The Diabetic Foot in Nova Scotia: Challenges and Opportunities

A Discussion Paper Prepared by the Diabetes Care Program of Nova Scotia

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INTRODUCTION

The Diabetes Care Program of Nova Scotia (DCPNS) is a provincial program that promotes and monitors adherence to standards of care for people with diabetes, advises on and recommends efficient and effective service delivery models, promotes knowledge transfer and translation, and collects and analyzes data related to diabetes and diabetes education in Nova Scotia.

The DCPNS is committed to a collaborative approach to diabetes management that involves the provincial government, healthcare providers and their institutions, academic centres, non-governmental organizations (such as the Canadian Diabetes Association [CDA]), individuals living with diabetes, and industry. Through its support of the DCPNS and recognition of the essential role of Diabetes Centres (DCs) at the community level, the Department of Health has taken a leadership role in optimizing diabetes care in this province. This well-established collaboration has laid a strong foundation for continued intervention to further improvements.

Through existing infrastructure, such as the DCPNS and the recently introduced Nova Scotia Diabetes Assistance Program (January 2006), the province has an opportunity to significantly reduce the heavy burden faced by many Nova Scotians with this complex and serious disease.

The DCPNS recognizes that there are human resource inequities as well as varying standards of foot care within the province. While committed to the concept of improved access and the establishment of uniform and base standards of care, the DCPNS acknowledges that issues of regulation, training, certification, recruitment, and retention will require broader efforts on the part of healthcare provider associations, regulatory bodies, government, and individual healthcare institutions. While the DCPNS does not have a mandate to enact such changes, it can continue to provide a forum for dialogue on optimizing care for patients with diabetes. It is hoped that this document will serve as a starting point for such discussions among interested stakeholders in order to take collaborative and concrete actions to reduce the burden of diabetes-related foot problems in Nova Scotia.
EXECUTIVE SUMMARY

On May 27, 2004, the DCPNS hosted a diabetes foot care roundtable. The objective was to identify issues, needs, and strategies around prevention, screening, and management of diabetic foot complications. Participants were asked to identify issues and gaps in care that are contributing to poor foot outcomes in this province and to identify priority areas for improvements. This document reflects the points of view and suggested actions of those stakeholders invited to participate in this process and is intended to inform healthcare professionals and policy makers about this issue.

Nova Scotia has among the highest prevalence rate of diabetes in Canada. Foot problems are a major cause of morbidity and mortality in people with diabetes. Currently lower extremity amputations (LEAs) in the diabetes population make up the greatest proportion of the total LEAs, accounting for 60% of all cases. Projecting to 2009/10, this proportion is estimated to reach 80%.

Amputation rates can be reduced by 49 to 85% through strategies that combine prevention, the multidisciplinary treatment of foot ulcers, appropriate organization of care, close and appropriate monitoring, and education of healthcare professionals and people with diabetes. This document includes a number of suggested actions to address each of the identified priority areas.

EDUCATING HEALTH PROFESSIONALS. Routine foot care is a primary prevention intervention that can significantly decrease the rate of ulcers and amputation; foot assessments need to find their way into routine care.

EDUCATING PEOPLE WITH DIABETES. There is poor knowledge of foot disease among people with diabetes. Foot care education should be provided at the time of diagnosis of diabetes and periodically reinforced thereafter.

FOOT CARE. Early and accurate assessment and institution of a treatment plan specific to the presenting pathology and risk status of the diabetic foot are essential. Mechanisms must be explored to address the cost of preventive care (access, assessment, and treatment).

FOOTWEAR. Footwear needs for people with diabetes vary according to their risk of developing foot problems. Appropriate footwear becomes essential for people with a history of previous foot ulcers. Provincial healthcare coverage is required for defined diabetes categories of risk.

TREATMENT. Timely and appropriate interventions for the treatment of ulcers are critical in avoiding amputations. Wound care is intimately linked to diabetic foot evaluation. Foot care referral and management algorithms must be developed for use by family physicians and other healthcare providers.

PSYCHOSOCIAL DETERMINANTS OF FOOT HEALTH. An optimal approach to overall foot health considers the whole patient and not exclusively the pathology. Tools and training should focus on the holistic approach to prevention and treatment with identification of community supports and groups.
Nova Scotia has made progress over the last decade in the area of diabetes care generally and in foot care specifically. However, amputations remain a common and devastating complication of diabetes, impacting negatively on quality of life (for both patients and their caregivers) and healthcare system utilization. Leadership is urgently required in order to remove systemic barriers to optimal care and to create a cohesive extremity risk-reduction program. Improved foot care outcomes will be difficult to achieve without concerted population-based efforts to prevent diabetes. The most cost-effective measures will be those that focus intensive prevention efforts on patients at highest risk, while promoting population-based prevention messages to the diabetic and general public. Finally, social determinants of health such as poverty and illiteracy cannot be ignored. The people of Nova Scotia will be best served if social and health policies are developed in tandem.
BACKGROUND

