control, and Pressure redistribution. Ulcers are more likely to heal if there is sufficient circulation. Healability of foot ulcers must be determined prior to initiating local treatment. Infection needs to be controlled with topical antimicrobial for superficial involvement, and deep tissue changes require systemic antibiotics. Special pressure-downloading footwear plays a role in all three phases of diabetic foot disease, including protection from the development of the first ulcer, treatment of ulcers, and prevention of recurrences. Shoes with inappropriate fitting (length or width) are associated with increased incidence of ulceration at six-month follow-up.²¹ Clients with ulcers treated with a total contact cast have significantly shorter healing time compared with other pressure-downloading interventions, including removable cast walkers and half shoes.²²

To improve client care, these evidence-based recommendations would need to permeate and diffuse into the ambulatory care system. The printed version of these recommendations was widely circulated to regional wound-care nurses and other health-care providers who service clients in the Peel Regional Community Care Access Centre (CCAC) area. At the same time, workshops were organized to allow interaction between practitioners and key opinion leaders, consolidating their management of leg ulcers. Despite these efforts, an inconsistent approach to wound care within the compartmentalized community-care system persisted. This issue was identified in many communities across Ontario and throughout other provinces.

In response to this problem, the Canadian Association of Wound Care (CAWC) released Best Practice Recommendations with Quick Reference Guides (QRG)²³

as a practice enabler in 2000 and disseminated these documents across Canada and the United States. These recommendations included information on best practices on local wound-bed preparation and on the prevention, diagnosis, and treatment of both venous leg ulcers and diabetic (neurotrophic and neuroischemic) foot ulcers. The CAWC QRGs were updated in 2006 and incorporated the Registered Nurses' Association of Ontario (RNAO) formalized guidelines,²⁴ which included the ranking of evidence and expert opinion.

Objectives

In light of the growing problem and financial restraints, there is an urgent need to examine the existing care of clients with leg and foot ulcers and to identify evidence-informed strategies to improve the quality of care. The first objective of this study was to establish the prevalence of leg and foot ulcerations. This study was designed to benchmark their occurrence in Ontario serviced by Community Care Access Centres (CCACs). A recent audit of Peel and Toronto completed in 2006 will be compared with two previous audits that were conducted in the Peel region to demonstrate the changing demographics of the client population. The second objective was to assess if gold-standard best practices were implemented within the community. The third objective was to examine the gap between best practices and client care through patient questionnaires.

Methodology

The quality assurance initiative began in early 1997 in collaboration with Peel Region CCAC. Peel Region CCAC nursing providers completed a survey after consent was obtained from their clients. The exact survey used in 1997 was repeated in 2001. The location of all open wounds, primary wound etiology, wound duration, and frequencies of nursing visits were documented. Specifically, data were collected on compression bandaging for the management of venous disease and protective footwear/devices for persons with neuropathy. The surveys in 1997 and 2001 were compared for differences and similarities in Peel wound-care-practice patterns.

In 2002, two questionnaires were designed, one for persons with leg ulcers and the other for persons with diabetes (PWD) and foot ulcers, to explore factors that

thwart the implementation of the best practice recommendations. Consenting clients were asked to respond to the appropriate questionnaire according to their ulcer types. Ninety-eight leg-ulcer and 86 foot-ulcer clients were included. All respondents were over 18 years old and were attending one of the two ambulatory clinics (Wound Healing Clinic at Women's College Hospital or Community Wound Centre in Mississauga) within a period of approximately three months. No client was surveyed twice.

In 2006, an updated CCAC survey was conducted in both Peel and Toronto. The Peel CCAC distributed surveys to all clients receiving nursing services (n=878), and Toronto CCAC limited the distribution of surveys only to clients with open leg and foot ulcers (n=148).

Ethical Review

The 1997 and 2001 surveys were considered quality improvement initiatives and were not formally reviewed by the ethics board. The 2002 ambulatory clinic survey was submitted to and approved by the Sunnybrook and Women's College Health Sciences' Research Ethics Board. The 2006 Peel Region and Toronto CCAC survey was submitted to and approved by the Sunnybrook and Women's College Health Sciences' Research Ethics Board as part of a larger study funded by the Ontario Ministry of Health and Long-Term Care.

Results

The demographics of the clients involved in the surveys in 1997 (Peel), 2001 (Peel), 2006 (Peel and Toronto) and patient questionnaires in 2002 (leg and foot) are summarized in Tables 1 and 2. The average age ranged from 60.7 to 74.

The number of individuals with open wounds who were serviced by the Peel CCAC increased from 413 in 1997 to 648 in 2001 and 878 in 2006. The relative proportion of various wound types is summarized in Figure 3 across the four community surveys. The percentage of leg ulcers increased by 14.6 per cent and foot ulcers by 25.4 per cent in the Peel region from 1997 to 2001. Interestingly, the number of surgical wounds decreased by 23.7 per cent.

Leg Ulcers

The most common diagnosis for leg ulcers was venous, followed by other etiologies, mixed arterial and venous, and

TABLE 1 Average Client Age from 1997, 2001, 2002 and 2006 Surveys

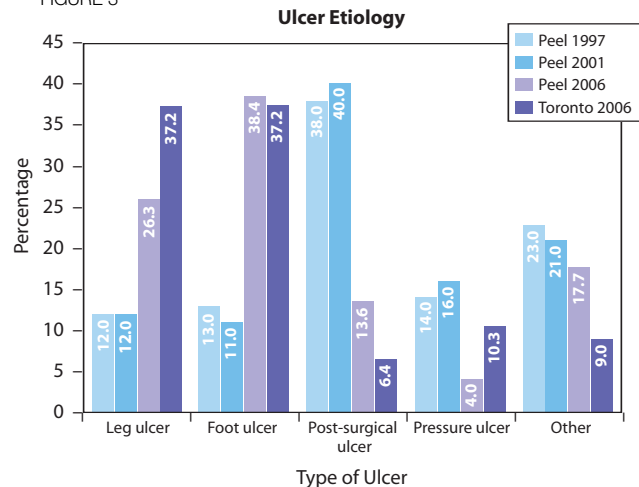
Year and region	Average age
1997 (Peel)	74.0
2001 (Peel)	68.1
2002 (Clinics – Peel and Toronto – Venous leg ulcers)	61.9
2002 (Clinics – Peel and Toronto – Diabetic foot ulcers)	60.7
2006 (Peel)	62.0
2006 (Toronto)	67.6

TABLE 2 Gender Demographics for 1997, 2001, 2002 and 2006 Surveys

Year and region	Male	Female
1997 (Peel)	496	772
2001 (Peel)	715	992
2002 (Clinics – Peel and Toronto – Venous leg ulcers)	38	60
2002 (Clinics – Peel and Toronto – Diabetic foot ulcers)	55	31
2006 (Peel)	416	467
2006 (Toronto)	74	74

arterial-predominant ulcers. Approximately 30 per cent of the clients in both the Toronto (29 per cent) and Peel (32.7 per cent) CCACs did not have a known diagnosis on their records (see Figure 4). Thirty-four to 37 per cent of clients received high compression using multi-layer bandaging systems (Figure 5). To rule out arterial insufficiency, hand-

FIGURE 3



Leg Ulcer Etiology from Peel Region in 1997 and 2001, and Peel Region and Toronto in 2006

FIGURE 4

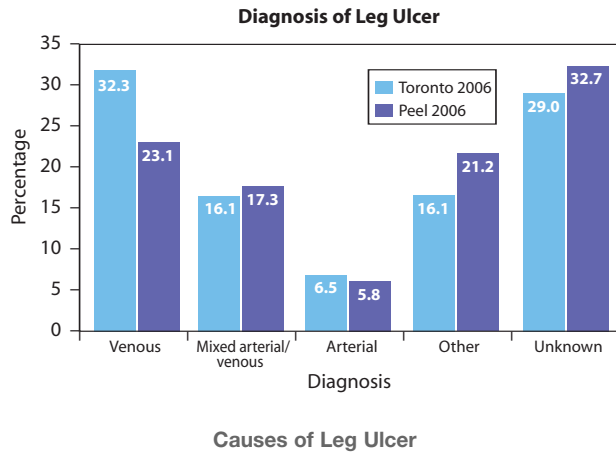
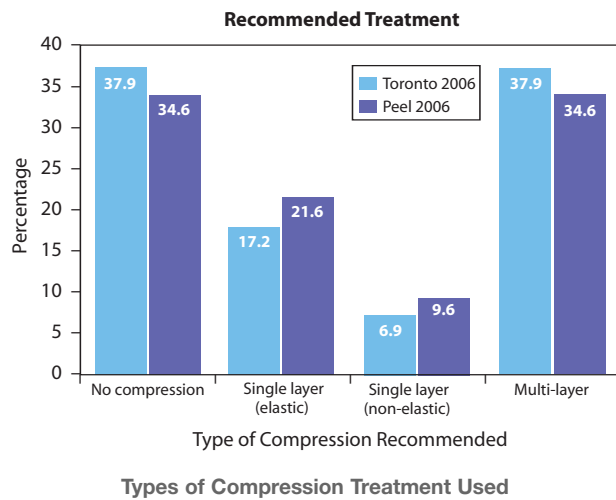


FIGURE 5

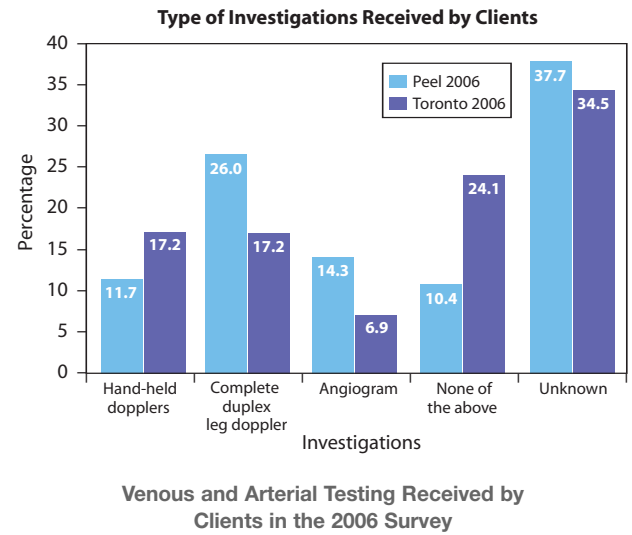


held Doppler, complete duplex leg Doppler, or angiogram was utilized (Figure 6). The majority of subjects had not undergone any known special vascular testing (Peel 48.1 per cent and Toronto 58.6 per cent).

Foot Ulcer Survey Results

There was a major disconnect between the need for pressure redistribution (downloading) and the wearing of appropriate footwear, orthotics and devices in persons with plantar ulcers and diabetes. As indicated in Figure 7, more than 50 per cent of individuals with diabetes and foot ulcers were not using any downloading devices at the time of the survey from 1997 to 2006.

FIGURE 6



The 2002 questionnaire revealed that the majority of clients were not aware of their footwear needs (54.5 per cent), and 36.6 per cent of clients were told to wear orthotics but could not afford them. Of clients who were prescribed orthotics, a significant percentage (22.8 per cent) of clients felt uncomfortable wearing their orthotics in public places (including at social functions, at beaches and on public transit) (Figure 8).

FIGURE 7

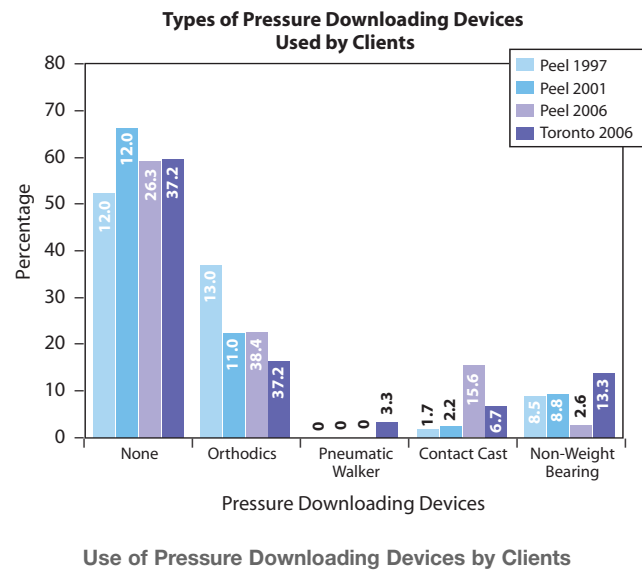


FIGURE 8

Has patient worn orthotics in the last three months?	Yes	No
	52.5%	47.7%

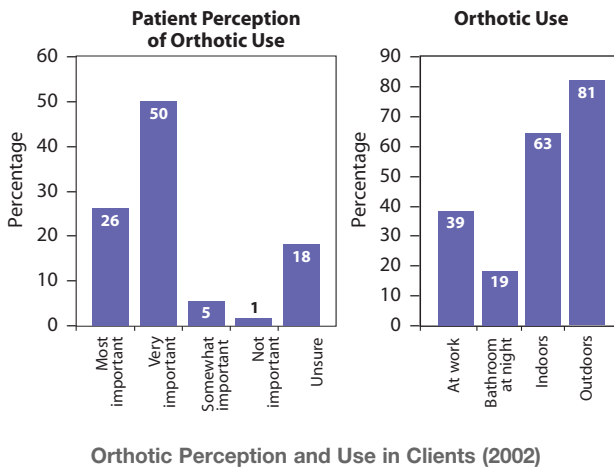


FIGURE 9

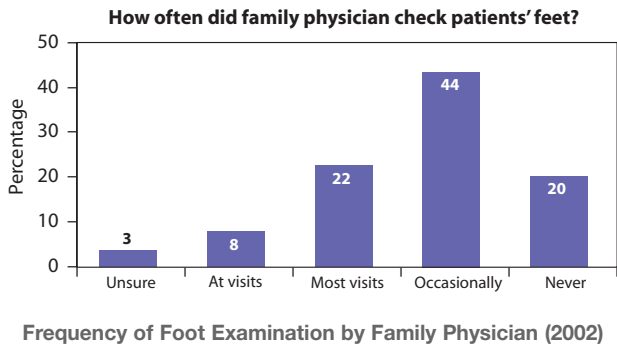
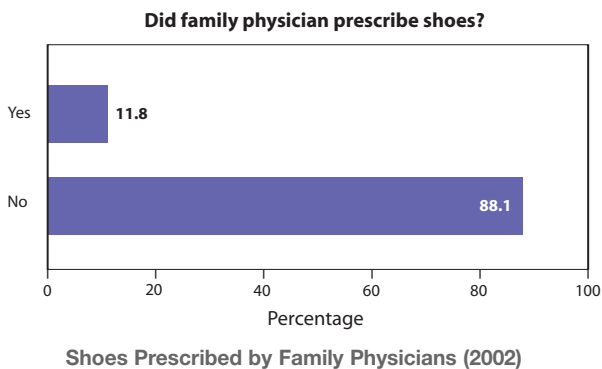
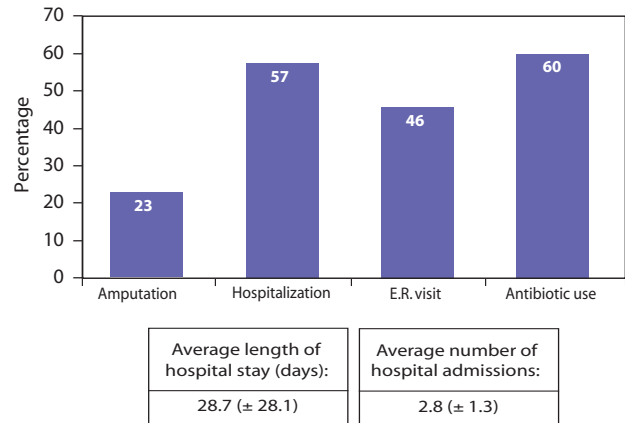


FIGURE 10



Ten per cent felt unsafe wearing orthotics in the home (e.g., to the washroom at night and around the house). Use of all prescribed orthotics was significantly lower with clients who have had diabetes for more than 20 years (OR 0.31; $p < 0.009$). Clients who had monthly incomes greater than \$500 were more likely to wear all prescribed orthotics than those with monthly incomes less than \$500 (OR 2.86; $p < 0.03$).

FIGURE 11



Complications in Clients with a Foot Ulcer (2002)

Of all the clients who responded to the survey, only a small percentage had their feet examined by their family physicians (Figure 9). The majority of clients reported that their primary care physician never or only occasionally checked their feet (62.8 per cent); only a small percentage (8.2 per cent) reported that their feet were checked each visit. A minority of clients at the wound-care clinic were told to wear orthotics by their family doctor (19.6 per cent) (Figure 10). The most common obstacle reported was that clients could not access the resources they wanted through their primary care physicians.

Chronic non-healing foot ulcers in PWD without appropriate plantar pressure redistribution (downloading) are prone to serious complications. We examined the complications of diabetic neuropathic ulcers by surveying clients attending the wound clinics in Toronto and Mississauga. Eighty-six clients were recruited in the study in 2002. A substantial percentage of the clients at the wound-care centre had sought medical help through emergency depart-

ments at least once in the past two years because of their foot ulcers (45.7 per cent) (Figure 11). A majority of clients (57.1 per cent) were admitted to hospital for ulcer-related complications for an average of 28.7±28.1 days. Most individuals (60.0 per cent) had been on antibiotics for their ulcer. A significant minority of PWD had amputations (22.9 per cent). Individuals with one amputation were at higher risk for a second amputation (OR 3.30; p<0.02).

Discussion

Our results have identified a large gap between the best practice recommendations and community practice for leg and foot ulcers. This is consistent with the current literature that has identified a need to link best practice recommendations with a systematic implementation policy.¹⁶

We will first discuss the specific problems of leg and foot ulcers before providing overall conclusions and recommendations.

Leg Ulcers

Our research identified four major problem areas that should be addressed in order to improve the care of chronic leg ulcer clients:

1. Failure to determine or communicate ulcer etiology. The prevalence of leg ulcers remained the same from 1997 to 2001 but increased drastically in 2006. The increased number of chronic wounds coincided with a dwindling number of acute post-surgical wounds (Figure 3). This shift in the distribution of ulcer types requires a different approach to client care focusing on treating the wound cause and determining the healability of these wounds (healable, maintenance and non-healable). Persons with maintenance and non-healable wounds should have their care focused on client-centred concerns and not on the use of expensive devices with little chance of a successful outcome.

Successful leg-ulcer management is dependent on accurate formulation of the diagnosis based on all of the causative factors that can be corrected or compensated for with treatment. As indicated in our findings, many clients (24 per cent in 1997 and 38 per cent in 2001) were receiving care without a diagnosis of the ulcer etiology on the community record. In 2006, 29 per cent and 33 per cent of the clients with leg

ulcers receiving home care in Toronto and Peel respectively did not have a definite diagnosis in their files.

2. Delay in referral to the wound clinic. The 2002 surveys indicated that the average new client receiving care at the Wound Healing Clinic had an open ulcer for 10.6 months before being referred to the clinic for a comprehensive assessment and treatment plan. The difficulty in accessing a specialized clinic may account for some of the delays (a few weeks to four to five months or longer) but this averages two to three months in our clinic. Another part of the delayed assessment and treatment occurs because the referral is often only generated when prolonged and disappointing results have been obtained from ordered local wound treatments. Many of the consults are triggered by the advanced wound-care nurse phoning the physician and asking for a referral or making a referral directly if this is acceptable to the wound clinic. Many clients have difficulty travelling to the specialized wound clinic. There is a need for comprehensive assessments in the homes of some clients (possibly through telemedicine). For centralized, co-ordinated assessments, a client transportation system needs to have more flexibility than current arrangements allow (across municipal borders, timely appointment scheduling and flexible pick-up times, depending on the complexity of the assessment and additional procedures that may be best completed with the primary assessment). For clients that are bed-bound, mobile clinics may also be an answer to the unmet need for these assessments in a community setting.

3. Failure to service clients over 90 years old in the wound clinic setting. There were a number of clients over the age of 90 identified in the community surveys. None of these clients were sampled in the clinic-setting surveys although we do see some patients in this age group. This elderly population is growing and is under-represented in the outpatient clinic practice. The average age of the population sampled at the tertiary clinic was older than the average age in the community, but the elderly over the age of 90 are not frequent attendees in the clinic setting. There needs to be a way to link this population with interprofessional wound teams through telemedicine or a community home-visiting program to facilitate appropriate care.

