

The case for diabetic foot screening

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Article points

1. Widespread failure to carry out diabetes foot screening can lead to risk of ulceration and amputation.
2. All healthcare organizations, programs and clinicians should implement diabetes foot screening and Clinical Practice Guideline recommendations.
3. People with diabetes must be empowered to take responsibility for their foot health and deserve access to knowledgeable healthcare professionals.

Key words

- Screening
- Amputation
- Best practise

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Diabetes foot screening is a key component of the systematic and multidisciplinary care required by people with diabetes and is strongly supported by evidence-based best practice recommendations. Failure to carry out comprehensive diabetes foot screening can have detrimental consequences for those with diabetes. This article summarizes the key evidence supporting diabetes foot screening for risk of ulceration and lower-extremity amputation.

The Canadian Diabetes Association estimates 9 million Canadians are living with pre-diabetes or diabetes (CDA, 2012). Diabetes and its complications result in decreased quality of life, with earlier mortality and increased health system use (PHAC, 2011). It is imperative that healthcare systems prioritize interventions that slow or halt the progression of diabetes complications (Council of the Federation, 2012). Early screening can detect diabetes-related complications in four key areas:

- HbA1C blood tests measure the average blood glucose over the previous 90 days, with higher levels predicting accelerated end organ diabetes complications
- Urine protein tests detect early renal disease
- Dilated eye examination detects early signs of diabetic retinopathy
- Diabetic foot screening identifies people with a high-risk foot, allowing for preventive treatment to decrease the chances of ulceration, wounds and amputation (CIHI, 2009).

Diabetic foot complications are common in Canada and may include ulcerations (wounds) and amputations. System-level strategies to combat these complications include:

- Education for patients, families, caregivers and health care professionals
- Prevention by early identification of persons with feet at risk for ulceration and potential amputation
- Close monitoring of people with high-risk feet

and assessment by multidisciplinary teams (IWGDF, 2012).

People with diabetes (PWD) are at high risk of developing foot complications because of a number of factors. People living with diabetes have a high incidence of neuropathy, peripheral arterial disease (PAD) and a decreased immune response (Boulton et al, 2008). This results in:

- Decreased protective sensation
- Deformity related to motor neuropathy
- Local ischemia
- Distal gangrene from PAD
- Increasing immune defects.

These foot changes can, in turn, result in:

- Calluses
- Blisters
- Skin ulcers
- Gangrene
- Secondary bacterial infections, such as cellulitis and osteomyelitis
- Avoidable amputations (Perkins & Bril, 2003).

People with consistently high and unstable blood glucose levels are at even higher risk. Some people with diabetes may have no symptoms of foot complications; however, they may have treatable, undetected foot complications. Completion of a comprehensive assessment and diabetic foot screening, as recommended by international and national diabetes clinical practice guidelines (CPGs) is critical to the prevention of foot complications in people with diabetes.

The Public Health Agency of Canada recognized the deficit in credible tools to prevent diabetic foot ulcerations and amputations in 2010. As a result PHAC funded the Canadian Association of Wound Care to develop self-management tools, including a diabetic foot screening tool.

Use of a standardized diabetic foot screen ensures a consistent approach to risk recognition and provides a framework for care. Strong evidence shows that up to 85% of diabetic foot amputations can be prevented, supporting the benefits of early recognition of diabetes-related foot complications (CDA, 2013).

Furthermore, timely assessment, referral, and provision of evidence-informed foot care are cost saving for the healthcare system. Yet, at the present, foot screening is the most neglected and least

completed of the four key recommended annual diabetes screens, with only 51% of Canadians with diabetes receiving a foot screen (CIHI, 2009).

Diabetic foot screening is the least followed of the four recommended care components of routine diabetes prevention. Data from the CIHI (2009) shows only 51% of Canadian adults with diabetes report having had a diabetic foot screen in the previous year. The CIHI (2013) report Compromised Wounds in Canada did not indicate any change in these numbers.

This article focuses on the importance of diabetic foot care screening and aims to highlight the need for all organizations, programs and clinicians to implement diabetes foot screening and Clinical Practice Guideline recommendations. There are a number of factors and challenges related to diabetic foot care, including:

“Timely assessment, referral, and provision of evidence-informed foot care are cost saving for the healthcare system.”

Table 1. Clinical Practice Recommendations

Clinical Practice Recommendations	Recommendation
Canadian Diabetes Association (CDA, 2013)	“In people with diabetes, foot examinations by healthcare providers should be an integral component of diabetes management to identify persons at risk for ulceration and lower-extremity amputation and should be performed at least annually and at more frequent intervals in those at high risk”. Retrieved from http://www.diabetes.ca/
Registered Nurses Association of Ontario (RNAO, 2004; Revised 2007)	“Foot examinations should be performed by a health professional at least annually in all people with diabetes over the age of 15, and at more frequent intervals for those at higher risk”. Retrieved from http://rnao.ca/bpg/guidelines/
International Working Group for Diabetic Foot 2011 (IWGDF, 2012)	“All people with diabetes should be examined at least once a year for potential foot problems. Patients with demonstrated risk factor(s) should be examined more often - every 1 - 6 months. The absence of symptoms does not mean that the feet are healthy; the patient might have neuropathy, peripheral vascular disease, or even an ulcer without any complaints. The patient’s feet should be examined with the patient lying down and standing up, and their shoes and socks should also be inspected”. Retrieved from http://iwgdf.org/
Scottish Intercollegiate Guidelines Network (SIGN, 2010)	“All patients with diabetes should be screened to assess their risk of developing a foot ulcer. The guideline group considers that at least annual screening from the diagnosis of diabetes is appropriate. The result of the foot screening examination should be entered onto an online screening tool to provide automatic risk stratification and recommend a management plan, including patient information”. Retrieved from http://www.sign.ac.uk/pdf/sign116.pdf/
National Institute for Health and Care Excellence (NICE), 2004; Revised 2011 & 2012	“Trained personnel should examine patient’s feet to detect risk factors for ulceration annually. Care of people at increased risk of foot ulcers should have a regular review 3-6 months by a foot protection team; those at high risk should be reassessed q 1-3 months”. Retrieved from http://www.nice.org.uk/nicemedia/live/13416/53556/53556.pdf/
Australian National Evidence-Based Guideline (2011)	“Assess all people with diabetes and stratify their risk of developing foot complications; any suitable trained healthcare professional may perform the risk assessment”. Retrieved from http://t2dgr.bakeridi.edu.au/