On May 27, 2004, the DCPNS hosted a diabetes foot care roundtable. The objective was to identify issues, needs, and strategies around prevention, screening, and management of diabetic foot complications. Participants were asked to identify issues and gaps in care that are contributing to poor foot outcomes in this province and to identify priority areas for improvements. This document reflects the points of view and suggested actions of those stakeholders invited to participate in this process. Roundtable participants acted as section authors and general contributors to the development of this document.

The province of Nova Scotia has made progress in diabetes care in general and in the area of diabetic foot care. The DCPNS spearheaded a foot care prevention strategy starting with the 1991 release of guidelines aimed at the need for routine foot assessment of people attending Nova Scotia’s DCs. This was followed in 1997 by the public release of “Surveying and Preventing Diabetes Complications in Nova Scotia” aimed at physicians and healthcare providers. A public and provider campaign in 1998 brought together a number of key stakeholders (including CDA, Victoria Order of Nurses [VON], foot care specialists, and diabetes educators) to further this agenda. This culminated in a series of regional health professional workshops, public town hall sessions, release of a consumer resource that is still used today, and media messages.

Despite progress, there remain significant morbidity and mortality due to diabetes-related foot problems in Nova Scotia. This paper, intended for both healthcare professionals and policy makers, identifies current barriers to optimal care and suggests strategies for improved outcomes to be measured over the next decade. Suggested actions provide a framework for evolving policies and use of resources regarding the diabetic foot in Nova Scotia. The implementation of any given action point would occur through the creation of a working group comprised of key stakeholders and after the valued consultation with end users. Ongoing research is needed to determine how well the proposed interventions would work in improving foot care in this province. Collaboration with agencies such as the Nova Scotia Health Research Foundation is encouraged in order to act on the data provided by provincial databases, and applied research should be encouraged to track the translation of evidence into practice to target interventions in communities with the poorest outcomes. There is no attempt in this paper to provide comparative data from other provincial jurisdictions, as these data are currently not available.
DIABETES AND FOOT PROBLEMS: SCOPE OF THE PROBLEM

Nova Scotia has among the highest prevalence rate of diabetes in Canada. It is estimated that 55,000 Nova Scotians over the age of 20 years have diabetes (1) — a number that is expected to increase significantly in the years to come due, in large part, to the aging population and increasing rates of obesity.

Foot problems are a major cause of morbidity and mortality in people with diabetes, accounting for approximately 20% of all diabetes-related hospital admissions in North America (2). Foot ulcers develop in approximately 15% of people with diabetes (3). The combination of neuropathy, minor foot trauma, and foot deformity was found in >63% of people with foot ulcers (4). The sequence of events leading to amputation is well documented. In a patient with neuropathy or peripheral vascular disease, a minor trauma to the foot leads to skin ulceration and infection, gangrene, and ultimately amputation (2). Up to 85% of lower limb amputations in people with diabetes are preceded by foot ulcers that fail to heal (5,6). Non-healing ulcers are the major cause of this morbidity, and people with diabetes are 15 times more likely to have an amputation than those without diabetes (7). In the USA, in 1997, nearly 70% of amputations were performed in people with diabetes (8). The mortality rate after a first amputation is as high as 50% after three years (9) and 70% at five years. After amputation of one limb, the prognosis for the contralateral limb is greater than 50% at three years (personal communication, Dr. Gerry MacKean, 2005).

Costs related to the care of diabetic ulcers and amputation are difficult to quantify and vary greatly between countries and healthcare systems. Up to 20% of total expenditure on diabetes in North America and Europe may be attributable to the diabetic foot. The estimated cost of amputation (in 1998) ranged from US$16,488 to $66,251 (10). Estimates can, however, be considered universally conservative. In addition, these estimates do not quantify the costs to society due to lost productivity. As 65% of amputations in NS are performed on patients in their prime working years (i.e., between 45 and 64 years of age), these costs are significant. What is more difficult to quantify is the devastating effect of amputations on quality of life.