4. Failure to initiate effective compression therapy. The cornerstone of venous ulcer treatment is compression therapy. Cullum et al.²⁵ systematically reviewed the random controlled trials in the literature and concluded that high-compression systems healed more ulcers than low to moderate compression. Many clients who did receive compression therapy were treated with single-layer elastic bandaging, which has been shown to be relatively ineffective and is below the recommended standard (27.8 per cent in 1997 and 28.4 in 2001; $P=0.934$; 17 per cent in Toronto and 21 per cent in Peel in 2006). Compression was not used in 41.8 per cent of the clients sampled in 1997, and this rate did not improve in following the implementation of the recommendations (not used in 42.1 per cent of clients in 2001; $p=0.8805$). Data from the survey in 2006 indicated that approximately one-third of the respondents did not receive compression therapy and another one-third received low compression for the management of their leg ulcers. Although the remaining one-third in the sample (34 per cent to 37 per cent) received high compression using a multi-layer bandaging system, it is uncertain if compression was applied appropriately. Many clients were being treated without knowledge of the underlying pathology of the ulcer and not all venous leg ulcer clients were receiving high-compression therapy. Compression may not be appropriate in some clients with alternative ulcer diagnoses, and the compression may need to be modified in clients with severe pain (non-elastic systems may be tolerated with treatment of the cause of the pain) or co-existing arterial disease. It is estimated that 21 per cent of clients with a venous ulcer have associated arterial insufficiency.²⁶ After the ulcer has healed, the focus then turns to prevention of recurrence. Clients should be prescribed graduated compression stockings. These stockings must be worn throughout the day, and clients should use the highest compression they can tolerate.²⁷ A previous randomized controlled trial identified the effectiveness of compression in the prevention of venous ulceration (21 per cent recurred at six months with compression vs. 46 per cent without relative risk (RR, 0.46; 95 per cent confidence interval, and 0.28-0.76). Clients should be advised that effective ulcer prophylaxis requires “compression for life” unless they develop a contraindication such as advancing arterial disease. In addition, clients should be encouraged to follow other simple advice aimed

at preventing the recurrence of the ulcer, including skin care, leg elevation, calf exercises, and adopting a suitable diet. The reported annual recurrence rate of venous ulcers (20 per cent) is strongly influenced by client adherence to the parameters previously described.³

The first Peel intervention to implement the best practice guideline was insufficient to improve the quality of leg-ulcer care in the home-care setting. This intervention is a preliminary form of active dissemination termed “training the trainers.” The intervention did not go to the next step of developing a co-ordinated implementation policy aimed to create “buy-in” in the practice community.^{28,29}

These shortcomings lead to the question of how wound care for these clients could be improved. A reasonable solution may be to establish a skin and wound assessment team (SWAT) as has been done with some success in Calgary and Miami.³⁰ This team would consist of a group of health-care professionals specially trained to perform the initial assessment of open wounds. In addition, this team would educate clients and attending home-care nurses about the appropriate wound-care protocol. This interprofessional assessment and treatment team would help to insure that both a diagnosis is communicated to the care-providing team and that there is local awareness and “buy-in” from the practice community.

The creation of a specialized team of wound-care nurses has several advantages compared with training all nurses and home-care workers. In Scotland, Vaughn Ruckley translated the excellent Scottish sign guideline for home-care through an implementation policy that included all home-care nurses who may see a client with a wound. On average, each nurse only assessed one or two new leg ulcer clients in a year, and the extensive intervention did not improve patient outcomes. The cost associated with training a specialized team is lower than embarking on a large-scale educational effort. Furthermore, the turnover rate in home-care workers is too high to maintain an effective educational effort in the long run (partly due to the fact that the health-care professionals employed in this sector are paid a proportionally lower salary than their counterparts in acute- or chronic-care institutions). Over time, the trained interprofessional team would develop a level of expertise that could not be achieved by other health-care workers with less frequent exposure to venous and other leg ulcers.

The creation of a mobile wound-care team also reduces the problem of accessibility to the centre. By visiting clients in their homes, the team would better serve clients who are currently unable to travel to the wound-care clinic, such as elderly clients and those who do not live in the vicinity of specialized wound clinics. The cost-effectiveness of this strategy has not yet been assessed.

The training of a small group of clinicians to perform initial assessments and provide client education bypasses the immediate need to train all wound-care providers to assess the vascular status of a client. As they gain experience, team members would become opinion leaders in the region and would simultaneously disseminate knowledge and improve the delivery of care. The creation of this team may be the catalyst necessary to bring the recommendations to fruition.

Foot Ulcers

In 2001, persons with diabetic foot ulcers made up 5.3 per cent of the Peel Region CCAC registered home-care nursing clientele. The demographics of this population had not substantially changed since 1997. However, significantly fewer clients had prescription footwear or an orthotic device in 2001 compared with 1997 (OR=0.44, $p<0.03$). In 2006, diabetic foot ulcers made up over one-third of the clients being serviced by Toronto and Peel CCAC for wound care. Many of the clients (60 per cent in Toronto and 59 per cent in Peel) did not have prescription footwear or an orthotic device. The loss of protective sensation is the most important factor that leads to ulceration of the foot in persons with neuropathy including PWD. Ninety per cent of neuropathic ulcers in PWD develop under areas of pressure throughout the foot.³¹ In addition, persistent plantar pressure at the site of ulceration will interfere with healing.³² In a four-year study,³³ the use of protective footwear for >60 per cent of the time resulted in a >50 per cent decrease in the ulcer recurrence rate ($p<0.0002$). These studies strongly support the use of appropriate downloading to prevent the cascade of events leading up to amputation—starting from pressure accumulation (callus formation), and shearing (blister and hemorrhage), to skin breakdown, and finally wound infection. In a prospective study with a sample of 63 persons with neurotrophic ulcers in PWD in the absence of infection or ischemia, 89.5 per cent of clients had their

ulcers healed with total contact casting, while 65 per cent healed with a removable cast walker, and 58.3 per cent with half-shoes²² after 12 weeks. Three randomized clinical trials evaluated the use of total contact casts (TCCs) as the down-loading device in clients with neuropathic plantar foot ulcers. All three studies concluded that a TCC healed a higher proportion of neuropathic and uninfected ulcers in a shorter amount of time, with healing rates of 90 per cent in two of the studies and 50 per cent in the third clinical trial.^{22,34,35} However, in a recent cross-sectional study of three American states, less than two per cent of clients with diabetic foot ulcers have therapeutic footwear regardless of risk stratification.³⁶ There is a disconnect between the experimental evidence and the delivery of plantar pressure-redistribution devices in the community. These statistics illustrate the gap between recommended practices and implementation policies needed to overcome the barriers preventing the improvement of clinical practice. The gap is due to several factors, including the following

- The care of ulcers in persons with diabetes requires significant resources.
- Orthotics are often not ordered and clients who have them often don't wear them consistently (poor client adherence).
- There are often client and health-care system financial barriers to appropriate pressure-redistribution devices.
- Primary care physicians need to be better informed on the evidence base for diabetic foot care and given tools to implement this in practice.
- Contact casts are costly, difficult to apply and contraindicated with the presence of ischemia or infection.

We have one potential solution, which is to make the pneumatic walker irremovable by using a flexible cohesive bandage or zinc-oxide paste bandage. This treatment is more accessible in the community, and if healing is not progressing at an acceptable rate, we could implement this technique, which Armstrong et al.²² have demonstrated to be equal to contact casting.

The lack of therapeutic devices and footwear is responsible for delayed or non-healing neurotrophic foot ulcers. Health-care systems continue to spend money on client care that is suboptimal and ineffective without targeting their resources to remove the cause of the ulcers. Using a mathematical model, Ragnarson and Aplelquist³⁷ concluded that intensive

client education, foot care and footwear are cost-effective in Sweden if it reduces amputations by 25 per cent. A randomized controlled trial³⁸ in the United Kingdom found a decrease in ulcer rate and a statistically significant decrease in major lower extremity amputations over a two-year period with a similar intensive foot-care program.

Overall Conclusions and Recommendations

The presence of best practice recommendations without a systematic implementation policy is insufficient to improve the standard of care for clients with leg and foot ulcers.

We propose the creation of a specialized, community-based, interprofessional wound assessment and treatment plan on all open leg and foot ulcers at the time of admission to home care. This initial assessment would determine the ulcer etiology and design a treatment plan based on evidence-informed medicine. For leg and foot ulcers, the treatment interventions must include high compression bandaging (in venous disease with adequate blood supply) and the appropriate use of pressure redistribution in persons with neurotrophic foot ulcers. This change can only be effective through appropriate education for clients and attending home-care workers about the current best practice recommendations and importance of the comprehensive assessment and accurate diagnosis linked to the prescribed therapy. There is also a need for earlier specialized care in clients who are not responding to their current treatment program.

For access to appropriate pressure redistribution for the person with neuropathy and ulcer formation the following recommendations are suggested:

- Primary care physicians need to be informed about and given the necessary enabling tools and the appropriate feedback from patient referrals. Their approach should include a regular foot examination in any person with neuropathy and an awareness of the importance of callus, blisters and deformity as part of this examination.
- Clients need to be made aware of the importance of pressure-redistribution devices and footwear.
- Footwear is costly, and alternative funding programs need to be developed based on financial need and client adherence.
- We need to form a coalition of stakeholders that includes the principles on this project (University of Toronto

Knowledge transfer program, Women's College Wound Healing Clinic, the Registered Nurses' Association of Ontario, the Ontario CCACs and newly formed LIHNs), the Canadian Association of Wound Care, chiropody and podiatry associations, the Pedorthic Association of Canada, the Canadian Association for Prosthetics and Orthotics, and other government and non-government health-care agencies to improve the approach to treating foot ulcers in the presence of neuropathy. These clients are losing their legs unnecessarily.

References

1. London NJ, Donnelly R. ABC of arterial and venous disease. Ulcerated lower limb. *British Medical Journal*. 2000;320(7249):1589-91.
2. Harrison MB, Graham ID, Lorimer K, Friedberg E, Pierscianowski T, Brandys T. Leg-ulcer care in the community, before and after implementation of an evidence-based service. *CMAJ*. 2005;172(11):1447-52.
3. Grey JE, Harding KG, Enoch S. Venous and arterial leg ulcers. *BMJ*. 2006;332(7537):347-50.
4. Phillips T, Stanton B, Provan A, Lew R, Gregor WM. A study of the impact of leg ulcers on quality of life: Financial, social, and psychologic implications. *Journal of the American Academy of Dermatology*. 1994;31:49-55.
5. Moffat CJ, Franks PJ. Quality of life considerations. Presented at the Symposium on Compression Therapy in Legs: The state of the art. Toronto. June 5, 2000.
6. Hamer C, et al. Client's perception of chronic leg ulcers. *Journal of Wound Care*. 1994;5(4):44-50.
7. Rudolph DM. Pathophysiology and management of venous ulcers. *J Wound Ostomy Continence Nurs*. 1998;25:248-55.
8. Phillips T, Babette S, Provan A, Lew R. A study of the impact of leg ulcers on quality of life: Financial, social, and psychologic implications. *J Am Acad Dermatol*. 1994;31:49-53.
9. Reiber GE, Ledoux WR. Epidemiology of diabetic foot ulcers and amputations: Evidence for prevention. In Williams R, Herman W, Kinmonth AL, Wareham NJ, (eds.). *The Evidence Base for Diabetes Care*. Chichester: J Wiley & Sons. 2002:642-665.
10. Ragnarson Tennvall G, Apelqvist J. Prevention of diabetes-related foot ulcers and amputations: A cost-utility analysis based on Markov model simulations. *Diabetologia*. 2001;44(11):2077-87.
11. Apelqvist J, Ragnarson Tennvall G, Persson U, et al. Diabetic foot ulcers in a multi-disciplinary setting. An economic analysis of primary healing and healing with amputation. *J Intern Med*. 1994;235:463-471.

12. Stockl K, Vanderplas A, Tafesse E, Chang E. Costs of lower-extremity ulcers among patients with diabetes. *Diabetes Care*. 2004;27(9):2129-34.
13. Palumbo PJ, Melton L. Peripheral vascular disease and diabetes. In Harris M, (ed.). *Diabetes in America*, Second Edition. Bethesda, MD: National Institutes of Health. 1995:401-408.
14. Ramsey SD, Newton K, Blough D, McCulloch DK, Sandhu N, Reiber GE, Wagner EH. Incidence, outcomes, and cost of foot ulcers in patients with diabetes. *Diabetes Care*. 1999;22(3):382-7.
15. Bloomgarden ZT. American Diabetes Association 60th Scientific Sessions, 2000: The diabetic foot. *Diabetes Care*. 2001;24:946-951.
16. Wild S, Roglic G, Green A, et al. Global prevalence of diabetes: Estimates for the year 2000 and projections for 2030. *Diabetes Care*. 2004;27:1047.
17. Kunimoto B, Cooling M, Gulliver W, Houghton P, Orsted H, Sibbald RG. Best practices for the prevention and treatment of venous leg ulcers. *Ostomy/Wound Management*. 2001;47(2):34-46, 48-50.
18. Sibbald RG, Williamson D, Orsted HL, Campbell K, Keast D, Krasner D, Sibbald D. Preparing the wound bed — debridement, bacterial balance, and moisture balance. *Ostomy/Wound Management*. 2000;46(11):14-22, 24-8,30-5; quiz 36-7.
19. Orsted H, Sibbald RG. A coordinated approach to chronic wound care. *Ostomy/Wound Management*. 2001;47(10):6, 8.
20. Sibbald RG. An approach to leg and foot ulcers: A brief overview. *Ostomy/Wound Management*. 1998;44(9):28-32, 34-5.
21. Litzelman DK, Marriott DJ, Vinicor F. The role of footwear in the prevention of foot lesions in clients with NIDDM. *Diabetes Care*. 1997;20(2):156-162.
22. Armstrong DG, Nguyen HC, Lavery LA, van Schie CHM, Boulton AJM, Harkless LB. Off-loading the diabetic foot wound. *Diabetes Care*. 2001;24(6):1019-1022.
23. Canadian Association of Wound Care. Special Issue: Best Practice Recommendations. *Wound Care Canada*. 2006;4(1).
24. Registered Nurses' Association of Ontario (RNAO). Best Practice Guideline: Assessment and Management of Foot Ulcers for People with Diabetes. Toronto: RNAO. 2005.
25. Cullum N, Nelson EA, Fletcher AW, Sheldon TA. Compression for venous leg ulcers. *Cochrane Database Syst Rev*. 2001;(2): CD000265.
26. Capeheart JK. Chronic venous insufficiency: A focus on prevention of venous ulceration. *J Wound Ostomy Continence Nurs*. 1996;23:227-34.
27. Nelson EA, Cullum N, Jones J. Venous leg ulcers. *Clin Evid*. 2002;(8):2031-45.
28. Davis D, Taylor-Vaisey A. Translating guidelines into practice. A systematic review of theoretic concepts, practical experience and research evidence in the adoption of clinical guidelines. *Canadian Medical Association Journal*. 1997;157(4):408-16.
29. Cameron C, Naylor CD. No impact from active dissemination of the Ottawa Ankle Rules: Further evidence of the need for local implementation of practice guidelines. *CMAJ*. 1999;160(8):1165-8.
30. Lancellot M. CNS combats pressure ulcers with skin and wound assessment team (SWAT). *Clin Nurse Spec*. 1996;10(3):154-60.
31. Millington JT, Ellenzweig JM. Management and treatment of diabetic foot wounds in the elderly. *Annals Long-Term Care*. 2003;11(1):26-32.
32. Cavanagh PR, Ulbrecht JS, Caputo GM. Biomechanical aspects of diabetic foot disease: Aetiology, treatment, and prevention. *Diabet Med*. 1996;13(Suppl. 1):S17-22.
33. Chantelau E, Haage P. An audit of cushioned diabetic footwear: Relation to patient compliance. *Diabet Med*. 1994;11(1):114-6.
34. Mueller MJ, Diamond JE, Sinacore DR, et al. Total contact casting in treatment of diabetic plantar ulcers. Controlled clinical trial. *Diabetes Care*. 1989;12:384-8.
35. Caravaggi C, Faglia E, De Giglio R, et al. Effectiveness and safety of a non-removable fiberglass off-bearing cast versus a therapeutic shoe in the treatment of neuropathic foot ulcers: a randomized study. *Diabetes Care*. 2000;23:1746-51.
36. Sugarman JR, Reiber GE, Baumgardner G, Prella CM, Lowery J. Use of the therapeutic footwear benefit among diabetic medicare beneficiaries in three states, 1995. *Diabetes Care*. 1998;21(2):507-15.
37. Ragnarson Tennvall G, Apelqvist J. Health-economic consequences of diabetic foot lesions. *Clin Infect Dis*. 2004;39(suppl 2):132-139.
38. Abbott CA, Vileikyte L, Williamson S, Carrington AL, Boulton AJM. Multicenter study of the incidence of and predictive risk factors for diabetic neuropathic foot ulceration. *Diabetes Care*. 1998;21:1071-1075.

Best Practice: Development, Implementation

Douglas Queen, BSc, PhD, MBA; Tazim Virani, RN, MSc; Pat Coutts, RN, IIWCC; Heather L. Orsted, RN, MSc; R. Gary Sibbald, BSc, MD, FRCPC (Med) (Derm), ABIM, DABD, MEd

Abstract

Evidence-based medicine is the “conscientious application of scientific best practice by clinicians in concert with patient understanding and values.” Recent offerings by the Canadian Association of Wound Care (CAWC), Registered Nurses’ Association of Ontario (RNAO), and others have called attention to the gap between scientifically supported approaches to care and day-to-day practice by clinicians.

In 2000, the CAWC formulated evidence-based wound-care recommendations for practice and tools for their membership and others to influence practice across Canada.

This article attempts to explain some of the benefits and problems associated with the development and implementation of recommendations and guidelines, both of which need to be considered in order to influence wound management and to provide a snapshot of Canadian initiatives.

Introduction

Over the past five years, various organizations in the wound-care field have developed and disseminated clinical practice guidelines as part of an evidence-based medicine approach.^{1,2,3} These guidelines are formal tools based on a scientific evaluation of the research literature combined with expert opinion and that, in some cases, express client preferences. The guidelines help health-care professionals to practise wound care.^{4,5} Because clinical practice guidelines shift the knowledge base in the health-care field through standardization, they remain controversial within and outside medicine.⁶

So what is best practice? Sackett⁷ first defined evidence-based medicine as “the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients [that] involves integrating individual clinical expertise with the best available external evidence from systemic research.”

Kitson, Harvey and McCormack⁸ showed that best practice combined not only the best available evidence, including patient risk factors, but also available resources. This group also pointed out that for successful implementation, the evidence needed to be scientifically robust, the environment had to prepare for change, and the change process had to be facilitated.