Amputation rates can be reduced by 49 to 85% through strategies that combine prevention, the multidisciplinary treatment of foot ulcers, appropriate organization of care, close and appropriate monitoring, and education of healthcare professionals and people with diabetes (11). The World Health Organization has declared that amputations need to be reduced by 50% by the year 2010 (11).
Magnitude of the Problem in Nova Scotia

Lower-extremity amputation (LEA) data from the Department of Health were reviewed for the years 1995 to 2005. These data were compared to data reported by the DCPNS starting in 1992. The more recent data are difficult to analyze in terms of change in LEA rates due to the introduction of the ICD-10 codes in April 2001. This coding change appears to have had a significant impact on the identification of diabetes and non-diabetes cases in that fiscal year, and possibly into 2002/2003. As such, in reporting on the LEA rate, the decision was made to exclude data from 2001/2002 and 2002/2003 fiscal years for analysis/interpretation. The following observations can be made:

Figure 1: Total counts (number) of LEAs in Nova Scotia per fiscal year 1995/96 to 2004/05

- The total number (count) of LEAs in the diabetes and non-diabetes populations increased by 19% between 1995/96 and 1999/00, with a reduction thereafter in both groups. This rate of increase is slower than that observed in the early 1990s (12).

- The above data suggest there has been a slowing of the LEA rate as compared to that observed in the early 1990s (12). This may well reflect the success of a number of measures implemented during this timeframe, as well as a heightened awareness of foot care issues. During this period, the DCPNS focused attention and resources on routine foot assessment for patients attending DCs, including use of monofilament testing and heightened public and healthcare provider awareness of the need for proper foot care and footwear. VON provided fee-for-service foot clinics in a number of Nova Scotia communities and vascular assessment labs were established in three Nova Scotia sites (New Glasgow, Sydney, and Kentville). In addition, CDA guidelines produced in 1992, 1998, and 2003 were heavily promoted at the national and provincial levels.
• LEAs in the diabetes population now make up the greatest proportion of the total LEAs, accounting for 60% of all cases (two-year average of 03/04 and 04/05). Projecting to 2009/2010, this proportion is estimated to reach 80%.

Figure 3: LEA rate ratios (diabetes to non-diabetes) Two-year average (2003 to 2005) by 10-year age grouping

*Using 2002/03 populations estimates as provided by the Population Health Research Unit, Dalhousie University, Halifax, NS.

• Assuming a 6% prevalence rate of diabetes in NS in the population over age 20 for 2002/03, and taking the mean number of LEA admissions in 2003/2004 and 2004/2005, people with diabetes over the age of 20 years are 20 times more likely to have an LEA than the non-diabetic population. This varies by age group with a rate ratio of approximately 25 in age groups 50-59 and 60-69 years. In the younger age groups, 30-39 and 40-49, people with diabetes are 34 and 73 times, respectively, more likely than the non-diabetes population to have a LEA.

Although not reported here, there are variations in the number of LEAs for people with diabetes per 100,000 general population across the District Health Authorities (DHA) with the highest numbers recorded as 43, 34, and 32 per 100,000 in DHAs 8 (Cape Breton District Health Authority), 6 (Pictou County District Health Authority), and 2 (South West Health District Health Authority), respectively.
OPTIMAL DIABETES MANAGEMENT AND FOOT CARE

The Canadian Diabetes Association 2003 Clinical Practice Guidelines for the Prevention and Management of Diabetes in Canada (2) provide evidence-based recommendations for the optimal care of all patients with diabetes to prevent, detect, and treat diabetes-related foot problems (Appendix A). A recent article in The Lancet (13) suggests using the elements of the chronic care model (CCM) to integrate a number of single and multiple-component interventions that have been shown to be effective in improving foot care outcomes. This CCM is currently under discussion with the Nova Scotia Departments of Health and Health Promotion and Protection as the basis for formulating a chronic disease management strategy for the province.

ORGANIZATION OF CARE: Prevention of ulcers and amputations must become a healthcare priority. Defined targets to reduce amputation rates should be developed and policy must be based on evidence. Consideration should be given to incentives to increase rates of screening and identification/treatment of high-risk individuals.

CLINICAL INFORMATION SYSTEM: Use established registries to track patients by risk strata, provide clinician performance feedback, and reminders for patients and providers. Benchmarking and using data from previous visits will facilitate good clinical decision-making.

DELIVERY SYSTEM DESIGN: The system should be designed to provide planned visits for screening (e.g., diabetes office days), clinical care, and follow-up in the primary care setting. Finding ways to integrate foot care provider teams into primary care would be invaluable.

DECISION SUPPORT: Implement recommendations from evidence-based guidelines, train healthcare providers on the provision of optimal care, and provide patient feedback and progress reports.

PATIENT SELF-MANAGEMENT SUPPORT: Provide self-help instruction and materials based on priorities identified by patients.