Best practice guidelines, also known as clinical practice guidelines, are systematically developed statements to assist clinical practice. They combine evidence, experience and

opinion to improve client care by reducing inappropriate variations in practice and by promoting the delivery of high-quality, evidence-based health care.⁹

To bridge the gap between scientific evidence and client care, we need an in-depth understanding of the barriers and incentives to achieving change in practice. When planning complex changes in practice, potential barriers at various levels need to be addressed.¹⁰ Planning needs to take into account the nature of the innovation, characteristics of the professionals and clients involved, and the social, organizational, economic and political context.¹¹

Few studies have monitored change in professional practice over time to determine the sustainability of change. Research from other behavioural change literature shows that initial change is difficult to maintain, with reported relapse rates as high as 80 per cent.¹² Interventions most likely to succeed are based on a clear understanding of target behaviours and the environmental context. The target population’s readiness to change is an important factor at both an individual and organizational level. In most cases, a combination of different interventions will be needed to achieve lasting change.¹³

The rate of transfer of the knowledge gained from health and medical research into evidence-based practice is determined by many factors. Preconditions for the uptake of new evidence are the availability of good evidence, ready access to the evidence, a supportive organizational environment, and effective mechanisms for promoting knowledge uptake.¹⁴

Evidence-based wound care is being promoted in Canada by a body of enthusiastic caregivers (e.g., Canadian Association of Wound Care^{1,3}), supported by initiatives from national, provincial and local health-care bodies.² The short- to medium-term future of evidence-based wound care in Canada is likely to be shaped by three major factors: an eventual proliferation of electronic health records; a trend toward shared decision-making between clinicians (working in interprofessional/transprofessional teams) and patients/clients (and/or families); and increased demand for information to fill the gaps in research-based evidence in specific areas of wound care.¹⁵

Few issues are more central to the ongoing debate about health care in Canada than concerns about cost and quality of medical care. The recent development and implementation of medical management guidelines that include recommendations for diagnostic and therapeutic interventions, hospital length of stay, intensity of service, home care, and access to

and Current Status Across Canada

specialists have often focused this debate on the potential trade-off between cost reductions and quality of care.¹⁶

The Canadian Association of Wound Care recognizes that cost and quality are integrally related and that it is possible to reduce costs while maintaining and improving the quality of wound care delivered to Canadians.¹⁷

Development, Implementation and Stakeholder Benefits

The development and use of practice guidelines—if framed as recommendations for best practices in prevention, diagnosis, and treatment—lead to better management of wound care and total client well-being.¹⁸ The implementation and adherence to evidence-informed guidelines can facilitate

- improved efficiency and effectiveness by reducing the wide variance in current practices and improved client outcomes
- enhanced patient education and realistic outcome expectations
- the provision of a minimal evidence-based standard and agreed-upon ways to make wound-care practices more defensible

Guidelines should be explicit; based on a review of the available evidence; have clear logic; link findings to diagnosis, treatment and prevention; be time-based; and avoid recommending unproven approaches. If possible, they should be reviewed and tested for usability.¹⁹

Simply developing and publishing guidelines have not resulted in improved practice.²⁰ However, if they are used as the basis for peer-group interactions and actions by wound-care opinion leaders, guidelines can contribute to marked improvements in quality, caregiver and client satisfaction, and improved client health.²¹ Compounding the problem of non-adherence by providers, researchers have observed that client compliance also falls short.²²

Evidence-based medicine is a basis for significant activity among leaders to increase caregiver and client adherence.²³ There remain significant challenges, however, in the implementation of evidence-based wound management by institutions, including the willingness of multiple different specialties to agree on evidence-based guidelines, the willingness of payors to reimburse for evidence-based interventions, and distrust among health-care authorities.²⁴

There is an increased external influence on clinical practice to provide high-quality evidence for recommendations and

guidelines.²⁵ Review of the evidence for wound-care interventions provides practitioners with several challenges. Randomized controlled trials are scarce and have many limitations with respect to wound care, while other sources of evidence are often flawed because of the complexities of the wound-healing process, or are limited by their methodology.²⁶

The goal of evidence-based wound care is to assist practitioners with optimal patient care. This is achieved by integrating sound research evidence with personal clinical expertise and client values to determine the best course of treatment. Although clinicians embrace this concept, its implementation in clinical practice has been slow. The wound-care profession is committed to providing the best possible care for clients and their wounds.²⁷ This is proving to be more complex due to a virtual “information explosion” on new therapies, techniques, and materials; increased consumer understanding of treatment possibilities; and changing health-care systems.²⁸ Although the profession advocates the importance of evidence-based wound prevention and treatment, practitioners have been slow to implement this concept.²⁹

In developing appropriate treatment plans, caregivers should combine the client’s treatment needs and preferences with the best available scientific evidence, in conjunction with the caregiver’s clinical expertise. To keep pace with other health professions in building a strong evidence-based foundation, wound care will require significant investments in clinical research and education to evaluate the best currently available evidence and to identify new information needed to help caregivers provide optimal client care.

Implementing clinical practice guidelines can improve outcomes.³⁰ However, guidelines are often poorly implemented in clinical practice for many reasons.³¹ Many caregivers are simply not aware that guidelines exist, they do not believe in them, or they simply do not care to implement them.³² Economic and social factors may also influence uptake of guidelines. It is the role of professional societies (e.g., CAWC or RNAO) to disseminate best scientific knowledge and ensure optimum implementation of guidelines. This can be achieved through educational activities and continuing educational credits,³³ along with professional development portfolios and reflective learning diaries.

Close collaboration between professionals, health authorities, and even industry has encouraged the adoption of best practice and has thereby improved patient outcomes in Canada.

Current Practices across Canada

Facility-driven Approach

ET NOW, Kitchener, Ontario

ET NOW is a specialized nursing provision company whose focus is the delivery of advanced, evidence-based wound and ostomy care services.

They service all of Waterloo Region, which is a mixture of urban and rural settings, with a growing, affluent technology base as well as traditional manufacturing. There are two universities and a community college within the region. The population is around 450,000.

The majority of visits (85-90 per cent) are in clients' homes, with the remainder being made in facilities or institutions. ET NOW also provides telemedicine wound and ostomy consultation for two other agencies outside the region where ET coverage is not as accessible.

Since 1996, ET NOW has grown and now includes a total of eight RN enterostomal therapists and eight RNs with advanced wound and ostomy skills (AWOS) obtained through the formal in-house ET NOW education program, frequent inservices and an ongoing preceptorship experience. They secured a three-year CCHSA accreditation in 2006.

ET NOW nurses provide highly trained and specialized care to clients with wounds and ostomies in Waterloo Region through the Community Care Access Centre of Waterloo Region, in Grand River (both sites), Cambridge Memorial and Guelph General Hospitals, in long-term-care facilities and in the women's prison. ET NOW does not have a clinic. They compete with other nursing agencies as part of the provincial request-for-proposal process to secure the local CCAC contract.

All clients are a result of referrals to the practice in general for an RN ET consultation. Once the initial visit is made, the RN ET nurse negotiates for follow-up visits based on the condition, acuity and treatments required for the client. The majority of physician-generated referrals include the orders for "ET assess and treat."

Physicians, nurses, CCAC case managers, other health-care professionals and clients themselves make referrals. Diagnosis-specific triage or referral forms have been developed with the CCAC, the long-term-care homes and the hospitals.

ET NOW provides specialty services in advanced wound and ostomy care and continence management. Specialty nurses have learned problem-solving skills, knowledge of evidence-

based best practice, and the ability to focus on the complexities of a specific area of practice. This positively influences client outcomes and positions them as role models for other nurses and nursing students.

Sharp debridement is a large component of care provided: e.g., in 2004, 3,800 scalpels and 2,600 sterile iris scissors and tissue forceps were utilized. Community visits are 50 per cent ET and 50 per cent RN with advanced wound and ostomy skills.

Clients who are receiving specialized services (e.g., VAC therapy or high-compression bandaging) will only have ET NOW for those skilled visits. Other clients who can do self-care or who have family or attendant care may not have another nursing agency involved. This is an example of a specialized approach based on best practices.

Health Authority-driven Approach

The Skin and Wound Assessment and Treatment (SWAT) Team, Care in the Community: Calgary Home Care, Calgary, Alberta

Bateman states the strongest component that differentiates one wound-care program from another is the wound-care team.³⁴ She brings forth four key questions to ask about the team:

- How qualified is the staff?
- What educational tools do they utilize?
- How do they measure patient outcomes?
- What does their patient population have to say about their program?

The Calgary Home Care program has been able to make the team concept work, often without walls. The clinical specialist role for wound and skin management, along with strong agency support, facilitated the development of a multidisciplinary team for wound and skin care—the SWAT team—in 1996. This 25-member multidisciplinary team became wound-care opinion leaders (RN, PT, and OT) through the same strategies as Kitson⁸ outlines: strong evidence, effective facilitation and context/environment support.

Initially, 10 self-paced, evidence-based learning modules and three skills labs were created relating to wound and skin management. As well, the team attended two to three hours of in-service every month to discuss practice issues. The program originally was built on the clinical practice guidelines #3 and #15 provided by the Agency for Health Care Policy and Research (AHCPR), but has since moved toward the Registered Nurses' of Ontario (RNAO) guidelines relating to

ulcer prevention and management and the best practice recommendations for wound management provided by the Canadian Association of Wound Care (CAWC). Additionally, to date 18 clinicians involved in wound care within the Calgary Health Region (acute, community and long-term care) have completed the 10-month International Interprofessional Wound Care Course offered through the University of Toronto. Evidence-based clinical practice (or best practice) occurred not only as a result of self-study but also by mentoring with the clinical specialist and educator as well as through joint multidisciplinary SWAT team visits and discussions. Additional team support was provided by the family physician and other staff involved in care, such as the social worker, orthotist and dietitian. The case-management model that Calgary Home Care followed fostered partnering with all services (community and hospital-based) and disciplines required to meet the needs of the home-care client. The SWAT team provides support through education, clinical visits, and policy/procedure recommendations to the staff at Calgary Home Care, clients receiving wound management, and other health professionals involved in client care.

Calgary Home Care identified gaps in the service delivery, which led to two initiatives. The first was the development of a clinical pathway by the SWAT team for wound management. Its adoption by the Calgary Home Care program has supported the holistic framework required to fully implement evidence-based practice for wound and skin management and has provided a framework for other program delivery tools. The pathway further supports enhanced practice across often fragmented service-delivery sites.

The second initiative was the development of five nurse-managed community-care clinics. Initially begun as wound clinics with the SWAT team, now all care that can be provided in a clinic setting is identified, and the clients are triaged to the form of care delivery that best meets their needs. Once a week, complex-wound clients are seen in the clinic by the multidisciplinary team. These clinics have proven to support optimal wound healing, to be cost-effective, and to provide and support community-based services. Recently the Calgary Health Region's Foot and Wound Clinic has come under the Calgary Home Care umbrella and has augmented traditional community care through their medically directed clinic.

David Thomas stated, "Teams must be built in terms of human relationships. In practical ways you have to become

involved with each other and break down barriers that may exist between disciplines."³⁵ Teams such as the Calgary Home Care SWAT Team must be built on partnerships and must have a function, purpose, and a belief that they will make a difference. They must also be flexible and dynamic as they change over time. Forming a team is an effective way of providing care, but developing and maintaining a team is an art that can be supported by evaluating and applying principles of team-building to the unique characteristics of the facility. Outcomes and strong leadership must support clinical practice. Wound-care teams must also have co-operative linkages with the local and regional agencies so that each client is treated appropriately and promptly. The reallocation of finances and costs of running a multidisciplinary team need to be justified by comparative studies showing the cost savings to the health-care system over the traditional or existing services. Maintaining the team requires accurate statistics to show improved outcome measures as a framework for the team's future development. Undertaking and, ideally, publishing studies demonstrating the cost-savings realized by the team will provide a solid justification for its continued existence.

Provincially Driven Approach

In 1999 the Centre for Professional Development of the Registered Nurses' Association of Ontario (RNAO) obtained provincial funding for the development of best practice guidelines (BPG).³⁶ A series of BPGs were developed to cover the topics of pressure ulcers, diabetic foot ulcers and venous leg ulcers.

The development of these BPGs was a team effort encompassing many clinical disciplines from across Ontario. For example, the venous-leg-ulcer best-practice-guideline panel consisted of community-based nurses, enterostomal therapists and personnel from private practice, long-term care and acute care.

The process of development began with face-to-face meetings, followed up with conference calls. A literature search was conducted for existing guidelines and articles related to venous leg ulcers.³⁷

Eight existing guidelines were chosen for critical appraisal. The data collected from this process were then analyzed, and recommendations concerning their use were given to the panel. This appraisal process highlighted three guidelines that formed the foundation for the BPGs.

The recommendations were brought back to the panel as a whole, and a process of consensus took place to determine which recommendations would be included. During this process a list of stakeholders, including clients, was assembled.³⁸ The stakeholders were then asked to comment on the guideline, and their responses were included in the final document.

The venous-leg-ulcer best-practice guideline was then implemented through a pilot project. The BPG was then refined through feedback from the implementation phase and the results of the initial evaluation. The venous leg ulcer guideline was published and is available through the RNAO Web site (www.rnao.org).

The Registered Nurses' Association of Ontario continues to lead and partner with multidisciplinary teams and health-care organizations in developing new guidelines and updating existing guidelines in wound care.

This guideline process is important both to Canadian health care and the treatment of wounds. Indeed, the RNAO has recently partnered with the University of Ottawa, School of Nursing, and has established the Nursing Best Practice Research Unit (NBPRU), which provides opportunities for researchers to share and collaborate on research interests related to best practices.

Nationally Driven Approach

In 2000, the Canadian Association of Wound Care (CAWC) published best practice recommendations relating to wound-bed preparation and the prevention and management of pressure ulcers, diabetic foot ulcers and venous leg ulcers.

These were not intended to be clinical practice guidelines but a distillation of existing guidelines into succinct practice articles and bedside enablers (the Quick Reference Guides, or QRGs) backed up by the existing articles, research and guidelines for more in-depth information.

Following this, the RNAO developed nursing guidelines specific to wound care. Though the RNAO is a nursing body, their guidelines were developed with interprofessional advice and patient guidance. Additionally, the RNAO utilizes a best practice approach to guideline development and has implemented a maintenance program.

The CAWC decided to update the previously developed CAWC recommendations in the context of the RNAO Best Practice Guidelines. The updated articles and QRGs could serve as practice enablers that would help to interpret these

guidelines for the multiple health-care professionals involved in the management of chronic wounds.

To further enable practice, each QRG is related to a Pathway to Assessment and Treatment, which provides an algorithm to guide clinical decision-making.

To implement best practice at the bedside, clinicians and their facilities must now integrate these evidence-supported practice, educational, organizational and policy enablers with specific client risk factors and locally available resources to develop specific wound-care plans.

The Future of Best Practices in Canadian Wound Care

The RNAO guidelines and the 2006 CAWC best practice recommendations bypass local variations of expert opinion by validating each recommendation and giving strength of evidence to each topic. By doing so, the documents take on a national flavour, rather than a mix of local (regional and provincial) flavours. These new recommendations also are following the national trend toward out-patient and ambulatory intervention, often through home care.

Health-care professionals throughout Canada will greatly benefit from these important initiatives. Much work remains, however, and it requires that each caregiver be cognizant of where we are but more importantly where we should be.

References

1. Inlow S, Orsted H, Sibbald RG. Best practices for the prevention, diagnosis, and treatment of diabetic foot ulcers. *Ostomy/Wound Management*. 2000;46(11):55-68,quiz 70-1.
2. Registered Nurses' Association of Ontario (RNAO). Nursing Best Practice Guideline: Assessment and Management of Venous Leg Ulcers. Toronto: RNAO. 2004. Available at www.rnao.org.
3. Keast D, Orsted HL. The Pathway to Best Practice. *Wound Care Canada*. 2006;4(1):10-11.
4. Coutts P. The RNAO's evolution of a best practice guideline for venous leg ulcers. *Wound Care Canada*. 2003;1(1):38-39.
5. Virani T. What's new with the RNAO Best Practices Program? *Wound Care Canada*. 2006;4(3):42.
6. Jenicek M. Evidence-based medicine: Fifteen years later. Golem the good, the bad, and the ugly in need of a review? *Med Sci Monit*. 2006;12(11):RA241-251.
7. Sackett DL, Rosenberg WMC, Gray JAM, Haynes RB, Richardson WD. Evidence-based medicine: What it is and what it isn't. *British Medical Journal*. 1996;312:71-72.

8. Kitson A, Harvey G, McCormack B. Enabling the implementation of evidence-based practice: A conceptual framework. *Quality in Health Care*. 1998;7:149-158.
9. Orsted HL, Campbell KE, Keast DH. Clinical practice guidelines, algorithms and standards: Tools to make evidence based practice available and user friendly. In Krasner DL, Rodeheaver GT and Sibbald RG, (eds.). *Chronic Wound Care: A Clinical Source Book for Healthcare Professionals*, Third Edition. Wayne, PA: HMP Communications. 2001:209-217.
10. Grol R, Grimshaw J. From best evidence to best practice: Effective implementation of change in patients' care. *Lancet*. 2003;11;362(9391):1225-30.
11. Gravel K, Legare F, Graham ID. Barriers and facilitators to implementing shared decision-making in clinical practice: A systematic review of health professionals' perceptions. *Implement Sci*. 2006;9;1:16.
12. Curran GM, Thrush CR, Smith JL, Owen RR, Ritchie M, Chadwick D. Implementing research findings into practice using clinical opinion leaders: Barriers and lessons learned. *Jt Comm J Qual Patient Saf*. 2005;31(12):700-7.
13. Benefield LE. Implementing evidence-based practice in home care. *Home Healthcare Nurse*. 2003;21(12):804-9; quiz 810-1.
14. Friedman N. Evidence-based medicine: The key to guidelines, disease and care management programmes. *Ann Acad Med Singapore*. 2002;31(4):446-51.
15. Hewitt-Taylor J. Developing and using clinical guidelines. *Nurs Stand*. 2003;18(5):41-4.
16. Bolton L, Corbett L, Bernato L, Dotson P, Laraus S, Merkle D, Patterson G, Phillips T, McNees P, Riedesel PP, Sheehan P; Government and Regulatory Task Force, Association for the Advancement of Wound Care. Development of a content-validated venous ulcer guideline. *Ostomy/Wound Management*. 2006;52(11):32-48.
17. Campbell K, Teague L, Hurd T, King J. Health policy and the delivery of evidence-based wound care using regional wound teams. *Healthc Manage Forum*. 2006;19(2):16-21.
18. Delmas L. Best practice in the assessment and management of diabetic foot ulcers. *Rehabil Nurs*. 2006;31(6):228-34.
19. Caminiti C, Scoditti U, Diodati F, Passalacqua R. How to promote, improve and test adherence to scientific evidence in clinical practice. *BMC Health Serv Res*. 2005;5:62.
20. Davis D. Continuing education, guideline implementation, and the emerging transdisciplinary field of knowledge translation. *J Contin Educ Health Prof*. 2006;26(1):5-12.
21. Ring N, Coull A, Howie C, Murphy-Black T, Watterson A. Analysis of the impact of a national initiative to promote evidence-based nursing practice. *Int J Nurs Pract*. 2006;12(4):232-40.
22. McGuckin M, Williams L, Brooks J, Cherry G. Guidelines in practice: The effect on healing of venous ulcers. *Adv Skin Wound Care*. 2001;14(1):33-6.
23. Grimshaw J, Eccles M, Thomas R, MacLennan G, Ramsay C, Fraser C, Vale L. Toward evidence-based quality improvement. Evidence (and its limitations) of the effectiveness of guideline dissemination and implementation strategies 1966-1998. *J Gen Intern Med*. 2006;21(Suppl 2):S14-20.
24. Falanga V. The dark side of evidence-based wound management. *J Wound Care*. 2001;10(5):145.
25. Baxter R, Baxter H. Clinical governance. 1: Evidence-based practice. *J Wound Care*. 2002;11(1):7-9.
26. Saliba D, Rubenstein LV, Simon B, Hickey E, Ferrell B, Czarnowski E, Berlowitz D. Adherence to pressure ulcer prevention guidelines: Implications for nursing home quality. *J Am Geriatr Soc*. 2003;51(1):56-62.
27. MacLeod FE, Harrison MB, Graham ID. The process of developing best practice guidelines for nurses in Ontario: Risk assessment and prevention of pressure ulcers. *Ostomy/Wound Management*. 2002;48(10):30-2,34-8.
28. Queen D, Orsted H, Sanada H, Sussman G. A dressing history. *Int Wound J*. 2004;1(1):59-77.
29. Birchall L, Taylor S. Surgical wound benchmark tool and best practice guidelines. *Br J Nurs*. 2003;12(17):1013-23.
30. Huffman MH. Standards of care and best practices: The link to patient outcomes. *Home Healthcare Nurse*. 2005;23(11):727-32, quiz 733-4.
31. Sonnad SS, Matuszewski K. Control mechanisms for guideline implementation. *Qual Manag Health Care*. 2006;15(1):15-26.
32. Dobbins M, Davies B, Danseco E, Edwards N, Virani T. Changing nursing practice: Evaluating the usefulness of a best-practice guideline implementation toolkit. *Can J Nurs Leadersh*. 2005;18(1):34-45.
33. Steinert Y, Mann K, Centeno A, Dolmans D, Spencer J, Gelula M, Prideaux D. A systematic review of faculty development initiatives designed to improve teaching effectiveness in medical education: BEME Guide No. 8. *Med Teach*. 2006;28(6):497-526.
34. Bateman S. Using a team approach ... diabetic and pressure ulcer home care. *Rehab Management*. 1999;12(5):48-9.
35. Baranoski S, Salzberg CA, Staley MJ, Thomas DR, Ayello EA. Obstacles and opportunities for the multidisciplinary wound

references continued on page S50

A Transprofessional Comprehensive Lower Extremity Leg and Foot Ulcers

Kevin Woo, RN, MSc, PhD(c), ACNP, GNC(c); Afsaneh Alavi, MD; Mariam Botros, DCh, IIWCC; Laura Lee Kozody, BSc, DCh; Marjorie Fierheller, RN, BScN; Kadhine Wiltshire, BA (Hons); R. Gary Sibbald, BSc, MD, FRCPC (Med) (Derm), ABIM, DABD, MED

Introduction

Leg and foot ulcers are often recalcitrant to healing, tend to recur, and become a long-term chronic health-care problem. Many clients living with chronic leg and foot ulcers experience diminished quality of life, pain, psychosocial maladjustment, limited work capacity and physical disabilities.¹ The Ontario point prevalence of lower limb ulcers was estimated to be in the vicinity of 0.18 per cent in all age groups and as high as 12.6 per cent in persons above age 70.^{2,3} The number of clients suffering from leg and foot ulcers in Canada is comparable to those reported in other international studies.^{4,5} It is obvious that as the population ages, leg and foot ulcers are becoming more prevalent and constitute a significant disease burden on the health-care system, particularly home-care nursing services.