COORDINATION OF COMMUNITY RESOURCES: Encourage and support patients’ participation in effective community programs.
EDUCATING HEALTHCARE PROFESSIONALS

Routine foot care is a primary prevention intervention that can significantly decrease the rate of ulcers and amputation (3); however, foot assessments have not yet found their way into routine care. For example, foot assessments are reportedly conducted during the initial assessment period in 23 of 37 (62%) DCs in Nova Scotia with an additional seven DCs (for a total of 81%) completing some form of foot assessment in the first 12-month period (DCPNS communication, based on the DCPNS Diabetes Centre Survey conducted in the summer of 2005). While health professionals often point to lack of clinical time for foot assessments, the DCPNS foot assessment tool and use of the monofilament is estimated to take only five to seven minutes. Continuing medical education initiatives and interventions are needed to improve rates of screening. A reminder tool, such as a revised DCPNS Quick Reference Guide (14), may be a low-cost and efficient prompt for the busy physician. A fee for service for foot assessments may also increase physician attention to this aspect of routine diabetes care. Without proper assessment, preventive strategies cannot be implemented.

Physician education is also needed to counter physician misperceptions that the future is bleak for patients with microvascular disease. Education is needed to encourage aggressive treatment (e.g., bypass, debridement) and facilitate referrals for high-risk patients.

Healthcare reform offers huge opportunities for primary care physicians to become better integrated into diabetes healthcare teams. Indeed, optimizing the multidisciplinary team approach to diabetes care serves as a model for patient-centered disease management for other chronic diseases. This will involve finding ways to manage the ever-increasing diabetes-related workload by appropriately using the services and skills of family physicians, endocrinologists and diabetes specialists, Diabetes Centre staff, specialty nurses, VON staff, podiatrists, chiropodists, pedorthists, physiotherapists, social workers, and other allied healthcare professionals as needed.

Foot care is an aspect of personal hygiene and diabetes management that is also often overlooked in long-term care facilities. The evidence suggests that educating care providers in this setting is more beneficial than educating patients, who often have cognitive and physical limitations that preclude optimal self-care. Indeed, as many as 75% of nursing home residents may have some form of dementia (15), which impedes the learning process. Staff education on national standards and guidelines for foot-care practices in patients with diabetes are essential first steps to reduce the risks of amputation in institutionalized seniors.
SUGGESTED ACTIONS

• Revisit the DCPNS foot care campaign that was launched in the 1990s. This included free foot assessment days throughout the province. A key message should be to encourage doctors to remove patients’ socks and shoes and examine their feet at each diabetes-related visit.

• Supply every primary care physician in Nova Scotia with a 10-g monofilament and simple instructions on screening for neuropathy and prevention and treatment of foot ulcers.

• Create a separate physician billing code for chronic disease management, including diabetic foot assessments/treatments to encourage routine and documented screening.

• Revise the foot assessment protocol using validated and standardized assessment tools.

• Revise the referral algorithm.

• Establish primary practice and institutional partnerships to provide easily accessible and accredited CME for primary care physicians. CME topics would include evidence for organization of care systems and approaches (such as diabetes mini-clinics emphasizing foot assessments), and use of clinical tools.

• Explore avenues to include preventive and acute foot care topics in medical, nursing, and other healthcare training curricula. Ideally, such curricula would include opportunities for students to observe care of patients with diabetes in podiatry offices, diabetes centres, VON foot care clinics, and/or wound care clinics.

• Work with local experts and key opinion leaders to present morbidity rounds, focusing on screening and appropriate management of the diabetic foot using locally available interdisciplinary resources.

• Disseminate pertinent foot care literature and tools (widely available through national and provincial diabetes associations and hospital foot clinics) to educational departments of all long-term care facilities.

• Educate long-term care facility staff on identification and proper referral/management of the high-risk foot.
EDUCATING PEOPLE WITH DIABETES

Various studies show poor knowledge of foot disease among people with diabetes (16). Foot care education should be provided at the time of diagnosis of diabetes and periodically reinforced. Education that includes supervision and follow-up has been found to improve knowledge and compliance and to decrease foot problems (17).

SUGGESTED ACTIONS

- Disseminate patient information on prevention of foot problems and ulcers and the importance of regular routine foot assessments. Educational information must be written and designed based on the needs of the target audiences (e.g., low-literacy readers, culturally sensitive).

- Create a patient “decision tree” tool explaining how and when to access the healthcare system if foot problems arise. Include information on what is considered routine care, signs and symptoms that require urgent attention, what healthcare provider should be consulted at a given stage, which services are covered by MSI, and which services may be covered by third-party insurance or government assistance programs. Such information would direct patients to the appropriate healthcare services at the appropriate time and would make patients and their physicians aware of available treatment options.

- Educate patients on the importance of seeking treatment from healthcare professionals who are trained, qualified, and experienced.