To better comprehend the scope of the wound-care issue, the Community Care Access Centre (CCAC) in Peel has been audited for the prevalence of chronic wounds on three occasions in 1997, 2000, and 2006. The number of home-care clients serviced with open wounds increased from 413 individuals in 1997, to 648 in 2000 to 878 in 2006.⁶ Of interest, 25 to 30 per cent of clients had chronic wounds for longer than six months. Some of these clients were receiving daily home care without specific ulcer etiologies or diagnoses identified. Most CCACs in Ontario have recognized wound care as their greatest increasing client-service expense. The plan of care for these clients is often limited to local dressing changes and the frequency of nursing visits. Health-care professionals and clients must be cognizant of the fact that not all chronic wounds are healable or have the ability to heal.⁷ In addition, some clients with these wounds do not have co-existing medical conditions (e.g., advanced cancer) or prescribed medication (e.g., immunosuppressive drugs) that would prevent normal healing. A maintenance wound is a wound with the ability to heal, but either the client does not consistently adhere to treatment or the health-care system may restrict access to appropriate resources. Non-healable wounds have inadequate vasculature, a cause that is not treatable, or co-existing medical conditions or medications that prohibit the healing process. To put this in a meaningful

context, this type of wound classification system helps clinicians and clients to identify common realistic outcomes.

The optimal care of individuals with chronic leg and foot ulcers is complex and time-consuming. Evidence-informed management of these ulcers involves detailed examination, investigation, and discussion of results with clients. However, inadequacies in the current health-care system do not allow health-care providers (family doctors and visiting nurses) to be financially remunerated for extended visits and lengthy comprehensive assessments to provide specific diagnoses and optimized treatment. The management of a chronic wound in the community is further complicated by the fragmentation

of services between acute, chronic, and home care. There is a lack of connected health-care professionals, especially in the home-care setting, and a need to evolve to work in co-ordinated interprofessional teams to assess, treat, and monitor outcomes of lower extremity leg and foot ulcers. A recent survey of 100 consecutive referrals to our clinic indicated a 10-month lag period between onset of the ulcer and the initial specialized assessment.⁶ We are concerned about the number of unnecessary nursing visits and potential client

complications that may have been avoided with prompt assessment and treatment. Our hypothesis is that if clients receive a comprehensive interprofessional assessment on admission to home care, outcomes can be improved with less frequent yet more effective nursing visits.

In this project, we also had a unique opportunity to conduct a paradigm-changing demonstration by establishing decentralized interprofessional teams to facilitate efficient client assessment and translation of evidence-informed knowledge for optimal client care. Our formalized but flexible interprofessional structure was designed to dissolve individual silos, forging links between compartmentalized community services.

Several reported wound-care models based on interprofessional collaboration have demonstrated improved client outcomes. In one United Kingdom study, Moffat and Franks⁸ reported that 12-week healing rates improved from 14 to 37 per cent after implementation of community leg-ulcer clinics.

FIGURE 1



Assessment Model for Persons with

TABLE 1

Key Objectives and Outcomes of this Study

Phases	Objectives	Outcomes
Phase one	Select best practice guidelines.	Best practice guidelines from RNAO, CAWC QRGs
	Develop partnership.	Partnership with RNAO and CCAC
	Develop prevalence audit tool.	Tool developed in consultation with Peel CCAC
	Establish interprofessional teams at CCACs.	Team assembled and trained with International Interprofessional Wound Care Course (nurse practitioner/physician leader, foot-care specialist, co-ordinator, and special consultant as needed)
Phase two	Audit prevalence and incidence of lower extremity ulcers.	Audit completed and reported in this issue
	Examine cost-effectiveness models.	Completed and reported in this issue
	Develop team assessment protocols.	Tools developed
	Pilot assessment tools.	Acceptable to clinicians and clients
Phase three	Assign home care co-ordinators to identify all new and continuing clients with leg and foot ulcers.	Co-ordinators facilitated optimal access to needed support services
	Send assessment team members as appropriate for baseline assessment and order treatment(s) for the cause at the beginning or on admission to home care (new clients, clients with stalled healing, chronic long-term clients).	Two teams were established in Toronto and Peel regions
	Co-ordinate appropriate foot-care services to deliver regular debridement and downloading in clients with neurotrophic foot ulcers.	Chiroprapist services established within the home-care framework
	Optimize compression therapy based on a combination of physical examination. Doppler testing, toe pressure, client preference and level of pain, other medical conditions.	Compression for clients with leg ulcers after arterial compromise was ruled out
	Follow-up assessments at four weeks to monitor progress.	91.9 per cent of clients were reassessed at week 4
	Transprofessional team members were included when required for formalized vascular studies (vascular surgery consultation); PT, OT, dieticians, and CCAC co-ordinator for clients requiring complex off-protocol services.	Appropriate referrals were made
Phase four	Re-assess and fine tune roles to enhance interprofessional practice (clinical, educational)	To be analyzed with all partners
	Recommend embedded successful interventions in the system by negotiating alternate payment scheme for team members with CCAC and Ministry of Health.	Report to Ministry of Health
	Compile client and provider satisfaction surveys.	Pending future funding
	Quality Assurance Audit and new policy for the delivery of wound-care services for leg and foot ulcers	Future project
	Establish transprofessional team knowledge and skill programs and longitudinally establish new teams in the community with an expert support network.	Pending funding

In Denmark,⁹ a wound-centre-based multidisciplinary team was formed consisting of physicians, nurses, podiatrists, and physiotherapists. Under their care, half of the centre's clients experienced healing even when the wounds were not previously progressing over an extended period of time. Based on these examples, our integrative teams, led by either a nurse practitioner or a physician took this idea a step further, creating a practice climate that is practical, transprofessional (merging professional boundaries), client-centred, and outcome-focused. This integrated transprofessional team approach with appropriate modification may form the basis for new care-delivery paradigms.⁴ This entire model incorporates a four-stage approach, including quality improvement: Preparation/partnership building, Pre-audit, Implementation

and Re-audit (PAIR) designed to sustain the primary care change (see Figure 1).

We have completed the first three stages (pre-audit, and weeks 0 to 4 comparative audits) of this project. We are attempting to demonstrate an improvement in client care with this transprofessional comprehensive approach that may be generalizable to other therapeutic areas (see Table 1).

Epidemiology of Leg and Foot Ulcers

Leg ulcers can be divided into venous, mixed (arterial and venous combined), and other causes. Approximately one in 350 adults suffers from an open leg ulcer at any time, and 50 per cent of the affected clients have recurrent ulcers over a 10-year period.^{4,5,10}

Venous disease has previously been reported to be responsible for up to 70 per cent of all chronic ulcers of the lower limbs.¹ With the aging population, these ulcers are likely to be complicated with concomitant arterial compromise and additional pathological conditions that render assessment and management of leg ulcers challenging. The multifactorial nature of venous leg ulcers may explain why one-third of the subjects in Graham's study¹ reported having a lower extremity ulcer for longer than 12 months. According to an analysis by Olin et al.¹¹ of the Cleveland Clinic Foundation database, the total medical cost per client with a venous ulcer was U.S. \$9,685. Home care, hospitalizations, and home dressing changes accounted for 21 per cent of total cost. A recently published Ontario CCAC survey by Freidberg, Harrison and Graham³ concluded that clients with leg ulcers constituted six per cent of home-care clients and 18 per cent of total supply expenditure (average supply costs per visit were \$21.06). The supply and visit costs for clients with venous leg ulcers receiving compression therapy were 19 per cent lower than those not using compression. Exactly 2,200 nursing visits were made with a mean treatment time of 26 minutes and a mean travel time of 17 minutes (40 per cent of nursing time billed), for an average total nursing cost per visit of \$80.62. The average annual home-care expenditure (visit and supplies) to provide care to 192 clients with leg ulcers was estimated to be \$1.3 million (\$6,771 per client). Faced with a dramatic increase in lower extremity ulcers as well as mounting costs in ulcer care, home-care authorities are struggling with the need to make an accurate diagnosis and optimize treatment. Home-care coordinators often have incomplete client assessments and are unable to link resources and services to evidence-informed best practice guidelines. Even when these guidelines are readily available, there is a provider-knowledge-transfer gap in implementing these principles into day-to-day practice.

Foot ulcers are potentially even a greater problem. In Canada, five to six per cent of the population has diabetes mellitus, and the number continues to soar.¹² Persons with diabetes are prone to developing foot ulcers due to a loss of protective sensation resulting from neuropathy and potential co-existing vascular disease. These clients have up to a 25 per cent risk of developing a foot ulcer during their lifetime.^{13,14} Around 7.2 per cent of clients with diabetes and neuropathy will develop a foot ulcer on an annual basis.¹⁵ Eighty-four per cent of all non-traumatic amputations are preceded by foot

ulcers and they serve as one of the significant disease indicators in persons with diabetes. O'Brien et al.¹⁶ analyzed the health-care costs of type 2 diabetes mellitus in Canada. Foot ulcers that healed without amputation or vascular surgery were scrutinized. The estimated average healing cost for each foot ulcer in persons with diabetes (PWD) was \$2,183. The addition of hospitalization costs increased this to \$7,802 per client.

Our previous clinical survey of 100 consecutive foot ulcers in PWD indicated the majority had been hospitalized or visited an emergency department.⁶ More alarmingly, 50 per cent of the admissions to hospital in PWD are due to complications of foot ulcers.¹⁷ The overall cost for each amputation is estimated to be \$40,000 or higher according to the Ontario Government Publication Diabetes in Ontario.¹² To facilitate healing of diabetic neurotrophic ulcers and prevent amputation, four factors must be considered: presence of adequate vascular supply, management of bacterial burden and infection, appropriate pressure downloading including accommodation of deformities, and sharp surgical debridement.^{18,19} To ascertain adequate vascular supply, the presence of a palpable pulse (at least 80 mmHg) is determined, or more definitely, a full segmental arterial Doppler can be obtained. Clients with inadequate vascular supply should be referred to vascular surgeons for potential dilation, stenting or bypass. Surface infection requires treatment with anti-bacterial dressings, and deeper infection necessitates systemic anti-microbial therapies.²⁰ Appropriate pressure-downloading will require specialized devices (pneumatic walkers, contact casts) and in some cases shoes and orthotics. According to previous findings, 88 per cent of the surveyed PWD did not have their feet examined or considerations given to footwear by their family physicians.⁶ Prior to their initial clinic visit, the vast majority of individuals were actually receiving daily home-care nursing visits without appropriate pressure-downloading measures. Although the contact cast has been the most extensively studied technique to redistribute foot pressure, less than one per cent of community clients have been able to acquire this device.⁶ The gap in practice implementation is due to a combination of factors, including contraindications (ischemia and infection), expertise in application, client preference, and cost.²¹ The benefit of total contact casts rests not only on their ability to mitigate pressure but to force clients to wear them because the device is not easily removable. Clients favour a pneumatic walker consisting of a rocker-

bottom, removable fibre cast structure, and air chambers to prevent friction and shear caused by movement. A recent randomized controlled trial modified the pneumatic walker to make it irremovable.²² In the study, the irremovable pneumatic walker was equal in efficacy to the total contact cast and may be a sensible alternative to integrating contact casting into community practice.

Research Objectives

The primary purpose of this study was to confirm that the integration of an initial transprofessional comprehensive assessment could improve clinical outcomes in clients with leg and foot ulcers.

The primary outcomes of interest were

1. prevalence of open wounds within the targeted CCACs (Toronto and Peel are used as examples)
2. formulation of accurate wound diagnoses
3. appropriate treatment and management plans linked to evidence-informed practice
4. documentation of accelerated wound-healing rate after comprehensive assessment
5. documentation of wound healing with appropriate down-loading devices (neurotrophic foot ulcers)
6. documentation of wound healing with optimal compression (venous and mixed leg ulcers)
7. change in visit frequency and potential cost-effectiveness
8. change in wound size over four-week period
9. change in pain control
10. appropriate resource utilization for maintenance or non-healable wounds

Methods

This longitudinal study followed 111 clients prospectively for four weeks in 2006. All subjects were referred by Toronto and Peel CCACs in Ontario. Separate assessment teams were established in Toronto and Peel areas, and were managed by a nurse practitioner and a physician respectively. The team leaders were trained in the International Interprofessional Wound Care Course (IIWCC) at the University of Toronto and have advanced clinical experience in a transprofessional clinic setting. This project was funded by the Ministry of Health Primary Care Reform Initiative. The study was designed to evaluate a home-care interprofessional/trans-professional delivery model for chronic leg and foot wounds.

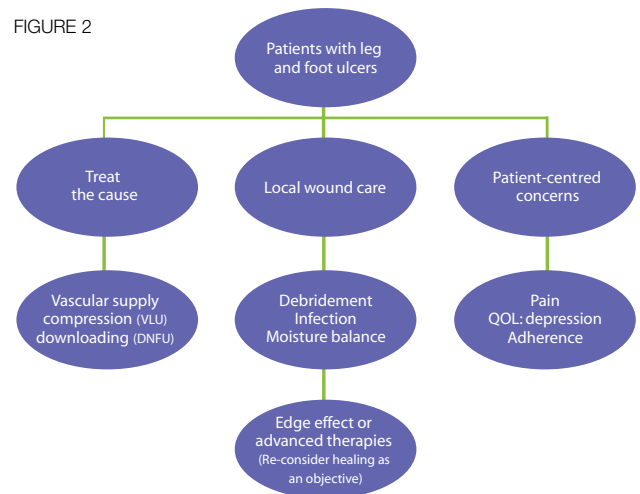
Project Implementation and Data Collection

The Registered Nurses' Association of Ontario (RNAO) has released best practice guidelines for the management of venous leg ulcers and diabetic foot ulcers.^{23,24} Although these guidelines were developed primarily by nurses, they have a strong inter-professional focus through a rigorous evidence-based process. To avoid lengthy details and make these recommendations practical for clinicians at the bedside, the Canadian Association of Wound Care (CAWC) has summarized 65 recommendations in the RNAO venous leg ulcer guidelines to produce 12 concise statements as enablers for practice.²⁵ A similar reference guide was developed for the prevention and treatment of diabetic foot ulcers (30 recommendations in the RNAO guidelines were summarized in 11 precise statements).²⁶

In addition, we standardized the approach to wound care. The wound bed preparation (WBP) model described by Sibbald et al.^{7,27,28} (Figure 2) was utilized as a theoretical framework. Central to this paradigm is the importance of treating the cause and addressing client-centred concerns prior to optimizing local wound care. To implement this paradigm, an initial comprehensive assessment was mandatory. The three important components of local care are debridement, infection and inflammation, and moisture balance—which are then followed by the edge effect if advanced therapies are indicated.^{20,27,29,30,31}

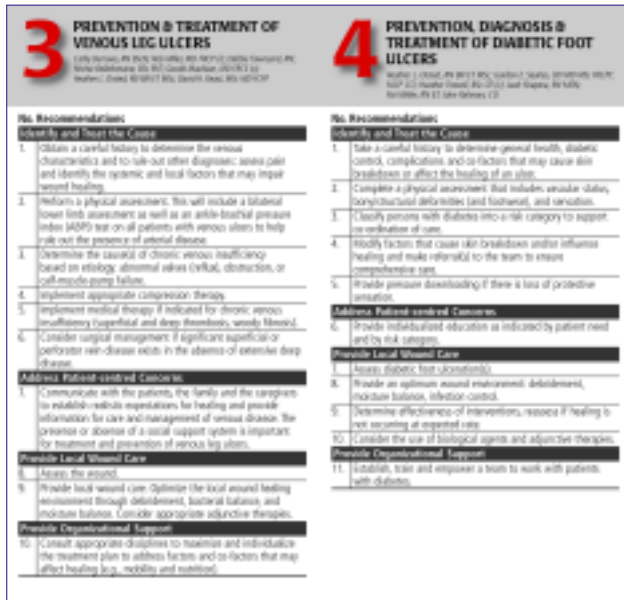
To establish face validity (collection tool from established guidelines) of data collection documents, the CAWC enablers were transposed into assessment forms. Specific recommen-

FIGURE 2



Wound Bed Preparation Paradigm

FIGURE 3 CAWC Quick Reference Guide^{25,26}



dations for venous leg ulcers and diabetic foot ulcers were used to determine the appropriate interventions in each of the above categories (Figure 3).

The data were collected at clients' homes or in the clinic setting by either a nurse practitioner or a physician with advanced knowledge in wound care. Baseline data were collected at week 0 and reassessed at week 4. Assessment findings and treatment plans were communicated verbally or in writing to clients and their family physicians. Primary care physicians were integrated members of this team and they functioned as a liaison with specialists as well as the nursing and allied health-professional team.

A collaborative partnership between the University of Toronto, RNAO and Toronto CCAC was initially established for this grant application. We also elicited participation from Peel CCAC to complete this project. A home-care co-ordinator at each CCAC was appointed to capture all newly enrolled persons with leg and foot ulcers as well as to identify clients who are already within the system. Questionnaires were sent to the participating CCACs and home-care agencies to determine the number of clients receiving nursing visits for wound care.

Data Analysis

Data were collected on documentation tools and transferred to Statistical Package for the Social Science (SPSS) version

12.0 for all analyses. Pooled and individual analysis was performed for the data collected from Peel and Toronto CCAC clients. Where appropriate, individual analyses were conducted to separate the data that pertain to leg ulcers from foot ulcers. Most of the data were analyzed using descriptive statistics. Continuous data were expressed as means and standard deviations. Non-continuous variables were presented as a percentage. The paired t-test was used to compare wound surface areas before and after the intervention. Significance level for statistical testing was set at 0.05.

Ethical Approval

The current study was approved by the Research Ethics Board at Sunnybrook and Women's College Hospital. Written informed consents were obtained from all participating subjects.

Results

During a three-month study period, a sample of 111 clients was recruited from Toronto and Peel CCACs. Forty-five per cent of the clients were assessed at their homes. Of the 111 clients, 102 clients (91.9 per cent) were re-assessed at week 4 for follow-up. A total number of 78 leg ulcers and 96 foot ulcers were evaluated at the beginning and 66 leg ulcers (85.9 per cent) and 85 foot ulcers (88.5 per cent) were evaluated at the end of the study. Client withdrawals were due to death (one client), hospitalization (two clients), and loss to follow-up (six clients). Sixty per cent of the clients were male (60.4 per cent) and the average age of the subjects was 66 years (range from 33-95). Other demographics of the subjects are summarized in Table 2.

The CAWC Quick Reference Guide format will be used to present the results.

1. Assess the client's ability to heal

According to the best practice guidelines, the client's ability to heal should be determined. The majority (95 per cent) of the clients were assessed by a hand-held Doppler to measure either ankle brachial pressure index (ABPI) for leg/foot ulcers or toe pressure for foot ulcers with ABPI >1.2 or no palpable pulse. Overall (both legs), 64.81 per cent of all subjects had an ABPI of above 0.6 or toe pressure of more than 50 mmHg as a minimal measure of healability. Intermediate circulation was noted (one or two legs) in 22.22 per cent of the subjects as defined by ABPI of 0.4-0.6 or a toe pressure of 30-50 mmHg. Inadequate circulation in one or both legs was present in 12.96 per cent of sub-

TABLE 2 Summary of Key Variables and Demographics

		Number of clients	Percent
Gender	Male	67	60.4
	Female	44	39.6
Follow up	Yes	102	91.9
	No	9	8.1
CCAC	Toronto	56	50.5
	Peel	50	45.0
	Other	5	4.5
		Number of wounds	Percent
Location of wounds	Leg	78	55.2
	Foot	96	44.8
		Mean	SD
Age (years)	66	14	33-95
Duration in study (days)	31.6	12.8	12-91*

* Extended follow-up due to orthodic or debridement issues.

TABLE 3 Healability of Wounds in this Study

	Category	Number of clients	Percent
Healability	Healable	121	69.9
	Maintenance	43	24.9
	Non-healable	9	5.2

jects. The results indicated that most subjects demonstrated adequate circulation for healing. Clients were classified into categories according to their healability (Table 3), based on circulation, co-existing disease, medications that may interfere with healing, and individual and health-system factors.

2. Diagnose and correct or modify treatment of causes/tissue damage

Nineteen out of 111 clients (17.1 per cent) clients did not have a definitive diagnosis upon entering into the study. After the comprehensive assessment, almost 60 per cent of the clients received a more specific diagnosis of their wounds that helped formulate an optimized treatment protocol (Table 4). It should be pointed out that two clients in the study were newly diagnosed with a cutaneous malignancy after being assessed by the expert team. One of the clients with a malignant wound had been receiving home-care services for a number of years without any definite diagnosis. These frequent nursing services for such a long period are expensive.

3. Assess and support the management of client-centred concerns

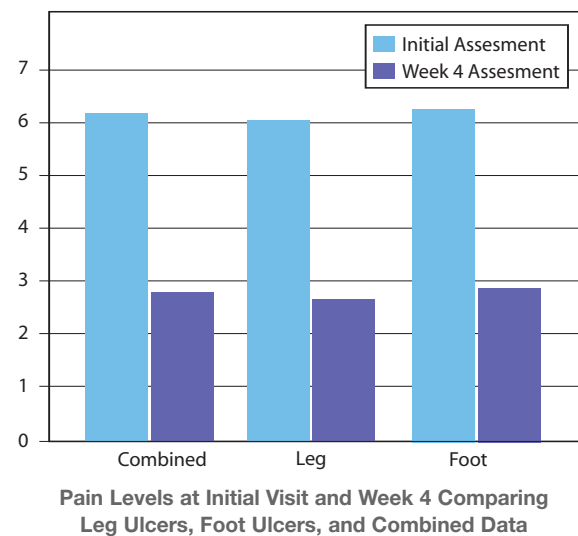
By direct questioning, 21 clients (23.6 per cent) acknowledged

TABLE 4 Wound Diagnosis Before and After Team Assessment

Primary wound diagnosis	Number of clients (%) before the study	Number of clients (%) post study
No specific diagnosis	19 (17.1)	0 (0)
DM normal (not NI/NP)	24 (21.6)	2 (1.8)
DM neuroischemic (NI)	3 (2.7)	17 (15.3)
DM neuropathic (NP)	19 (17.1)	27 (24.3)
Arterial	4 (3.6)	2 (1.8)
Venous	18 (16.2)	28 (25.2)
Mixed AV	0 (0)	1 (0.9)
Mixed VA	0 (0)	4 (3.6)
Non-DM Neuroischemic	0 (0)	5 (4.5)
Non DM neuropathic	4 (3.6)	7 (6.3)
Lymphedema	5 (4.5)	6 (5.4)
Trauma	9 (8.1)	8 (7.2)
Osteomyelitis/infection	6 (5.4)	1 (0.9)
Pressure-related	0 (0)	1 (0.9)
Cancer	0 (0)	2 (1.8)

DM= diabetes mellitus NI=neuroischemic NP=neurotrophic AV=arterial venous VA=venous arterial

FIGURE 4



feeling depressed. One-third of the subjects, 37 clients (33.3 per cent) experienced some disability (28 clients totally disabled, four clients temporarily off work, five clients reduced work or part time). Pain was measured by an 11-point numeric scale, with 0 representing no pain and 10 the worst pain experienced. Pain was a significant problem in 68 clients (61.3 per cent). At the beginning of the study, 12 clients rated their pain at 1-3, 25 clients at 2-4, 17 clients at 7-9, and 14 clients at the highest

level of 10. The average level of pain was reduced from 6.3 at week 0 to 2.8 at week 4 ($p < 0.001$). Seventy per cent of clients were prescribed pain-relieving oral or topical medications. In some clients, pain was improved with the appropriate treatment of the cause and optimal local wound care without adjunctive pain medication.

4. Provide client education and support to increase adherence to treatment of plan.

An open disclosure policy was used during the study. Clients were informed of the assessment findings and proposed treatment plans. They had the opportunity to discuss their perspectives and have input into the final therapeutic decisions.

5. Assess and monitor the wound history and physical characteristics.

All wounds were assessed using the procedures and documentation created by the interprofessional team.

At study initiation, within the leg ulcer population the mean wound length was 3.52 cm and mean wound width 3.39 cm. At the end of the study, the mean length and width were reduced to 2.04 cm (42 per cent decrease) and 1.9 cm (44 per cent decrease) respectively.

At study initiation, within the foot-ulcer population the mean wound length was 2.58 cm and mean wound width 2.24 cm. At the end of the study, the mean length and width were reduced to 1.68 cm (36 per cent reduction) and 1.43 cm (35 per cent reduction) respectively.

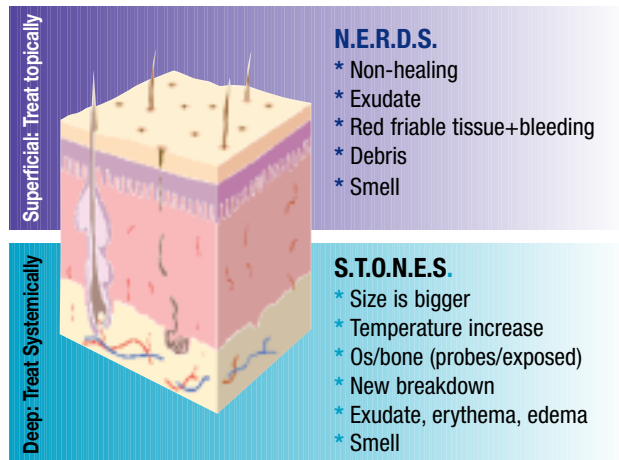
6. Debride healable wounds.

Providing the wound has adequate tissue perfusion, debridement has been shown to improve wound healing in both venous leg ulcers and diabetic foot ulcers. In the current study, 15 clients with leg ulcers (34.9 per cent) and 61 clients with foot ulcers (75.3 per cent) received debridement. Overall, 61 per cent of the subjects received wound debridement more than once. Debridement is discussed more fully by Shannon et al. on page S51 in this supplement.

7. Cleanse wounds with low-toxicity solutions.

In this study either sterile water or saline was the recommended cleansing solution for the healable wounds.

FIGURE 5



Signs of Superficial and Deep Infection: NERDS and STONES²⁰

8. Assess and treat the wound for increased bacterial burden or infection.

To determine whether infection was present in the superficial or deep compartment of the wounds, the clinical diagnostic criteria developed by Sibbald et al.²⁰ was used (NERDS and STONES).

Semi-quantitative swabs were obtained in 97 of the subjects (87.3 per cent).

In Sibbald et al.²⁰ the diagnosis of infection was based on the presence of two or more clinical signs in each wound compartment; however, in this study we observed that it is more accurate to use at least three signs in each to diagnose the presence of wound infection.

Using these diagnostic criteria to determine the presence of wound infection required that 53 of the clients (45.3 per cent) with foot ulcers receive antibiotic treatment. The use of clinical criteria to determine the presence of infection was consistent with the microbiology reports.

Moderate to heavy growth of different bacterial species was indicated in 41 clients (35.0 per cent) with foot ulcers.

In the client group with leg ulcers, 15 clients (19.2 per cent) were diagnosed with infection and treated with systemic antibiotics. To support the validity of the clinical assessment, 18 of the cultures (23.1 per cent) were positive, showing significant bacterial growth.

9. Select an appropriate dressing.

Moist healing was promoted in wounds that were deemed healable. According to the initial assessment, only 30.7 per cent of the wounds were covered with appropriate dressings to maintain moisture balance. Forty per cent of the wounds were too wet, and 29.3 per cent the wounds were too dry, suggesting that the selected dressings may not be the most appropriate. The most commonly employed dressings were those with topical antimicrobial creams and ointments (21 per cent), silver-containing dressings (20 per cent) and moisture-retentive dressings (20 per cent).

Of the clients receiving home-care-based dressing changes, 75 per cent had their dressings changed three times a week or less. However, it was shown that around 15 per cent of the clients studied received daily home care visits for dressing changes.

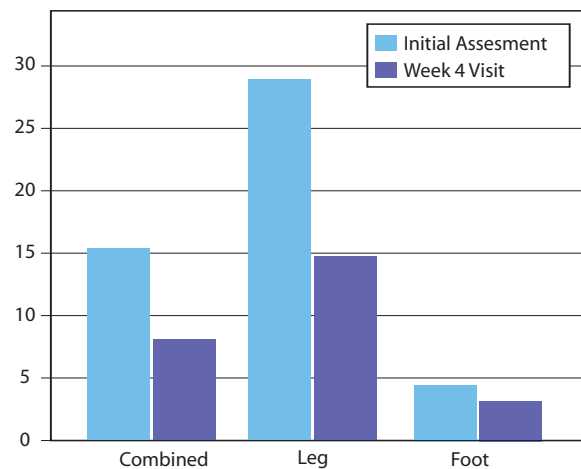
At week four, after reassessment by the interprofessional team, 85 per cent of the clients received home-care nursing care three times or less per week. The mean number of dressing changes was reduced from 3.60 times per week at the beginning of the study to 3.06 at week 4 assessment ($t=3.37$ $p=0.001$). A small number of the wounds were treated with dressings combined with antiseptics (e.g., Betadine or chlorhexidine). Although Betadine and chlorhexidine have some cytotoxicity, their broad-spectrum and prolonged residual action makes them suitable for selected wounds. These agents were used for wounds where healing was not immediately achievable (uncontrolled deep infection) or where bacterial burden was more of a concern than tissue toxicity (maintenance or non-healable wounds).

10. Evaluate the expected rate of wound healing.

It is a general rule of thumb that if a wound is not 30 per cent smaller by week 4, it is not likely to completely heal by week 12.³²

We compared the wound surface areas at week 1 and 4 to determine the relative healing rate (Figure 6). In the leg ulcer group, the surface areas were significantly reduced, from 29.05 cm² to 13.97 cm² at week 4 ($t=2.67$; $p=0.01$). The average healing rate was 3.77 cm² per week and there was an average 51.91 per cent reduction in size. In the foot-ulcer population, the surface areas were reduced from 4.5 cm² to 2.95 cm² at week 4. The average healing rate was 0.39 cm² per week and the average relative reduction in size was 59.36 per cent. This result was significant ($t=2.31$; $p=0.023$).

FIGURE 6



Surface Area Reduction at Initial Visit And Week 4 Comparing Leg Ulcers, Foot Ulcers, and Combined Data.

Leg Ulcers

There were 79 leg ulcers in a total of 44 clients. Most of the leg ulcers were related to venous disease (24 clients, 54.5 per cent), and a small portion of the subjects had lymphedema (six clients or 13.6 per cent) and mixed venous arterial disease (three clients or 6.6 per cent) (Table 5).

Twenty-nine clients (64.4 per cent) with leg ulcers did not receive any compression, and only 11 clients (24.4 per cent) had the high compression that is recommended for the treatment of venous leg ulcers. At week 4, 86.3 per cent of the clients ($n=38$) received compression and 72.7 per cent of them received high compression. As a result, 31 out of 79 (39.24 per cent) leg ulcers were completely healed within the study time frame. More specifically, 67.74 per cent (21) of the venous leg ulcers; six per cent (two) of the mixed venous/arterial ulcers and 16.1 per cent (five) of the lymphedema-related ulcers, achieved complete healing by week 4.

Foot Ulcers

There were 96 foot ulcers in a total of 68 clients. Diabetes was related to the foot ulcers in 63.24 per cent of cases. Of these diabetic foot ulcers, 39.7 per cent were neuropathic, 22.1 per cent were classified as neuroischemic, and 1.5 per cent were not related to either ischemia nor neuropathy. The other diagnoses are documented in Table 6.

TABLE 5 Leg Ulcers Diagnosis Before and After Team Assessment

Primary leg ulcers diagnosis	Number of clients (%) before the study	Number of clients (%) post study
No specific diagnosis	8 (18.6)	0 (0)
DM normal (not NI/NP)	3 (7.0)	1 (2.3)
DM neuroischemic (NI)	0 (0)	2 (4.7)
DM neuropathic (NP)	0 (0)	0 (0)
Arterial	1 (2.3)	1 (2.3)
Venous	16 (37.2)	24 (55.8)
Mixed AV	0 (0)	0 (0)
Mixed VA	0 (0)	3 (7.0)
Non-DM neuroischemic	0 (0)	0 (0)
Non DM neuropathic	0 (0)	0 (0)
Lymphedema	4 (9.3)	6 (14.0)
Trauma	6 (14.0)	3 (7.0)
Osteomyelitis/infection	5 (11.7)	1 (2.3)
Pressure-related	0 (0)	0 (0)
Cancer	0 (0)	2 (4.7)

DM= diabetes mellitus NI=neuroischemic NP=neuropathic AV=arterial venous VA=venous arterial

HbA1c ranged from 0.06 to 0.14 with a mean of 0.08.

According to the RNAO Guidelines,²⁴ it is imperative to identify deformities and institute appropriate downloading measures. In this study, 86.8 per cent of clients with foot ulcers had evidence of foot deformity as a predisposing factor. More importantly, 77.9 per cent of the individuals with foot ulcers required appropriate offloading footwear. Our study revealed that only 11.8 per cent of the clients referred to our project had

TABLE 6 Foot Ulcers Diagnosis Before and After Team Assessment

Primary foot ulcers diagnosis	Number of clients (%) before the study	Number of clients (%) post study
No specific diagnosis	11 (16.2)	0 (0)
DM normal (not NI/NP)	21 (30.9)	1 (1.5)
DM neuroischemic (NI)	3 (4.4)	15 (22.1)
DM neuropathic (NP)	19 (27.9)	27 (39.7)
Arterial	3 (4.4)	1 (1.5)
Venous	2 (2.9)	4 (5.9)
Mixed AV	0 (0)	1 (1.5)
Mixed VA	0 (0)	1 (1.5)
Non-DM neuroischemic	0 (0)	5 (7.4)
Non DM neuropathic	4 (5.9)	7 (10.3)
Lymphedema	1 (1.5)	0 (0)
Trauma	3 (4.4)	5 (7.4)
Osteomyelitis/infection	1 (1.5)	0 (0)
Pressure-related	0 (0)	1 (1.5)
Cancer	0 (0)	0 (0)

appropriate shoes and orthotics ordered and 85.3 per cent of home-care clients did not have any protective footwear. It is highly unlikely that the nursing visits for dressing changes will lead to any improvement or healing in these clients.

To facilitate healing, clients with foot deformity were referred to a chiropodist for further evaluation. Up to 73.5 per cent of the clients with foot ulcers were evaluated by a chiropodist who provided regular ulcer debridement and nail and callus care for these clients.

In this study 60 per cent of the clients received an air cast, orthotics or supportive shoes to provide effective downloading, at no personal cost. Of the total number of foot wounds (96), 24 ulcers healed completely (29.3 per cent). Of the 24 ulcers that healed, 16 (66.67 per cent) were classified as diabetic neurotrophic/neuroischemic ulcers, five (20.83 per cent) were non-diabetic neurotrophic/neuroischemic ulcers, and three (12.5 per cent) were trauma-related.

Discussion

The objective of this study was to examine the issue of leg and foot ulcer diagnosis and treatment in the home-care setting. Our audits showed that many clients receiving home-care services for wound care had not obtained an optimal assessment under the existing system. It proved difficult for family doctors and other health-care professionals, to perform an integrated assessment that can take a long time to complete—but this could have saved many months of home-care services and, hence, dollars. Physicians were rewarded for individual client visits and not for the complete assessment that will facilitate evidence-informed care. The same issue exists for nursing services, which are based on a fee per visit and not for the detailed assessment or advanced expertise required for cost-effective care. For these reasons, most home-care records regarding leg or foot ulcers did not contain specific important information on the etiologies or other complicating factors around these wounds. Home-care co-ordinators were often working with incomplete assessment documentation. Without clear diagnoses of these wounds, it was evident that provision of care was often inappropriate, was variable and was detrimental to wound healing. Some element of treatment and follow-up were instituted, but this did not always follow best evidence protocols and appropriate benchmarks.

To challenge the present paradigm, we introduced and

demonstrated an alternative and viable model to deliver wound care in the community. A formal wound-care protocol and nursing service was built around an initial comprehensive assessment, performed by virtual teams of health-care professionals led by a nurse practitioner or a physician. Both team leaders were able to perform their duties efficiently and effectively.

This model was designed to indicate that a physician and expert nurse can perform the same function within a trans-professional framework with an appropriate tertiary support system. The complexity of these clients demands an in-depth understanding of wound care complemented by a variety of knowledge and competency bases. Both the nurse practitioner and physician were equally capable of improving diagnostic accuracy, optimizing any treatment plan and ultimately enhancing client outcomes.

To address the existing fragmented system, professional collaboration often requires role extension, incorporation of knowledge from other professionals, a blurring of traditional discipline boundaries, and transmitting one's own expertise to other team members. What underpins the success of this "transprofessional model" was the willingness of the team members to not only complement but to replace each other when necessary.³³

The outcome was well-co-ordinated care delivered in a timely fashion. The care model was effective and efficient by appropriating health resources early in the clinical course and reducing the number of ineffective and unnecessary visits. There is much to be gained by a system that supports the delivery of best practice and co-ordination of services.

The development of a comprehensive assessment at the home-care level will improve access to specialized wound-care clinics for those clients with complex, multifactorial chronic wounds requiring tertiary expertise. This would facilitate tertiary wound-care clinics to service home care more efficiently and to assess clients that are benchmarked locally as not responding at the expected rate.

We need to greatly improve the currently documented 10-month average lag period, from identification of wound to the expert-integrated assessment process. The proposed model may eliminate delays caused by the referral of many clients in tertiary centres with less complex wound-care challenges.

Wound-care expertise, the ability to efficiently case-manage clients and the relief of pain and suffering are all required to translate the new approach into day-to-day client care.

Leg Ulcers

Leg ulcers are often painful, chronic and recurrent. In a Canadian study of lower limb ulcers, Graham and his colleagues² reported that nearly 45 per cent of the individuals assessed experienced a prior episode of ulceration.¹ More than 40 per cent were suffering from two or more ulcers at the time of the study. Up to 60 per cent reported having the ulcer for longer than six months and a third for longer than one year. The mainstay of treatment and prevention of venous ulcers is the control of edema and venous hypertension through adequate compression with support stockings. Various randomized controlled trials have demonstrated the importance of high-compression therapy for the healing of venous leg ulcers in two separate meta-analyses. Palfreyman³⁴ reviewed 42 randomized controlled studies, while Bouza³⁵ included 31 trials comparing hydrocolloids, foams, alginates, polyurethane dressings, paraffin gauze and hydrogel for the treatment of venous leg ulcers.²⁸ There is no evidence that one type of dressing when applied beneath compression is superior to others, but the study to match or mismatch the moisture-balance properties of a dressing with the same compression technique has not been published.

The importance of compression is further substantiated by the fact that the recurrence rate of venous ulcers was reduced from 75 per cent to 25 per cent per year with compression hosiery worn consistently after the ulcer has healed.³⁶ Appropriate high-compression therapy should be initiated and used consistently so long as tissue perfusion is deemed adequate.^{37,38} In clients with venous-predominant disease but co-existing arterial compromise, compression therapy needs to be modified to prevent aggravation of the arterial component.

Inappropriate compression bandaging can be harmful, leading to distal gangrene and limb loss in individuals with arterial-predominant disease. It is only through the suggested comprehensive team assessments that a definitive diagnosis can be made.

In this study, significant arterial disease was ruled out by obtaining an ABPI with the help of a hand-held Doppler device that was easy and quick to operate. Subsequently, an increased proportion of clients were prescribed appropriate compression therapy—from 60 per cent at the beginning of the study to 80 per cent at week 4.

Considering surface area reduction as the primary endpoint, it was successfully demonstrated that significant improvement in healing of leg ulcers (48.11 per cent reduction in size) when

in conjunction with appropriate compression. Margolis and his colleagues³² portended that the initial healing rates over the initial four weeks of therapy were correlated with overall healing rates in venous leg ulcers at week 12. Healing rates were carefully calculated by using a mathematical formula (modified Gilman formulation) that accounted for wound areas and perimeters. Regardless of the utility of initial healing rate in predicting overall healing trajectory, surface area in the present study was estimated by multiplying the maximum perpendicular length and width. This technique may be crude and imprecise, especially for large wounds with irregular margins, but it is a convenient and practical way to capture wound-healing in a clinical setting.³⁹ It is equivocal whether the leg ulcers in this study will achieve complete wound closure or will become stalled. Considering that 60 per cent of venous stasis ulcers achieved total healing in 20 weeks,⁴⁰ a longer duration is needed to demonstrate similar outcomes.