- Develop targeted materials for patients with type 1 diabetes who leave the system (often as young adults) and who do not present again until the onset of complications. This population is at high risk by virtue of their often long duration of diabetes. In addition, the lack of regular care often results in poor metabolic control, further increasing their risk.

- Develop partnerships with key stakeholders to educate high-risk patients (e.g., those with long duration of diabetes, low vision, or renal failure) about foot care.

- Ensure patients throughout the province have access to diabetes self-management education.

- Using mass media, educate the general public about the risk of foot problems with diabetes and the importance of proper care.
FOOT CARE

There are many therapeutic interventions for the diabetic foot, but early and accurate assessment and institution of a treatment plan specific to the presenting pathology and risk status are essential. Debridement of hyperkeratoses and safe removal of corns and callouses are key components of proper and preventive foot care for people with diabetes. Appropriate treatment of warts, ingrown toenails, and other common foot problems also require careful management in the person with diabetes. In addition to such care, elements of a podiatric assessment and treatment would include dermatological, vascular, neurological, biomechanical, onychological, morphological, vascular, neurological, and osteological assessments, as well as footwear and education. A review of American Medicare claims data found that patients with diabetes who were at high risk for lower-limb amputation and who received palliative podiatric care had an amputation rate 75% lower than high-risk patients who did not receive that care (18). When choosing foot care providers, patients should consider providers’ qualifications, competence, and experience in caring for people with diabetes.

While procedures such as advanced wound care and amputation, and items such as prostheses and wheelchairs are covered by MSI, coverage for simple and inexpensive preventive care, including assessment and treatment, varies widely.

- Foot care is not covered by MSI or Continuing Care.
- Patients who are followed by services such as the VON pay $25 to $32 per clinic visit and between $45 to $74 for a home visit (personal communication, Suzanne D’Entremont, RN, BScN, VON, 2007).
- Podiatry fees are approximately $50 per assessment/treatment/visit (personal communication, Brendan Bennett, Pod SRCh, 2007). Podiatry is not covered under MSI, but is covered by the majority of third-party insurers (some may require a physician’s referral).
- Veterans’ Affairs Canada covers the cost of podiatry with referral from a physician.
- Patients in hospital-based diabetes centres have limited access to podiatry services.
SUGGESTED ACTIONS

• Include routine foot care as an item eligible for coverage in the Nova Scotia Diabetes Assistance Program and clearly define who is qualified to provide such care under the Program.

• Advocate for coverage of seasonal foot care in the home. Asking patients with foot problems to attend clinics in the winter increases risk of injury while traveling to the clinic.

• Improve access to foot services for patients with diabetes through partial or full public funding of podiatric services and foot care provided by defined providers.

• Incorporate podiatrists into multidisciplinary teams. Inclusion in hospital budgets would reduce financial burden to patients.

• Explore opportunities to educate primary care providers on the role of podiatrists and other qualified foot care providers (such as trained VON nurses) in assessing and treating the diabetic foot.
FOOTWEAR

Footwear needs for people with diabetes vary according to their risk of developing foot problems. In terms of prevention, all people with diabetes need access to sturdy, properly fitting footwear. In a person with neuropathy or poor circulation (i.e., a person at higher risk), ill-fitting shoes significantly increase the risk of developing blisters and lesions that can lead to ulcers. Appropriate footwear becomes essential for people with a history of previous foot ulcers. In a person with neuropathy or poor circulation, ill-fitting shoes significantly increase the risk of developing blisters and lesions that can lead to ulcers. Some patients need to have pressure off-loading with proper footwear and orthotics. For patients recovering from ulcers, custom-made footwear may be required for proper healing and prevention of relapse. Appropriate footwear may prevent up to ~54% of amputations (19).

Coverage for footwear varies greatly:

- MSI does not cover podiatrists' or pedorthists' fees, specialized or custom-made footwear and orthotics, but private insurance will generally cover costs with a letter of referral from a physician or podiatrist.

- Some private insurance companies cover therapeutic and orthopedic/depth footwear, while others cover only custom-made shoes. Some companies will insure orthotics prescribed by a physician or podiatrist.

- Coverage for Aboriginal patients is provided by non-insured health benefit (NHIB). The NHIB will cover custom-made orthotics made from a plaster cast, but not depth footwear.

- Veterans' Affairs Canada covers the cost of podiatrists' or pedorthists' fees, footwear and orthotics with referral from a primary care provider.

- In long-term care facilities, patients are assessed for degree of risk. The social services department in the facility notifies provincial insurers once risk has been established. Provincial insurance plans will provide funding to purchase the most appropriate footwear for that patient.

Appropriate footwear can present a financial burden for patients who do not have third-party insurance. Often, the only available resource for these patients is a service club (personal communication, Penny Durnford, MSW, RSW, 2007). The average cost of orthotics is $300 to $400 (personal communication, Andrew Hoar, C Ped (C), 2007), while custom-made shoes range in price, but can cost up to and over $2000 (personal communication, Freeman Churchill, C Ped (C), 2007).
Depth footwear does not necessarily always need to be custom made, but should be fitted by someone with training, experience, and knowledge. While not all patients with diabetes require custom-made therapeutic footwear, appropriate and comprehensive solutions must be available to those in need. In these cases, for example, covering only orthotics but not the depth footwear needed to accommodate the orthotic means the problem is not being appropriately addressed.

**SUGGESTED ACTIONS**

- Develop parameters and guidelines for provincial healthcare coverage for footwear for patients with diabetes according to different risk factors and financial circumstances.

- Define conditions for coverage for custom-made and therapeutic (depth) footwear in the Nova Scotia Diabetes Assistance Program.

- Educate shoe fitters/retailers on the specific footwear needs of people with diabetes.
TREATMENT

Timely and appropriate interventions for the treatment of ulcers are critical in avoiding amputations. Wound care is intimately linked to diabetic foot evaluation. Referral of high-risk patients to a comprehensive foot care clinic has been shown to reduce absolute risk by 1% for major amputations (1.2% in usual care arm to 0.1% in the screening arm) (20). Most people with a foot ulcer do not present to a vascular clinic until they have a non-healing wound or an area that is draining. The specific therapeutic interventions employed in the acute care of the diabetic foot are beyond the scope of this paper, but can involve many medical specialties depending on the presenting problem. For example, infection control requires surgeons, neuropathy requires neurologists, structural deformities require orthopedic surgeons, reconstruction requires plastic surgeons, revascularization requires vascular surgeons, and specific skin conditions require dermatologists. Other allied health professionals such as specialized nurses, podiatrists, pedorthists, chiropodists, occupational therapists, social workers, and pharmacists may be included as needed. As a number of specialists may be involved in foot care, protocols delineating each clinician's task or potential role are important. In addition, accurate record keeping and communication between specialists and the family doctor are essential for ensuring continuity of patient care. The continued integration of the electronic health record will facilitate continuity of care and will enhance the provincial database.

The key to the success of healing an ulcer and preventing amputation is the team approach. A multidisciplinary approach using appropriate medical specialists such as dermatologists, vascular surgeons, pedorthists and well-trained nurses, has been shown to increase healing rates and decrease recurrence rates (21). The Vascular Leg Ulcer Clinic at the QEII Health Sciences Centre uses such a multidisciplinary approach to managing patients with diabetic neuropathic foot ulcers. The team approach offers patients a "one-stop shopping" service that expedites the delivery of care and reduces the number of amputations. Compared to a six-month chart audit done in 2000, a six-month retrospective chart audit in 2005 showed that the clinic population with diabetes increased from 15 to 44%, and the average age of patients with diabetes decreased from 67 to 59.6 years. Healing rates decreased from 12 to 20 weeks to 9.5 weeks. Seventy-two percent were male and 28% female (personal communications, Cathy Burrows, RN BScN, 2006).
SUGGESTED ACTIONS

• Establish satellite clinics from the QEII Health Sciences Centre Vascular Leg Ulcer Clinic in areas where such care is not easily accessible.

• Educate general surgeons about surgical options besides amputation (e.g., revascularization and endovascular surgery).

• Using a “centre of excellence” model, ensure recruitment and retention of highly trained surgeons who can establish and sustain surgical programs (e.g., endovascular surgery) that offer patients the best available care. This includes ensuring that the machinery and technology required for advanced surgical techniques are available.

• Within DCs, develop triage criteria to identify the patients at highest risk and facilitate referral directly to vascular surgeons.

• Within DCs, develop specialized care protocols and implement a case management approach for high-risk patients.

• Develop and distribute foot care referral and management algorithms to family physicians and other healthcare providers (base documents are available and can be customized for local use). Define the roles and responsibilities of each healthcare professional involved.

• Support efforts to integrate electronic health records to enhance communication and referral related to foot problems.
PSYCHOSOCIAL DETERMINANTS OF FOOT HEALTH

An optimal approach to overall foot health should consider the whole patient and not focus exclusively on pathology (22). Beyond the physical challenges of treating the population with foot problems, financial, emotional, social, geographic and literacy issues, as well as personal health beliefs, often complicate their care. For example, patients living in poverty often contend with poor housing, poor nutrition, lack of transportation, inability to pay for medications, appropriate foot care and footwear, and diabetic supplies. These factors conspire to limit these patients’ choices and present numerous challenges to the maintenance of optimal health. These are also significant barriers to wound healing (22). Indeed, an Ontario study found that individuals in those income groups had amputation rates that were nearly one-third higher than those in the highest income category. Amputation rates were 50% higher in northern communities than in Toronto (23 cited in 22). Low socioeconomic conditions in many areas of rural Nova Scotia also make access to good care and follow-up particularly problematic.