Venous leg ulcers are painful, and this issue is not always recognized or acknowledged. Noonan and Burge⁴¹ confirmed that 88 per cent of clients with venous leg ulcers experienced pain. Of these, two-thirds expressed that the pain was severe. Pain was found to be a concern among our study clients, with over 60 per cent of them experiencing pain. Almost half of these clients (45.6 per cent) were afflicted with severe pain (pain ratings of 7 or above) in relation to their ulcers. Significant reduction of pain was accomplished with the use of pharmacological agents. Although not measured in the current study, the teams spent significant amounts of time educating clients and providing emotional support. This may have empowered clients to cope with their pain. Significant pain has now been documented in persons with venous and other leg ulcers. There is a reluctance of family doctors to order appropriate pain-relieving medications due to concerns of client addiction and side effects along with fear of audits from the regulatory authorities for narcotic prescribing. It is very unlikely that a client with significant pain from a chronic wound will become addicted to medication—and the relief of pain may actually accelerate healing. Most side effects are predictable, and appropriate preventative therapy, such as lactulose for constipation, can be instituted.

In our study, 19 of the 44 clients with leg ulcers (44.2 per cent) had coexisting arterial compromise (3), lymphedema (6) and other diagnoses (10). These clients would require treatment outside the best practice guidelines. This observa-

tion speaks to the need for expert assessment within the home-care model.

Foot Ulcers

A foot ulcer may be the first indication of an increased amputation risk. The four cardinal components for healing are adequate perfusion, controlled infection or bacterial damage, pressure downloading and sharp surgical debridement. The wound bed is not optimally prepared without aggressive and regular debridement of any firm eschar or soft slough. A firm eschar serves as a pro-inflammatory stimulus inhibiting healing, while the slough promotes bacterial proliferation. In clients with diabetes and neuropathy treated with correction of the cause but inadequate surgical debridement even with platelet-derived growth factor, only 20 per cent healed, but in clients with correction of the cause and active surgical debridement the rate of healing increased to 83 per cent. The results strongly suggest “wound debridement is a vital adjunct in the care of patients with chronic diabetic (neuropathic) foot ulcers.”⁴² In the present study, the majority of the clients (70 per cent) received regular sharp debridement by the team members.

Chiropody services should be incorporated in the care of foot ulcer clients with loss of protective sensation (neuropathy). Special attention should be given to foot deformity that may require surgical correction if appropriate downloading cannot be accomplished. The cumulative study findings suggest that neuropathy is a significant independent predictor of ulceration.^{13,15,43} McGill’s study⁴⁴ demonstrated that annual ulcer incidence rate was as high as 10 per cent among clients with neuropathy compared with 0.5 per cent in the control group. Neuropathy eliminates the protective function of pain to signal tissue damage, and the motor component leads to muscle atrophy, foot deformity, altered biomechanics, and redistribution of plantar pressure with callus formation. Callus is usually associated with increased local pressure, and debridement should be accompanied by appropriate assessment of downloading and client adherence. The build-up of plantar pressure and trauma is the key variable that usually precedes skin breakdown and perpetuates chronic non-healing ulceration.⁴³ McGill and colleagues⁴⁴ reported that 54 per cent of the ulcers in diabetic clients were related to trauma from footwear and a 55 per cent relative risk reduction in ulceration could be achieved from podiatry care (chiropody). The number

of clients that would benefit from appropriate downloading footwear was overwhelming in this study sample. Pressure redistribution and downloading is critical for wound healing by cushioning, accommodating, realigning, stabilizing, and unloading rigid or deformed structures.⁴⁵ However, these devices are expensive and may require ongoing modification as the structure of the feet changes.

To our frustration, to date downloading footwear is not included in the assisted-device program despite available evidence. Diabetic neurotrophic ulcers may have the potential to heal but fail because downloading is not optimized. In this study, we are fortunate to have the funding to provide footwear and downloading devices. In the future, similar devices need to be available at a price based on the client's ability to pay and their collaboration with the treatment program. We also need a wider spectrum of health-care professionals qualified to order these devices in keeping with newer transprofessional care models. However, treatment must be negotiated with clients to encourage their adherence to wearing devices such as the pneumatic walker for healing of forefoot ulcers. Protective footwear such as deep-toed shoes to accommodate deformity and orthotics for pressure redistribution are required for maintenance. Significant improvement of ulcers in clients with diabetic foot complications can be achieved if best practices are implemented. Sheehan⁴⁶ has demonstrated that diabetic clients who had their ulcers healed by week 12 also had a 53 per cent area reduction from baseline to week 4. In our study the relative wound size in PWD decreased by 59.36 per cent in four weeks, indicating a good healing potential for the foot-ulcer sample.

Critical colonization and wound infection are common in clients with diabetes partly related to their relative immunodeficiency (high glucose levels, other impairment of granulocytic function or inflammatory cell chemotaxis defects). The decision to prescribe antibiotics should be based primarily on clinical evaluation and supplemented by bacterial testing, including culture results.²⁰

System Changes

This project promoted optimal utilization of the health-care system and a shifting of emphasis from the treatment of disease to prevention through assistive devices (compression for leg ulcers and appropriate downloading for foot ulcers with the loss of protective sensation). It is important to create a paradigm where nursing services contracted through CCACs are

not rewarded for frequent and incomplete visits, but instead for improved healing (outcomes). The wound-care expert team needs to train a smaller number of contracted nurses to deliver the wound-care treatment plans with an increased level of clinical expertise. We can no longer have home-care nurses paid at a level below that of other health-care organizations.

There is a need to have a way to supply compression hosiery if clients are unable to purchase the stockings with their own device plans or funds. If this practice is shown to be beneficial, then an assistive device program needs to be negotiated that will provide stockings on a graduated income scale in conjunction with home care.

There is also a need to ensure every client receiving home-care services for neuropathic foot ulcers has appropriate pressure-downloading footwear. Part of this study documented the barriers for clients to obtain footwear and the cost. We need to provide this footwear to all clients who can not obtain appropriate downloading devices. The costs need to be compared to the costs of home-care services that are provided in the baseline audit to demonstrate that the provision of these assistive devices will be cost-effective.

Reiber⁴⁷ was able to demonstrate cost-effectiveness of protective footwear in the Veteran's Administration program in the U.S. As an alternative to an enhanced assistive device program for footwear, this provision may be covered in the home-care envelope, but there is a danger that if this benefit is linked to home care, individuals who are self-sufficient will be registered with home care simply to obtain protective footwear.

Alberta Aids to Daily Living covers support stockings and pressure downloading footwear under appropriate circumstances.⁴⁸

The major components and conclusion from this initiative can be summarized as the need to

1. foster co-ordination across the continuum of services, particularly between the client, family doctor, home-care nurse and CCAC care co-ordinator
2. create a specialized transprofessional team that can perform initial assessments and treatment plans with client-centred concerns incorporated
3. audit and benchmark initial wound characteristics for timely re-assessment and re-audit by appropriate team members
4. modify the assistive devices program to include more timely acquisition and ordering from transprofessional team members including

- deep-toed shoes and orthotics
- specialized pneumatic walkers
- ankle-foot orthoses
- compression stockings for prevention of recurrent of leg ulcers

Another important part of the process is the ongoing monitoring of the outcomes from the health-care provider service and patient satisfaction points of view. The satisfaction levels should take into account co-ordinating teams and care, facilitating initial assessment, benchmarking, accessing timely specialized services where appropriate, and including the client in the process.

Limitations

This study was limited by the lack of a control population separate from the benchmarking of clients to act as their own comparator. The recurrence of leg and foot ulcers is common. The timeframe for this study was relatively short compared with the usual time for ulcers to heal. Client education and empowerment were important components of comprehensive wound care. Clients were constantly reminded of simple measures such as support stockings for life and the use of protective downloading footwear for persons with neurotrophic ulcers. Client education was not evaluated. Quality-of-life issues needed to be addressed in more detail with a wound-specific and general audit tool to measure change and compare relative disability with other disorders.

References

1. Abbade LPF, Lastoria S. Venous ulcer: Epidemiology, pathophysiology, diagnosis and treatment. *International Journal of Dermatology*. 2005;44:449-456.
2. Graham ID, Harrison MB, Friedberg E, Lorimer K, Vandeveld-Coke S. Assessing the population with leg and foot ulcers: Regional planning study. *The Canadian Nurse*. 2000;97(2):18.
3. Friedberg E, Harrison M, Graham I. Current home care expenditures for persons with leg ulcers. *Journal of Wound Care*. 2002;29:186-192.
4. Callam MJ. Epidemiology of varicose veins. *British Journal of Surgery*. 1994;81:167-173.
5. Fowlers FGR, Evans CJ, Lee AJ. Prevalence and risk factors of chronic venous insufficiency. *Angiology*. 2001;52:S5- S6.
6. Woo K, Lo C, Queen D, Rothman A, Woodbury G, Sibbald M, Noseworthy P, Anderson C, Purbhoo D, Sibbald RG. An audit of leg and foot ulcer care in an Ontario CCAC. *Wound Care Canada*. 2007;5(Suppl. 1):S17-S27.
7. Sibbald RG, Orsted HL, Coutts PM, Keast DH. Best practice recommendations for preparing the wound bed: Update 2006. *Wound Care Canada*. 2006;4(1):R6-R18.
8. Moffatt CJ, Franks PJ. Implementation of a leg ulcer strategy. *British Journal of Dermatology*. 2004;151:857-867.
9. Gottrup F, Holstein P, Jorgensen B, Lohmann M, Karlsmar T. A new concept of a multidisciplinary wound healing center and a national expert function of wound healing. *Arch Surg*. 2001;136:765-772.
10. Mekkes JR, Loots MAM, Van Der Wal AC, Bos JD. Causes, investigation and treatment of leg ulceration. *British Journal of Dermatology*. 2003;148:388-401.
11. Olin JW, Beusterien KM, Childs MB, et al. Medical cost of treating venous stasis ulcer: Evidence from a retrospective cohort study. *Vasc. Med*. 1994;4:1-7.
12. www.diabetes.ca/section_main/NewsReleases.asp?ID=65. Accessed January 31, 2007.
13. Brem H, Sheehan P, Rosenberg H, Schneider JS, Boulton AJ. Evidence-based protocol for diabetic foot ulcers. *Journal of Plastic Reconstructive Surgery*. 2006;117:193S-209S.
14. Singh N, Armstrong DG, Lipsky BA. Preventing foot ulcers in clients with diabetes. *JAMA*. 2005; 293:217.
15. Abbott C, Vileikyte L, Williamson S, Carrington A, Boulton A. Multicenter study of the incidence of and predictive risk factors for diabetic neuropathic foot ulceration. *Diabetes Care*. 1998;21:1071-5.
16. O'Brien Judith A, Patrick Amanda R, Caro J. Cost of managing complications resulting from type 2 diabetes mellitus in Canada. *BMC Health Services Research*. 2003;3:7.
17. Krentz AJ, Acheson P, Basu A, Kilvert A, Wright AD, Natrass M. Morbidity and mortality associated with diabetic foot disease: A 12-month prospective survey of hospital admissions in a single UK center. *The Foot*. 1997;7(3):144-147.
18. Browne AC, Sibbald RG. The diabetic neuropathic ulcer: An overview. *Ostomy/ Wound Management*. 1999;45(11)(Suppl. 1A):6S-20S.
19. Inlow S, Orsted H, Sibbald RG. Best practices for the prevention, diagnosis, and treatment of diabetic foot ulcers. *Ostomy/Wound Management*. 2000;46(11):55-68; quiz 70-1.
20. Sibbald RG, Woo K, Ayello EA. Increased bacterial burden and infection: The story of NERDS and STONES. *Advances in Skin and Wound Care*. 2006;19(8):447-461.
21. Wu SC, Armstrong DG. The role of activity, adherence, and off-

- loading on the healing of diabetic foot wounds. *Plast Reconstr Surg*. 2006;117(Suppl.):248S-253S.
22. Armstrong DG, Lavery LA, Wu S, Boulton AJ. Evaluation of removable and irremovable cast walkers in the healing of diabetic foot wounds: A randomized controlled trial. *Diabetes Care*. 2005;28:554.
 23. Registered Nurses' Association of Ontario (RNAO). Nursing Best Practice Guideline: Assessment and Management of Venous Leg Ulcers. Toronto: RNAO. 2004.
 24. ——. Nursing Best Practice Guideline: Assessment and Management of Foot ulcers for People with Diabetes. Toronto: RNAO. 2005.
 25. Canadian Association of Wound Care. Prevention and treatment of venous leg ulcers. Available online at www.cawc.net/open/library/clinical/QRG2006E.pdf. Accessed January 31, 2007.
 26. ——. Prevention, diagnosis and treatment of diabetic foot ulcers. Available online at www.cawc.net/open/library/clinical/QRG2006E.pdf. Accessed January 31, 2007.
 27. Sibbald RG, Orsted HL, Schultz GS, Coutts P, Keast DH. Preparing the wound bed 2003: Focus on infection and inflammation. *Ostomy/Wound Management*. 2003;49(11):24-51.
 28. Sibbald RG, Williamson D, Orsted HL, Campbell K, Keast D, Krasner D, Sibbald D. Preparing the wound bed: Debridement, bacterial balance and moisture balance. *Ostomy/Wound Management*. 2000;46(11):14-35.
 29. Kirshen C, Woo K, Ayello EA, Sibbald RG. Debridement: A vital component of wound bed preparation. *Advances in Skin and Wound Care*. 2006;19(9):506-517.
 30. Okan D, Woo K, Ayello EA, Sibbald RG. The role of moisture balance in wound healing. *Advances in Skin and Wound Care*. 2007;20(1):39-52.
 31. Woo K, Ayello EA, Sibbald RG. The edge effect: Current therapeutic options to advance the wound edge. *Advances in Skin and Wound Care*. 2007;20(2):99-117.
 32. Margolis DJ, Gross EA, Wood CR, Lazarus GS. Planimetric rate of healing in venous ulcers of the leg treated with pressure bandage and hydrocolloid dressing. *J Am Acad Dermatol*. 1993;28:418-21.
 33. Gottrup F. Optimizing wound treatment through health care structuring and professional education. *Wound Repair and Regeneration*. 2004;12(2):129-133.
 34. Palfreyman SJ, Nelson EA, Lochiel R, Michaels JA. Dressings for healing venous leg ulcers. The Cochrane Collaboration. 2006;4(3).
 35. Bouza C, Munoz A, Amate, JM. Efficacy of modern dressings in the treatment of leg ulcers: A systematic review. *Wound Rep Reg*. 2005;13:218-229.
 36. Sibbald RG, Williamson D, Falanga V, Cherry GW. Venous leg ulcers. In Krasner DL, Rodeheaver GT and Sibbald RG, (eds.). *Chronic Wound Care: A Clinical Source Book for Healthcare Professionals*, Third Edition. Wayne, PA: HMP Communications. 2001.
 37. Patel NP, Labropoulos N, Pappas PJ. Current management of venous ulceration. *Plast Reconstr Surg*. 2006;117(Suppl.):254S-260S.
 38. Nelson EA, Harper DR, Prescott RJ, Gibson B, Brown D, Ruckley CV. Prevention of recurrence of venous ulceration: Randomized controlled trial of class 2 and class 3 elastic compression. *J Vasc Surg*. 2006;44:803-808.
 49. Flanagan M. Improving accuracy of wound measurement in clinical practice. *Ostomy/Wound Management*. 2003;49(10):28-40.
 40. Steed DL, Hill DP, Woodske ME, Payne WG, Robson MC. Wound-healing trajectories as outcome measures of venous stasis ulcer treatment. *Int Wound J*. 2006;3:40-47.
 41. Noonan L, Burge SM. Venous leg ulcers: Is pain a problem? *Phlebology*. 1998;13:14-19.
 42. Steed DL, Conohoe D, Webster MC, Lindsley L. Effect of extensive debridement and treatment on the healing of diabetic foot ulcers. Diabetic Ulcer Study Group. *J Am Surg*. 1996;183:61-4.
 43. Bus SA, Maas M, de Lange A, Michels RPJ, Levi M. Elevated plantar pressures in neuropathic diabetic patients with claw/hammer toe deformity. *Journal of Biomechanics*. 2005;38:1918-1925.
 44. McGill M, Molyneaux L, Yue DK. Which diabetic patients should receive podiatry care? An objective analysis. *Intern Med J*. 2005;35:451-456.
 45. Plank J, Haas W, Rakovac E, Gorzer E, Romana S, Siebenhoffer A, Pieber T. Evaluation of the impact of chiroprapist care in the secondary prevention of foot ulceration in diabetic subjects. *Diabetes Care*. 2003;26(6):1691-1695.
 46. Sheehan P, Jones P, Caselli A, Giurini JM, Veves A. Percent change in the wound care of diabetic foot ulcers over a 4-week period is a robust predictor of complete healing in a 12-week prospective trial. *Diabetes Care*. 2003;26:1879-1882.
 47. Reiber GE, Smith DG, Wallace C, Sullivan K, Hayes S, Vath C, Maciejewski ML, Yu O, Heagerty PJ, LeMaster J. Effect of therapeutic footwear on foot reulceration in patients with diabetes. *JAMA*. 2002; 287(19):2552-2558.
 48. Queen D, Virani T, Coutts P, Orsted HL, Sibbald RG. Best practice: Development, implementation and current status across Canada. *Wound Care Canada*. 2007;5(Suppl. 1):S28-S33, S50.

A Client's Perspective in the Manage

Katherine McAuliffe, RN

The provincially funded Primary Care Transition Project looking at lower extremity ulcers allowed the capture of clients' perspectives regarding the management of their ulcers.

The role of project co-ordinator in this study was to identify potential clients with leg ulcers, contact them to explain the study and obtain verbal consent to have their information released to the researchers. This required about 10 to 20 minutes on the phone. Most clients were more than happy to provide their stories, which provide an important insight on the significant impact a leg or foot ulcer has on individual clients and their families.

Care of the ulcer becomes the client's job and life focus.

Toronto Community Care Access Centre Stories

Examples of clients with healed ulcers and not requiring help from the project

1. An 80-year-old male with below-the-knee ulcer, now healed. His comments included, "The home nurse was wonderful. I could not do the dressing even though I tried and was told I had to by someone."

2. An 86-year-old male with a foot ulcer, healed after 10 months. His comments included, "It took 10 months to heal. I cried today as I wore a shoe for the first time. I can do things now. I am so grateful to the wonderful nurses. Tell the study team how nice and good the nurses were. I can walk with two shoes on now."

3. A 76-year-old female with a below-the-knee ulcer, healed after four months. The client stated, "I am grateful for the good nursing care ... I was surprised that the ulcer took so long to heal."

Examples of clients who refused to participate in the project

1. A 78-year-old male with plantar and toe ulcers. He stated, "I can look after this myself. I tell the nurse what to do. I am not having another person telling me what to do. I don't want the study."

2. A 72-year-old female with lower leg ulcers for three years. She expressed her concern that health-care providers did not know how to look after her wound and that she had already picked up infections during her hospital stay. She

commented, "No one knows anything and I already picked up an infection at a hospital. I do not want to expose myself to another infection. I am fed up with this subject, and no one knows anything about this."

3. A male client with a foot ulcer who is assessed regularly at his local hospital. He indicated he only wanted his health-care providers in hospital giving dressing orders for his foot ulcer. He commented, "No, I only want people from hospital looking and making the orders." He was very firm and did not want to discuss the study.

4. A male with a foot ulcer did not want to participate as too many people were already involved in his care. His wife is also receiving home care. Client stated, "Too many people visiting the home every day. I have no time alone."

5. An 86-year-old male with a shin ulcer. Client's phone number is his landlord's. Landlord informs me client has no phone and is out daily and misses nurse visits.

6. A 51-year-old female with chronic edema of legs, cellulitis, wound and home bound. Client informed me, "I do not want any change, I know what I need, I don't want shoes, I want the same treatment." This client was critical of all her nurses (on CCAC since 2003).

7. An 87-year-old male with venous leg ulcers. Relative declined client's participation. Relative states, "We are waiting until October for the dermatologist, who will tell the nurse what to do." (Family practice referred client in August to a dermatologist.)

8. An 85-year-old female with painful, non-healing ulcers. She stated, "No I will not participate, as I finally have wound care that works. I make the nurses follow the wound clinic orders. In the past I had different nurses who all had different theories and did different dressings. I am glad I went to the wound clinic and got orders that are now healing the wound."

Examples of clients who agreed to participate in the study

1. A 42-year-old male with a plantar ulcer. He said, "I want this to heal. I can't do anything and it's frustrating."

ment of Lower Extremity Ulcers

2. An 81-year-old male with a heel ulcer. He said, "Can they come today? It's infected and I am very worried. I want this to get better, I will do anything. I am on IV antibiotics."