SUGGESTED ACTIONS

• In all healthcare provider education literature and tools, stress the importance of a holistic approach to prevention and treatment that includes consideration of patients’ psychosocial reality.

• Ensure training programs and foot information materials reflect the importance of a holistic approach to prevention and treatment, and identify potential social barriers and the appropriate allied healthcare professionals to best address these barriers (e.g., social workers, occupational therapists, physiotherapists, and dietitians).

• Ensure primary care providers are aware of community groups, compassionate use programs, and local service groups such as the Red Cross, War Amps, and local legions.
CONCLUSIONS

Nova Scotia has made progress over the last decade in the area of diabetes care generally and in foot care specifically. Recent data suggest that the rate of LEAs in people with diabetes has slowed somewhat over the past 10 years. However, there is still work to be done. Amputations remain a common and devastating complication of diabetes, impacting negatively on quality of life (for both patients and their caregivers) and healthcare system utilization. A thoughtful and coordinated approach to the management of the diabetic foot could drastically reduce the amputation rate in the province of Nova Scotia. This discussion paper presents a series of action steps needed to optimize foot care in this province. There are many committed and passionate healthcare professionals in Nova Scotia who are eager to improve care for their patients with diabetes. However, political leadership is urgently required in order to remove systemic barriers to optimal care. “Without a cohesive extremity risk-reduction program, the tremendous physical, financial and psychological impact of diabetic extremity morbidity will continue to drain resources and quality of life for this high-risk patient population” (7).

Although this paper does not specifically address primary prevention of diabetes, improved foot care outcomes will be difficult to achieve without concerted population-based efforts to prevent diabetes. All levels of government and the healthcare community must support community-based efforts to increase opportunities for people to be physically active, and educate Nova Scotians on healthy eating. The costs of preventing diabetes will be vastly less than the costs of treating diabetes and its many complications, including serious foot infections and amputations. The most cost-effective measures will be those that focus intensive prevention efforts on patients at highest risk, while promoting population-based prevention messages to the diabetic and general public. Indeed, a cost-utility analysis found that if intensive prevention could reduce the incidence of foot ulcers and amputations by 25%, it would be cost effective and save money in all patients with diabetes, except those without specific risk factors (24).

Finally, social determinants of health such as poverty and illiteracy cannot be ignored. The people of Nova Scotia will be best served if social and health policies are developed in tandem.
APPENDIX A

Evidence-Based National Standards of Care

The Canadian Diabetes Association 2003 Clinical Practice Guidelines for the Prevention and Management of Diabetes in Canada* (2) state the following regarding the care of all patients with diabetes in Canada:

“The healthcare system should recognize the rights of people with diabetes by striving to include them in healthcare delivery planning, and ensuring that they have timely, affordable and ongoing access to diabetes education, comprehensive treatment services provided by qualified professionals, and appropriate access to pharmaceuticals and medical devices that can improve quality of life. Such access may also prevent future interventions that are more costly and less effective. In addition, governments should commit to a strategy to ensure that the costs of medications and supplies for the management of diabetes and diabetes-related complications are not a burden to the individual or a barrier to managing the disease.”

The following are recommendations for optimal organization of care in the management of diabetes:

• Diabetes care should be organized around the person with diabetes using a multi- and interdisciplinary diabetes healthcare team (DHC) team approach (25,26).

• Diabetes care should be systematic and incorporate organizational interventions that have been shown to improve healthcare efficiencies such as databases to provide patient and physician reminders and transfer of information, organized diabetes clinics, and tools, including clinical flow charts (25-27).

• As an essential member of the DHC team, the family physician and/or diabetes specialist and the other members of the DHC team have the responsibility to:
  – Ensure that systematic, structured, and standardized diabetes care is available (27);
  – Incorporate current standards of diabetes care into daily practice;
  – Facilitate transfer of information among all members of the team to ensure continuity of care (27,28); and
  – Endeavour to identify and prevent diabetes in those identified to be at risk.

• People with diabetes should be offered initial and ongoing needs-based diabetes education in a timely manner to enhance self-care practices and behaviours (29).

• The role of diabetes nurse educators (25) and other DHC team members should be enhanced in cooperation with the physician to improve coordination of care and to effect timely diabetes management changes.
The following strategies are specifically recommended for the prevention and management of neuropathy and foot problems:

**Screening**

Screening for peripheral neuropathy should be carried out annually to identify those at high risk of developing foot ulcers. Screening should begin at diagnosis in people with type 2 diabetes and after 5 years’ duration of type 1 diabetes in postpubertal individuals.