3. A 94-year-old female with an ankle ulcer. Detailed discussion with relative revealed that the CCAC case manager told her that the client has had nursing three times a week for a long time period. They can only have nursing once a week now. Relative is worried that healing of the wound may be affected by only once-a-week nursing visits. The nurse told them the client needs three visits a week but that the CCAC case manager is only providing one visit a week. Action: Recommend joint home visit with CCAC case manager and nurse to discuss treatment plan.

4. An 89-year-old female with ulcers on shin and ankle. Client cried through the entire discussion. Client stated, "I can't sleep from the pain, and I am suffering." Client explained that she went to an ER for treatment and admission but they didn't admit her to hospital or help with her pain and ulcer care. She said "There is no one to help me. Can't walk. Can't do anything. I can't get out." She asked for wound-study people to come today. She was upset.

Action: Recommended the following treatment plan:

- a. Suggested the CCAC case manager do a home visit.
- b. Referral for physiotherapy with a request to visit as soon as possible.
- c. Recommended personal support worker (PSW) hours be reassessed and increased temporarily during this acute episode.
- d. Add pain assessment to the in-home nursing role.

5. A 91-year-old male with an ankle ulcer and reduced hearing. Wife spoke with me on the phone. She obtained his consent to participate. She stated, "He needs to get better as he is unable to walk without someone with him due to the ulcer."

Action: Assessed whether physiotherapy (PT) and occupational therapy (OT) referral would be appropriate and referral offered.

6. A 73-year-old male with ulcers on toes. He was very interested in participating in the study as he wants to get better. Client stated, "I want to try something new due to daily

nursing visits. I never know the time of the nursing visits and I have to stay home all day." He can only go out for doctor's appointments.

Action: Suggested he request an a.m. or p.m. time block for consistency of care and so he can attend to his activities of daily living.

7. A 66-year-old male with an ulcer on the ball of his foot. Previous amputation of some of his toes on this foot and the other leg. The client was very interested in the study as he wanted another opinion. He wants to become independent. He also wanted access to the orthotics because he cannot afford them as they are too expensive. He also does not want another amputation. Detailed discussion of the medical journey that is his life.

8. An 86-year-old male with a toe ulcer. Client agreed to participate in the study because his ulcer was painful and slow in healing. He said, "I cannot do anything, can't get out, and the pain medication not working. I need help now."

Action:

- a. Discussed the need for and referral offered for PT or OT for comfort, mobility and activities of daily living (ADL).
- b. Recommended he talk about a referral to a pain treatment clinic or specialist with his doctor, who can make the referral.

9. A 52-year-old male with a foot ulcer and previous toe amputation. Client very interested as he cannot go out nor do anything due to the ulcers. Client can't afford the orthotics.

10. A 69-year-old male with very painful venous leg ulcers and numerous other medical issues. He said, "I wake up at four in the morning due to leg ulcer pain. My life is about the pain."

11. A 71-year-old male with lower leg ulcers. He was told by his doctor it had to be amputated and he does not want to have the amputation. He wants his leg. He also talked of financial issues in obtaining the right shoes. He agreed to the study as he really wants this study to keep his leg from amputation.

Action:

- a. Add on social worker.
- b. Reassured him that the study team would have good communication with him, his nurses and all his doctors.

12. A 78-year-old male with amputation of one leg and an eight-month unhealed ulcer on the remaining leg. Client states "My leg/foot does not work." Client complimented his CCAC services of PSW, OT and nursing. Client thanked me three times for inviting him to participate in the wound care study.

The Project Co-ordinator's Voice for the Clients

Clients with wounds have the same adjustments and impact to their lives as clients with other chronic illnesses such as stroke, chronic obstructive pulmonary disease (COPD), Parkinson's disease and diabetes. It appears that these other chronic illnesses are viewed with a different perspective by the public and medical staff because of their visibility and high profile (due to high-profile fundraising events, advertisements for products and role in medical TV shows).

Clients with lower leg ulcers have to make profound changes in their lives. The ulcer has an impact on all of their daily activities of life, and often increases the effort, energy and time needed to attend to their wound. Added to this are issues of pain, wounds with drainage and wounds with odours. Mobility may be affected; as a result, clients are often housebound. Clients are very busy with nursing visits and doctor's appointments. Attending medical appointments is sometimes very difficult and often the only reason they leave their homes. Transportation arrangements and payment are issues for many clients. The resulting social isolation further impacts quality of life.

Financial concerns are present for the younger clients who cannot work full time or part time due to the ulcer and who have no benefit plan. There is also concern from people

about the cost of specialized footwear (orthotics). Many people cannot afford these shoes. Clients are often concerned with the cost of travel to medical appointments and tests. Financial problems may also arise if additional care is required.

Clients are worried about wound healing, angry or sad about physical limitations, annoyed at waiting for diagnostic tests and consultations, and frustrated about having to see numerous medical/nursing staff. Lack of privacy is a huge issue. Clients verbalize how upset they are about the change in their lives. Many clients fear amputation. All the clients said they wanted to get better and have their ulcers heal.

Clients with multiple medical problems also consider their ulcers to be the cause of the changes in their life. They seem to have adapted or adjusted to the other medical conditions and their resultant effects but feel the ulcers are the cause of their impediments.

Discussions with these clients clearly show that they are knowledgeable about their impact on the system, particularly their cost to the system as they are informed of this by people who look after them. They are at a loss of how to change this. Some told me they cannot "learn the dressings." Many cannot afford the supplies. Many want care from a nurse. There is a fear of infection or setback without the nurse visits (to assess and monitor).

This Primary Care Reform Project was important to the clients of the Toronto Community Care Access Centre, who gained numerous significant benefits from their participation. The study will contribute to excellence in case management. The staff of the Toronto Community Care Access Centre are gratefully acknowledged for their generous involvement, which contributed significantly to the success of completing the assessment of these clients. Acknowledgement is also given to the many clients who were willing to share their stories to help themselves and others receive appropriate care.

Best Practice

references continued from page S33

- care team. *Advances in Wound Care*. 1998;11:85-8.
36. Grinspun, D, Virani, T, Bajnok I. Nursing Best Practice Guidelines: RNAO Project. *Hospital Quarterly*. Winter 2001/2002.
37. Grinspun D. Healthy workplaces: The case for shared clinical

decision making and increased full-time employment. *Healthcare Papers*. 2007;7(Sp):85-91.

38. Nelligan P, Grinspun D, Jonas-Simpson C, McConnell H, Peter E, Pilkington B, Balfour J, Connolly L, Lefebvre N, Reid-Haughian C, Sherry K. Client-centred care: Making the ideal real. *Hospital Quarterly*. 2002;5(4):70-6.

The Importance of Sharp Debridement in the Community Care of Foot Ulcer Care: A Cost-benefit Evaluation

Ron Shannon, MPH; Connie Harris, RN, ET; Cathy Harley, RN; Kathryn Kozell, RN, ET; Kevin Woo, RN, MSc, PhD(c), ACNP, GNC(c); Afsaneh Alavi, MD; Miriam Boutros, DCh, IIWCC; Laura Lee Kozody, BSc, DCh; R. Gary Sibbald, BSc, MD, FRCPC (Med) (Derm), ABIM, DABD, MEd

The use of debridement as a standard procedure for proper wound management is based largely on expert consensus as opposed to randomized clinical trials. However, some clinical trial evidence for debridement does exist. One landmark trial supporting its use in chronic wounds was published in 1996 by Steed et al.¹ In this study, which was part of the data that led to the approval of rhPDGF (Recombinant Human Platelet-Derived Growth Factor) for diabetic neuropathic foot ulcers, higher healing rates were observed in those treatment centres that performed more frequent surgical debridement of diabetic foot ulcers compared with other centres that did not debride as often. Other data from clinical series exist. For example, in one study, 26 out of 30 refractory ulcer clients showed successful healing following two-stage surgical debridement.²

However, given the theoretical advantages of debridement based upon proposed mechanisms of chronicity of wounds, more and better data are needed to document the efficacy of debridement. Debridement for most wound types is considered the standard of care, and this standard should be based upon well-performed randomized trials. Given the widespread acceptance of debridement and potential theoretical benefits, the utility of debridement should be proven in a more rigorous fashion.

Objective

To evaluate the cost-benefit of sharp debridement in community foot-ulcer care to attain a clean wound bed.

Methods

An analysis of variance was used to determine differences in debridement frequency between sharp debridement in the Primary Care Reform Project (PCRPP),³ sharp debridement from a community enterostomal therapist (ET) nurse⁴ and forced irrigation using clinical data from the Ontario Community Nursing Agency Chart Audit Study (OCCAS).

Primary cost data were extracted from the OCCAS study

and the Ontario Schedule of Benefits. Secondary costs of dressing materials and debridement supplies were estimated from wholesale pricing at community vendor Web sites and direct from the clinician performing the debridement procedures.

All direct medical costs, from the perspective of the Ontario health system, were taken into account through frequency of visits to the client for debridement of necrotic tissue in foot ulcers.

Results

A wound specialist in the PCRPP study averaged two visits for sharp debridement per ulcer. An ET working in the community averaged five visits per ulcer to attain a clean wound bed while working under the constraints of the other nurses who predominate the care with many more visits. Visiting nurses in the OCCAS project required an average of 29 visits per ulcer to accomplish a clean wound bed with forced irrigation.

The average cost per-ulcer to achieve a clean wound bed is \$304, \$445 and \$1,820 for PCRPP, ET and OCCAS respectively. The probability of healing a lower extremity foot ulcer in the community either with an ET or OCCAS is the same, but at a lower cost with sharp debridement by an ET than forced irrigation by a visiting nurse (\$1,516 difference between OCCAS vs. PCRPP results, and \$1,375 difference between OCCAS and ET nurse results).

A clear distinction in healing times and nurse visits between care by an ET nurse alone and visiting nurses is currently under investigation by the Canadian Association of Enterostomal Therapy (CAET).⁵

The PCRPP study shows a clear advantage in cost and healing when a transprofessional wound-care team has control of the wound management.

Discussion

In this evaluation, sharp debridement was used routinely in the removal of devitalized tissue in co-ordination with implementation of best practices.

Healing was significantly faster in the PCRPP study than in

similar clients and foot ulcers audited in the Ontario community. Data from an ET nurse chart audit where sharp debridement was used routinely were a comparator to the PCRP study. The probability of healing after sharp debridement by an ET nurse was significantly less in the community than the PCRP healing outcomes. This was due primarily to confounding factors where the care co-ordination with other visiting nurse agencies and their respective nursing policies often conflict with best practice.

A clear distinction in healing outcomes between ET driven care only and community nursing visits only is under investigation by the CAET. Results of that study may also validate best practices and the use of sharp debridement by a wound specialist.⁵

Cost Impactors

Community nurses routinely use forced irrigation to remove devitalized tissue in foot wounds because they are not certified to perform sharp debridement. Frequency of this technique is significantly more than sharp debridement in the community. Sharp debridement removes dead tissue quickly. Frequent debridement is important, but not at the expense of extra nursing visits. The extended cost of nursing visits required to attain a clean wound bed does not warrant its routine use, especially when the probability of healing is less than a quicker method.

Cost-benefit Considerations

Given finite resources, efficient resource allocation is necessary to maximize the health-benefit-per-dollar spent for the client population with diabetic foot wounds. In this evaluation, the cost of direct medical resources to remove devitalized tissue in the shortest time possible was evaluated. The central tenet of healing for any wound is quick, appropriate debridement of dead tissue to reduce the prevalence of chronic inflammatory byproducts that delay healing.

Forced irrigation by OCCAS visiting nurses to remove dead tissue from the wound bed requires significantly more client visits and materials than sharp debridement by an ET or wound specialist in the PCRP study. Sharp debridement performed by an ET nurse in the community has merit for cost-savings, but in this evaluation healing results were confounded by the incremental presence of visiting nurses providing care. A study underway by the CAET is targeted to determine the cost-effec-

tiveness of the ET nurse alone in guiding care for the wound client. Preliminary results from the CAET project demonstrate a significant cost saving and healing efficacy when the ET nurse is providing care alone to the client.⁶

Conclusion

This study showed a clear difference in costs when sharp debridement is part of a best-practice treatment scenario for foot ulcers. When forced irrigation is the only method of debridement in the community, an additional cost of approximately \$1,516 is added to direct medical expenses for each ulcer, compared with sharp debridement used in a best practice scenario by a transprofessional wound team. When an ET nurse is utilized in the community to remove dead tissue there is a cost saving of \$1,375 per ulcer compared with the OCCAS model. The major portion of costs for forced irrigation is found in added nurse visits and supplies used to remove the dead tissue.

Healing results from the PCRP cost-utility study show a significant difference in healing trajectories between the OCCAS and the PCRP. The cost-utility study could not determine the impact that sharp debridement has on healing outcomes. But from a payor perspective, sharp debridement should be considered the method of choice in the OCCAS and performed by a wound specialist as it provides a cost benefit through reduction of direct medical resources needed to achieve a clean wound bed in a timely manner. Future studies are needed to link sharp debridement to healing outcomes.

References

1. Steed DL, Donohoe D, Webster MW, Lindsley L. Effect of extensive debridement and treatment on the healing of diabetic foot ulcers. Diabetic Ulcer Study Group. *J Am Coll Surg*. 1996;183:61-4.
2. Kumagai SG, Mahoney CR, Fitzgibbons TC, et al. Treatment of diabetic (neuropathic) foot ulcers with two stage debridement and closure. *Foot Ankle Int*. 1998;19(3):160-5.
3. Woo K, Alavi A, Botros M, et al. A transprofessional comprehensive assessment model for persons with lower extremity leg and foot ulcers. *Wound Care Canada*. 2007;5(Suppl 1):S34-S47.
4. ET NOW. Chart Audit of Foot Ulcers in the Community. [Unpublished].
5. Shannon R, Harris C. CAET Cost-Effectiveness Project: Community audit of wound patient charts. Final results to be published in 2007.
6. ——. CAET Cost-Effectiveness Project: Preliminary results presented at the CAET National Conference. May 2006.

A Cost-utility Evaluation of Best Practice Implementation of Leg and Foot Ulcer Care in the Ontario Community

Ronald J. Shannon, MPH

Comprehensive wound management using best practices is an integration into practice of evidence-based care that includes adequate wound and client assessment, optimizing the local wound healing environment and treating the cause for each chronic wound type (e.g., pressure redistribution for neurotrophic foot ulcers and compression for venous ulcers).^{1,2} Inherent in this process is education and communication between community partners and wound specialists to maximize medical outcomes (mortality, healing and quality of life) and to minimize the economic consequences. There is an abundance of supporting literature promoting these best practices for chronic wounds.^{1,2,3,4,5,6,7}

Epidemiology

In Canada, there is a paucity of published data on the epidemiology of lower extremity ulcers or their cost to the health-care system. There are no reliable means of identifying this population through existing community or medical databases (e.g., in Ontario, there is no unique physician billing code for leg or diabetic foot ulcer care). With this in mind, estimates were attained from published studies^{8,9} and the Canadian Diabetes Association.¹⁰

A regional prevalence and profile study in Ontario identified 263 people with leg ulcers for a rate of 2.0 per 1,000 people >25 years of age.⁹ There are approximately 12 million people in Ontario. Approximately 68 per cent of the population is older than 25. This means approximately 15,000 people have a venous ulcer in the province at any one point in time.

The cost of leg ulcer care is considerable, being reported in both the U.K. and France to account for two per cent of their total national health budgets. In Canada, the impact is only now being recognized due to the pressure on home-care caseloads resulting from hospital downsizing, nursing shortages, and growing numbers of complex health populations. In one Ontario study, the care for fewer than 200 community leg ulcer cases cost in excess of \$1.5 million for supplies and nursing visits.¹¹

The Canadian Diabetes Association estimates there are about two million people in Canada with diabetes (almost seven per cent of the population).¹⁰ About 10 to 15 per cent

of people with diabetes develop a foot wound in their lifetimes because of underlying peripheral neuropathy and peripheral vascular disease.¹⁰ This equals between 70,000 and 105,000 people in Ontario, based on the diabetes prevalence estimate of 700,000 people.

Without early treatment, a foot ulcer may become infected and persistent (chronic).¹⁰ Chronic wounds are difficult to heal, despite medical and nursing care, and may lead to impaired quality of life and functioning, amputation, or even death.^{12,13,14} Diabetic foot ulcers precede approximately 85 per cent of all amputations in clients with diabetes and account for more hospital days than all other diabetic complications combined.¹⁵

In Canada, the estimated direct and indirect costs of an amputation are between \$35,000 and \$50,000.¹⁶

Health Economic Objectives

To determine an estimate of the annual cost to the Ontario Ministry of Health and the cost-effectiveness of best practice implementation of leg and foot ulcer care in the Ontario community.

The current project was undertaken to determine if a comprehensive approach, compared with current practices in the community, provides clinical benefits and a reduction in costs to warrant a change in policy at the community level. Two types of lower extremity ulcers are investigated in this analysis: venous leg ulcers and diabetic foot ulcers.

Methods

The expected costs per client after best practice implementation were compared with expected costs per client after standard community care using clinical data from the Primary Care Reform Project (PCRP) and Ontario Community Nursing Agency Chart Audit Study (OCCAS).

Primary cost data were used from the OCCAS study, the Ontario Case Costing Project and the Ontario Schedule of Benefits. Secondary costs of dressing materials and devices were estimated from wholesale pricing at community vendor Web sites.

A Markov cost-utility model was used to assess the incremental direct medical costs to produce incremental benefits in quality of life for each leg and foot ulcer client.^{17,18,19,20}

The clinical outcomes measured included ulcer healing, infection (mild, moderate and severe), lower extremity amputation and quality of life expressed in utilities of physical functioning, social interaction and general well-being. All direct medical costs from the perspective of the Ontario health system were taken into account for the treatment of leg and foot ulcers.

Results

Study Population

Lower extremity ulcer client populations were equivalent with regard to age and sex upon presentation. The primary diagnosis for all ulcers in the study was “chronic wound,” as they did not satisfy expectations for a normal healing process. Chronic wounds occur in individuals with underlying diseases of various types whose medical conditions compromise the body's ability to repair injured tissue on its own. Ulcer size was used to risk adjust at baseline. The majority of the ulcers had an area that was less than or equal to 16 cm². These parameters were used as primary determinants of healing and costs.

Healing

In this study, significant differences in the healing of lower extremity ulcers was seen between a best practice-based approach and standard community care.

Healing trajectories were calculated for each cohort of clients, determining the probability of healing over a one-year period. The best practices cohort showed significantly faster healing over an initial four-week period when compared with standard community care.

The probability of healing a diabetic foot ulcer was approximately 50 per cent at four weeks compared to 12 per cent with community care. Approximately 42 per cent of the leg ulcers were healed at four weeks using a best practice-based approach when compared with only 26 per cent with the standard approach. Surrogate healing trajectories were then used from best practice clinical studies to estimate a one-year probability of healing for comprehensive care. Actual data from a one-year retrospective review of client charts in the community allowed calculation of healing probabilities for a year.²¹

Cost Impactors

Healing trajectories determine the quantity of direct medical resources consumed over a one-year period. An average of four nursing visits per week was recorded in the community, with a heavy concentration of registered nurses (RN) and registered practical nurses (RPN) giving care from family practitioner advice. Occasionally, an enterostomal therapy nurse was utilized.

Wound-dressing materials recommended by family physicians did not necessarily follow best practice guidelines. Use of a pressure reduction shoe or insole for foot ulcers was documented approximately 51 per cent of the time. Forced irrigation was the predominant choice of debridement, although sharp debridement from a certified specialist was done on occasion.

The best practices approach included a weekly visit by a wound specialist. A chiropodist was also called in on occasion to treat difficult symptoms of the wound. The choice of appropriate wound dressing was only determined after effective wound assessment. Sharp debridement was used as the primary means of removing devitalized tissue. Orthotics and air casts were used approximately 80 per cent of the time for foot ulcers. Compression therapy was standard for best practice of leg ulcers with a venous predominant component.

Costs of Wound Complications

Deep infections in lower extremity wounds will occur approximately five per cent of the time and are related to healing efficiency.^{22,23} Amputations occur approximately 1.5 per cent of the time for diabetic ulcers and 0.4 per cent in leg ulcers.^{12,24} In the cost-utility model, best practices reduced the probability of infections and amputations between 33 per cent and 58 per cent for diabetic and venous ulcers respectively when compared with standard community care. This translated into significant savings in cost and quality of life.