- Detection of peripheral neuropathy should be conducted by assessing loss of sensitivity to the 10-g monofilament at the great toe or loss of sensitivity to vibration at the great toe (30).

- Foot examinations in adults by both patients and healthcare providers should be an integral component of diabetes management to decrease the risk of foot lesions and amputations (20,31).

- Foot examination should include assessment of structural abnormalities, neuropathy, vascular disease, ulcerations, and evidence of infection (20,31).

- Foot examinations should be performed at least annually in all people with diabetes, commencing at puberty and at more frequent intervals in those at high risk.

**Prevention**

- People with type 1 diabetes should be treated with intensive glycemic control management to delay the onset and slow the progression of peripheral neuropathy (32,33). Intensified glycemic control management should be considered for people with type 2 diabetes to prevent the onset and progression of neuropathy (34).

- People at high risk of foot ulceration and amputation require foot care education, proper footwear, counselling to avoid foot trauma, smoking cessation, and early referrals if problems occur (20).

*The Canadian Diabetes Association guidelines are currently being updated and are scheduled for publication in 2008.*
APPENDIX B

Foot Care/Footwear Providers in Nova Scotia

Foot care and the provision of footwear are unregulated in Nova Scotia, and as such, services are provided by individuals with a broad range of education, training, and experience. National standards of care exist for the management of the diabetic foot (as outlined in Appendix A) and the Nova Scotia Podiatric Society also set standards for foot care for their members. Footwear is not regulated in any jurisdiction. The following section briefly outlines the training of some of the providers involved in management of the diabetic foot. These are general descriptions that are included to give the reader a broad sense of the roles of various individuals involved in managing the diabetic foot in Nova Scotia and may not reflect the training of some individuals practicing in Nova Scotia.

Podiatrists: Podiatry is defined as the branch of medicine concerned with the diagnosis and medical, surgical, mechanical, physical, and adjunctive treatment of diseases, injuries, and defects of the foot. The podiatry curriculum spans three or four years at an accredited School of Podiatric Medicine in the United Kingdom. Upon completion, graduates receive their degree in Podiatric Medicine having successfully passed professional regulatory licensing examinations. Postgraduate specializations including diabetology, sports medicine, and surgery are available. Podiatrists are primary care providers, and accept referrals from all healthcare agencies and facilities. While podiatry is regulated in all provinces west of Nova Scotia, it remains unregulated in this province. The Nova Scotia Podiatry Association (NSPA) adopts common standards of educational qualifications for membership as the majority of provinces across Canada. As of October 2006, there were nine members of the NSPA. Membership is voluntary. There are two practicing podiatrists in the province who do not belong to the NSPA.

Chiropodists: Chiropody is the assessment of the foot and the treatment and prevention of diseases or disorders of the foot by therapeutic, orthotic, and palliative means. Chiropody is a regulated health profession in Ontario; to work as a chiropodist in Ontario, practitioners must be registered with the College of Chiropodists of Ontario. Graduates from the three-year chiropody program offered in Ontario are eligible to write the College’s provincial registration exams. There are 2 chiropodists from this program in Nova Scotia. There are a further five chiropodists from other (now discontinued) programs.
Pedorthists: Pedorthists are qualified to carry out an assessment to fit and modify footwear; design, mold, and make custom-made orthotics. Patients who consult a pedorthist must have a written referral that includes a diagnosis and prescription from a primary care provider for custom foot orthoses. As of August 2006, there were 23 pedorthists in Nova Scotia (College of Pedorthics of Canada, www.cpedcs.ca/). These individuals are members of the Pedorthic Association of Canada and have written exams entitling them to use the C Ped (C) designation. There are individuals who call themselves pedorthists in NS, but who are not members of the Pedorthic Association of Canada and hold no certification. There is also a group in Ontario who has said it certifies individuals with a diploma in pedorthics, but it is not recognized by the Pedorthic Association of Canada or the College of Pedorthics Canada.

Nurses: Some nurses with extra training throughout the province provide foot assessments and care for patients in institutions, in the home, and as private foot care providers. In Nova Scotia Diabetes Centres, diabetes nurse educators offer foot assessments. Diabetes Centre nurses use a DCPNS standard assessment tool that allows for objective determination of risk rating. In addition to nursing training, basic to advanced foot care continuing education courses are available through the community college system. These courses vary in terms of length and course content. All VON staff is given a two- to three-day foot care training program before being tasked to provide foot care. Patients can access foot care provided by VON or independent foot care providers without referral and at cost.
REFERENCES


The Diabetic Foot in Nova Scotia Challenges and Opportunities