Cost Expectations

The total expected annual cost per client was \$4,868 for diabetic foot ulcers and \$5,554 for venous leg ulcers treated under standard community care. However, the total expected annual cost per client was \$1,645 for diabetic foot ulcers and \$1,492 for venous leg ulcers when treated with best

practice. The incremental cost of standard community care (\$3,223 for foot and \$4,062 for leg) corresponds to an additional \$4,171 and \$4,483 cost to the Ontario Ministry of Health per client for foot and leg treatment respectively to achieve the same level of health benefits (ulcer-free days, reduced infections and reduced lower extremity amputations) as best practice care.

A budget-impact analysis revealed that with the increased implementation of best practices, the number of infections and amputations were reduced, and the overall costs were lower than standard community care, when projected to the total Ontario foot and leg ulcer population.

Budget Impact for the Ontario Ministry of Health

Annual costs of lower extremity ulcer care in the community are estimated to be \$511 million based on a prevalence of 90,000 diabetic foot ulcer clients and 15,000 leg ulcer clients. After implementation of best practices, estimated savings of \$338 million in direct medical costs are possible. These savings result from faster healing and a reduction in infections and amputations.

Approximately \$24 million alone will be saved from hospitalizations as a result of infection and amputation. The remainder will result from reduced nursing visits and better use of medical supplies in the care of each client.

Discussion

It is clear from the “real-world” clinical evidence that best practices for the treatment of lower extremity wounds are needed in the Ontario community. This study found significant nursing resources being used in the community that were not under the guidance of best practices or a wound specialist.

Wound specialists have a minimal role in the management of the community client with a chronic wound because previous data have not addressed this issue. The current PCRIP identified demonstrated improved outcomes with an initial wound-specialist assessment. Healing outcomes and client quality of life are suffering because of the lack of formalized involvement of the wound-care expert in most community-care models.

Based on the results of this economic evaluation, the Ontario Ministry of Health and Long-Term Care should focus on paying for clinical wound expertise as a guiding

resource in lower extremity wound management. The cost-offset for utilizing wound specialists routinely in care is warranted through the savings in episodes of severe infection and amputation alone.

It was also noted in this study that pressure-reduction devices, such as orthotics for diabetic foot ulcers, are essential for healing using a best practices approach and are important in client outcomes. Reimbursement for orthotics may also be offset in the savings achieved per client through the more appropriate use, and therefore reduction in use, of currently reimbursed medical supplies.

Conclusion

In Ontario, the clinical and quality-of-life benefits from foot and leg ulcer best practice implementation were associated with a favourable cost-effectiveness ratio. Best practice implementation costs 66 per cent less than standard community care, while producing a 33 per cent to 57 per cent reduction in infections and lower extremity amputations, increased healing, and a greater capacity for improved quality of life.

References

1. Canadian Association of Wound Care. *Wound Care Canada*. Special Issue: Best Practice Recommendations. 2006;4(1).
2. Irion G. *Comprehensive Wound Management*. Thorofare, NJ: SLACK Incorporated. 2002.
3. Harrison MB, Graham ID, Lorimer, K, Friedberg E, Pierscianowski T, Brandys T. Leg-ulcer care in the community, before and after implementation of an evidence-based service. *CMAJ*. 2005;172(11):1447-1452.
4. Delmas L. Best practice in the assessment and management of diabetic foot ulcers. *Rehabil Nurs*. 2006;31(6):228-34.
5. Ayello AE, Baranoski S, Salati DS. Best practices in wound care prevention and treatment. *Nurs Manage*. 2006;37(9):42-8.
6. Bolton L, McNees P, van Rijswijk L, de Leon J, Lyder C, Kobza L, Edman K, Scheurich A, Shannon R, Toth M, Wound Outcomes Study Group. Wound-healing outcomes using standardized assessment and care in clinical practice. *J Wound Ostomy Continence Nurs*. 2004;31(2):65-71.
7. DiCianni N, Kobza L. A chance to heal. Home health agencies can improve patient care and increase profits with telehealth wound consulting. *Health Manag Technol*. 2002;23(4):22-4.
8. Medical Advisory Secretariat, Ontario Ministry of Health and

Long-Term Care for the Ontario Health Technology Advisory Committee. Health Technology Literature Review: Hyperbaric Oxygen Therapy for Non Healing Ulcers in Diabetes Mellitus. 2005.

9. Lorimer KR, Harrison MB, Graham ID, Friedberg E, Davies B. Assessing venous ulcer population characteristics and practices in a home care community. *Ostomy/Wound Management*. 2003;49(5):32-43.
10. Canadian Diabetes Association. Diabetes and footcare. 2006. Available online at www.diabetes.ca/Section_About/feet.asp. Accessed January 31, 2007.
11. Graham ID, Harrison MB, Shafey M, Keast D. Knowledge and attitudes regarding care of leg ulcers. *Can Fam Physician*. 2003;49:896-902.
12. Redekop WK, Stolk EA, Kok E, Lovas K, Kalo Z, Busschbach JJV. Diabetic foot ulcers and amputations: Estimates of health utility for use in cost-effectiveness analyses of new treatments. *Diabetes Metab*. 2004;30:549-556.
13. Phillips T, Stanton B, Provan A, Lew R. A study of the impact of leg ulcers on quality of life: Financial, social, and psychological implications. *J Am Acad Dermatol*. 1994;31:49-53.
14. Lindholm C, Bjellerup M, Christenson OB, Zederfeldt B. Quality of life in chronic leg ulcer patients. An assessment according to the Nottingham Health Profile. *Acta Derm Venereol*. 1993;73:440-443.
15. Apelqvist J, Ragnarson Tennvall G, Persson U, Larsson J. Diabetic

foot ulcers in a multidisciplinary setting. An economic analysis of primary healing and healing with amputation. *J Intern Med*. 1994;235:463-471.

16. O'Brien JA, Patrick AR, Caro JJ. Cost of managing complications resulting from type 2 diabetes mellitus in Canada. *BMC Health Serv Res*. 2003;3:7.
17. Weinstein MC, Fineberg HV. *Clinical Decision Analysis*. Philadelphia, PA: WB Saunders Co. 1980.
18. Petitti DB. *Meta-Analysis, Decision Analysis, and Cost-Effectiveness Analysis*. New York: Oxford University Press. 1994.
19. Gold MR, Siegel JE, Russell LB, Weinstein MC. *Cost-Effectiveness in Health and Medicine*. New York: Oxford University Press. 1996:285 et. seq.
20. Beck JR, Pauker SG. The Markov process in medical prognosis. *Med Decis Making*. 1983;3:419-458.
21. CAET Annual Conference. Preliminary results of chart audit study. Presentation. Ottawa. May 2006.
22. Armstrong DG, Lipsky BA. Diabetic foot infections: Stepwise medical and surgical management. *International Wound Journal*. 2004;1(2):123-132.
23. Goldsmith H, Garoufalis MG. Third-party reimbursement for lower-extremity wound care. *Journal of the American Podiatric Medical Association*. 2002;92(1):54-58.
24. Gelfand JE, Hoffstad O, Margolis DJ. Surrogate endpoints for the treatment of venous leg ulcers. *Journal of Investigative Dermatology*. 2002;119:1420-1425

Primary Care Reform Project: Concluding Discussion and Recommendations

Douglas Queen, BSc, PhD, MBA; R. Gary Sibbald, BSc, MD, FRCPC (Med) (Derm), ABIM, DABD, MEd

The Wound Healing Clinic of Women's College Hospital, along with our partners the University of Toronto, the Registered Nurses' Association of Ontario (RNAO) and the Toronto Community Care Access Centre (CCAC), received funding for this Primary Care Reform project to develop a new community primary care model for persons with lower extremity ulcers. This important initiative is funded by the Primary Care Reform program of the Ontario Ministry of Health and Long-Term Care. The following summarizes the main findings of our research, both academic and clinical.

Best Practices in Canadian Wound Care

As part of the research we examined the development, implementation and proliferation of best practice for wound care in Canada.

Best practices are informed by evidence that combines experimental data, expert opinions and client preferences. In Canada, although developed by local experts, the RNAO Guidelines and the 2006 CAWC Best Practice Recommendations were derived from a rigorous review process that involved international and national guidelines and relevant literature. Each recommendation was supported by best available evidence within a client-centred framework. These documents have not only been adopted at the local (regional and provincial) level but also at a national level.

The new recommendations from the RNAO recognize the emerging national trend toward ambulatory care and home-based client care. Canadian health-care professionals and clients, to whom the guidelines were targeted, will greatly benefit from these important initiatives. However, strong leadership is required in each constituency across Canada to plan, implement, and evaluate the adoption of best practice recommendations. Much work remains, and it requires each caregiver, advocate, payer and government to be cognizant of where we are but more importantly where we should be. Implementation and dissemination is the key, and both the RNAO and the CAWC lead the way in driving best practices in wound care across Canada.

The Challenges

Without a systematic implementation policy, the presence of best practice recommendations are not sufficient to improve the standard of care for clients with leg or foot ulcers.

We evaluated a community-based, interprofessional, wound-assessment team to deliver evidence-informed wound care that includes a comprehensive initial assessment to determine healability along with ulcer etiology. Appropriate diagnosis of these wounds ensures that clients receive appropriate treatment through the use of high-compression bandaging (in venous disease with adequate blood supply) or the use of debridement in neurotrophic foot ulcers. For those clients who are not responding to their current treatment, a timely referral to the specialized wound-care team would also be indicated. Clients and attending home-care workers are partners in this paradigm, and they need to be informed of the current recommendations and importance of the prescribed therapy to reach a common goal. This approach may help to improve the efficiency of the home-care system for clients, health-care providers and payers.

A Canadian Caregiver's Perspective and Challenges

Although many health-care professionals have good intentions to provide the best care for their clients, there is a need to articulate and circumscribe what high-quality patient care should look like. Practitioners need to feel they are instituting and *can* institute best practice in their professional environment. We need a collective vision within the wound-care community to advocate for best practice for clients and for best possible outcomes. The RNAO has led the way in the development of best practice guidelines that are truly Canadian, and the CAWC followed up with user-friendly recommendations for practice. To obtain a perspective of the current standing of the adoption of best practices in wound care across Canada we conducted a survey as part of this project.

Our survey was intended to capture a "snapshot" of current practices across Canada. A significant percentage of respondents were identified as somewhat expert or having sufficient knowledge in wound care. Despite this, over 50 per cent of respondents stated that their clients were not seen by a multidisciplinary team. This statistic is worrisome as it indicates a fragmented system where people are working in their own silos. When reading this, we must remember that these expert respondents are known because of their quality care and that their opinions represent the ideal, while many home-care programs across the country may lack this level of expertise to deliver best practices.

More importantly, several specific comments from the nurses during the survey highlighted the inadequacies and frustrations experienced by qualified individuals who cannot carry out their profession effectively. The respondents clearly identified the lack of administrative support and funding as the primary roadblocks to implementing good-quality care. Within the current system, responsibilities are not well defined, and the funding available for the health-care system is less than adequate across Canada.

Consistently, many health-care providers expressed that primary challenges for them were to gain “access to resources,” “access to expert care” and “access to diagnostics.” Much work remains regarding the creation and support of an infrastructure for both human and financial resources.

It is through appropriate resources allocation that the causative and aggravating factors of wounds can be addressed. Based on this premise, clients with diabetic neurotrophic ulcers must have protective footwear to facilitate the healing of their ulcers and to prevent recurrence. Interestingly, despite the evidence, this practice is not consistent across Canada. Some provinces (e.g., Alberta) fund the provision of specialized footwear for persons with diabetes while others (e.g., Ontario) do not. Some consistency of approach and the recognition of the value of best practices and their implementation will clearly maximize the health-care expenditure for lower extremity ulcers across the country. This is important for all Canadians, both clients and taxpayers.

One encouraging finding was the ability of respondents to perform wound debridement. Unfortunately, this is not the case in many Ontario constituencies where nurses may not be allowed to perform non-viable surgical debridement.

There is often no home-care expertise to order pressure downloading (redistribution) for plantar ulcer management. Both of these functions could be provided by incorporating chiropody services into the home-care system. The debridement function can be shared by a transprofessional team of office- or clinic-based physicians, chiropodists, and nurses with advanced training.

A Canadian Client's Perspective

A transprofessional approach to care must also take into account the views of the clients. In this study this was done as part of the client enrollment program within one of the

participating CCACs. Our findings were not surprising but support the significant personal burden that a chronic wound can be to an individual.

Clients with chronic wounds experience reduced quality of life and suffering similar to people with other chronic illnesses such as stroke, COPD, Parkinson's disease and diabetes. The ulcer carries a significant economic burden and has a tremendous impact on many aspects of their daily activities. Clients lose significant personal time waiting for nursing visits. Many individuals become housebound because of poor mobility. Attending medical appointments is sometimes very difficult (clients over 90 years old who are enrolled in home care are less likely to have medical supervision of their wounds), and these appointments are often the only reason they leave their home (i.e., sometimes the only social interaction they have). They often experience many symptoms related to their ulcers—with pain being the most debilitating—as well as odour from wound drainage. The resulting social isolation further impacts quality of life and can have a negative impact on wound healing.

The recent high profile and visibility of many chronic illnesses has led to a changing perspective by the public, advocates, governments and medical staff, but this awareness has yet to happen with respect to chronic wounds, which remain under the radar.

Major financial concerns exist for those clients who cannot work as a result of the ulcer and who have no benefit plan. Another significant financial issue is special shoes or orthotics for clients with diabetic foot ulcers. This specialized footwear is exceedingly expensive and generally not covered by any health plan. Many individuals cannot afford these devices—and without downloading of a neurotrophic ulcer, the majority of the other client services are relatively futile. Clients are also often concerned with the cost of travel to medical appointments and tests, which sometimes results in the need for a more specialized care plan to lessen this potential financial burden.

Clients in the study worried about wound healing and wanted to get better and have their ulcers healed. They were often angry or sad about physical limitations, annoyed about extended waiting for diagnostic tests and consultations, and frustrated about the numerous ever-changing medical/nursing staff, who are often ill-informed regarding their particular circumstances. Lack of privacy is also a huge

issue. Clients verbalized their displeasure about the change in their lives. Many fear amputation. In fact, clients with multiple medical problems often identify ulcers as the most significant cause of the changes in their life more than other medical conditions.

Some of the issues and concerns expressed by our clients echo those of the practitioners supply the care.

It is evident that it is time for change.

Interventional Change

This initiative promoted optimal utilization of the health-care system and a shifting of emphasis from the treatment of disease to a holistic approach that includes prevention through assistive devices (compression for venous leg ulcers and appropriate downloading for neuropathic foot ulcers).

It is important to create a model where nursing services, contracted through Community Care Access Centres, are rewarded for holistic, complete assessments that lead to improved healing outcomes.

To achieve this goal, the wound-care-expert team needs to train a smaller number of contracted nurses to deliver the wound-care treatment plans with an increased level of clinical expertise.

There is a need to explore cost-effective ways to supply compression hosiery or alternative edema-control garments/bandages if clients are unable to purchase them with their own device plans or funds. If this practice is shown to be beneficial, then an assistive device program needs to be negotiated that will provide compression devices on a graduated income scale in conjunction with home care.

There is also a need to ensure that every client receiving home-care services for neuropathic foot ulcers has appropriate pressure-downloading footwear. Part of this study documented the barriers for clients to obtain footwear—including cost. This footwear needs to be provided to all clients who can not obtain appropriate downloading devices on their own. Alberta Aids to Daily Living (AADL) currently covers support stockings and pressure-downloading footwear under appropriate circumstances.

The major components and conclusion from this initiative can be summarized as the need to

- foster co-ordination across the continuum of services, particularly between the family doctor, home-care nurse, other members of the interprofessional team and the

CCAC care co-ordinator

- create specialized teams within the community setting that can perform timely (linked to admission to home-care) initial assessments and create treatment plans with patient-centred concerns incorporated
- benchmark initial wound characteristics for timely re-assessment by appropriate team members
- modify the assistive devices program to include criteria-based immediate acquisition and enable the ordering of these devices by all members of the transprofessional team members. The devices that need to be made available include
 - deep-toed shoes and orthotics
 - specialized pneumatic walkers
 - ankle-foot orthoses
 - compression stockings for prevention of recurrent of leg ulcers
- monitor outcomes from the health-care provider service and patient satisfaction points of view. These satisfaction levels should take into account co-ordinating teams and care, facilitating initial assessment, benchmarking, accessing timely specialized services where appropriate, and including the client in the process.

Budget Impact for Ontario Ministry of Health

The annual costs of the treatment of lower extremity ulcers within the community is estimated to be \$511 million based on a prevalence of 90,000 neurotrophic and other foot ulcer clients and 15,000 leg ulcer clients.

After implementation of our best practice approach, an estimated saving of \$338 million in direct medical costs is possible. These savings result from faster healing and a reduction in infections and amputations.

For example, approximately \$24 million alone can be saved by reducing hospitalizations as a result of infection and amputation. The remainder will result from reduced nursing visits and better use of medical supplies in the care of each client.

In Ontario, the improved clinical outcomes and quality-of-life benefits from our best practice implementation in the treatment of foot and leg ulcers were associated with a favourable cost-effectiveness ratio. Care through this best practice implementation results in a 66 per cent reduction in costs when compared with standard community care.

Such an approach also produces a 33 per cent to 57 per cent reduction in infections and lower extremity amputations, resulting in improved patient outcomes and quality of life.

The interprofessional change in our approach leads to improved client outcomes, enhanced client satisfaction and health-care savings. This is a win-win situation for all the stakeholders in health care.

Overall Recommendations

The incidence of chronic wounds is increasing, with leg and foot ulcers having a major influence on client and home-care resources in Ontario and Canada. Governments need to recognize the impact that chronic wounds have on their health-care expenditures. Minimal provincial changes in the home-care structure can improve patient outcomes and deliver substantial savings to the health-care system.

Involvement of all interprofessional team members is required for optimal client health-care outcomes. The chronic wound is only one component of a person's medical status, and a team is required to meet and co-ordinate all elements of care that relate to causes and co-factors that may affect healing. As a result, the training requirements for wound-care clinicians and the implementation processes are significantly greater.

In the specific case of the management of venous leg ulcers, the following recommendations are suggested:

- Primary-care physicians need to be educated regarding best practice and must be given the necessary enabling tools and the appropriate feedback from client referrals.
- Caregivers need to realize the importance of effective diagnosis through client history and clinical examination, laboratory investigation, vascular studies including ABPI—and skin biopsy if the wound is not progressing at the expected rate.
- Clients need to be made aware of the importance of high compression and the ongoing need for compression hosiery after healing to reduce the chance of recurrence.
- Support stockings may be costly, and alternative funding programs based on financial need should be tested for cost-savings and improved outcomes.
- Preventative programs need to be provided for at-risk clients and should include information on edema control, activity and mobility, and interventions to reduce the risk of venous leg ulcer formation.
- Consider partnering with the CAWC and/or RNAO to provide education to clinicians and clients.

In the case of the management of neuropathic foot ulcers,

especially in persons with diabetes, the following recommendations are suggested:

- Primary-care physicians need to be educated regarding best practice and must be given the necessary enabling tools and the appropriate feedback from client referrals.
- Caregivers need to realize the importance of effective diagnosis through client history and clinical examination (VIPS), laboratory investigation, vascular studies including ABPI and toe pressures, monitoring for infections (superficial and deep), and downloading (plantar pressure redistribution)—and skin biopsy if the wound is not progressing at the expected rate.
- Clients and health-care providers need to be made aware of the importance of therapeutic footwear.
- Footwear is costly, and alternative funding programs need to be developed.
- Expertise in debridement skills, both for callus build-up and removal of necrotic tissue, needs to be incorporated into Ontario home care. Widespread availability of this skill set may be best accomplished through appropriately trained chiropodists or advanced practice nurses with foot-care training and expertise.
- Expertise for prescribing downloading devices needs to be incorporated into Ontario home care. This can also be accomplished through appropriately trained chiropodists or advanced practice nurses with foot-care training and expertise.
- Preventative programs need to be provided for at-risk clients to include information on metabolic control, exercise, footwear and foot care
- Consider partnering with CAWC and/or RNAOs other partners to provide education to clinicians and clients.

A leadership role is required outside the “wound care family.” Wound-care and nursing organizations have taken a leadership role in the development of a transprofessional approach with the necessary supporting documentation, training and drive, but it is beyond their scope to implement the policy changes required to truly benefit from their activities. Politically, much kudos can be gained through the recognition of this health-care challenge and the relative ease by which it can be changed, with the resulting significant financial benefits.

A leadership role has been intimated by the Province of Ontario through the funding of this initiative. What is needed now is the furthering of this leadership through an implementation plan for these recommendations—benefiting clients, caregivers and taxpayers alike.