“Canadians with diabetes are approximately 20 times more likely to be hospitalized for non-traumatic lower limb amputations than those without diabetes.”

- The state of diabetic foot screening in Canada
- Related CPG recommendations
- Available diabetic foot screening tools
- Barriers to diabetic foot screening.

Recent developments will be examined and recommendations will be made to improve the rate and quality of diabetic foot screening in Canada.

Clinical Practice Guideline (CPG) Recommendations

As Table 1 indicates, CPGs from a variety of different sources are unanimous in recommending foot screening for people with diabetes.

The State of Diabetic Foot Screening in Canada

Evidence-based practice recommendations included in numerous CPGs which relate to comprehensive foot screening for people with diabetes, are not generally reflected in Canadian clinical practice. Reported Canadian screening rates are substantially lower than other high income countries. A Commonwealth Fund survey (2005) of annual foot assessments for people with diabetes placed Canada last of the six countries surveyed. Previous reports (see Figure 1) identified that only 52% of Canadians living with diabetes had undergone a professional foot exam (screening) in the previous year when compared with Australia (57%), Germany (65%),

New Zealand (66%), the United States (70%) and the United Kingdom (75%) (Schoen, 2005).

Failure to systematically undertake diabetic foot screening has detrimental consequences for patients and healthcare systems. In 2008, a survey (n=33) from St Joseph’s Health Care in London, Ontario targeted patients after they underwent a diabetes-related lower limb amputation (Goettl, 2011). The study states 44% of those patients did not have their feet assessed by a chiropodist, podiatrist, nurse or doctor in the year previous to their amputation; 18% reported never having a diabetic foot screen until after the amputation.

Canadians with diabetes are approximately 20 times more likely to be hospitalized for non-traumatic lower limb amputations than those without diabetes (PHAC, 2011). Overall, more than 60% of all lower limb amputations performed in Canadian hospitals are associated with diabetes (CIHI, 2013). Following a diagnosis of diabetes, the risk of lower limb amputation is 6% at 20 years, and 11% at 30 years (PHAC, 2011). The five-year mortality rate of those who develop first time diabetic-associated foot ulcers has been reported to be between 43% and 55%, and 74% for those with subsequent lower-extremity amputation (Robbins et al, 2008).

Diabetic Foot Screening Tools

There are a number of screening tools available for clinicians, some of which are outlined in Table 2,

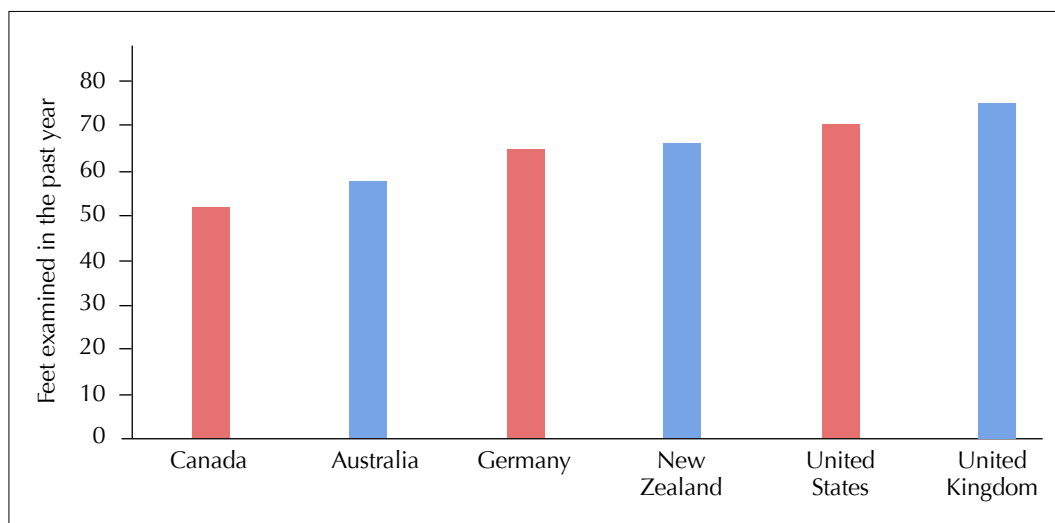


Figure 1. People living with diabetes who had received a professional foot exam in the previous year (365 days), in multiple countries. Source: Commonwealth Fund (2005).

along with a description and psychometric properties where available, as well as how to access them. When selecting a screening tool for use there are several factors to consider. A well designed screening tool can assist the clinician in collecting meaningful data to provide an assessment of the person's current health status and not only detects problems early and guides practice but provides a standard for timely, effective follow-up with the PWD, trained clinicians and service providers. Screening tools can be linked to improved decision-making for both the clinician and the person with diabetes, while allowing better management of healthcare resources through improved patient outcomes at a reduced cost to healthcare (Orsted, 2009).

The diabetic foot-screening tool used needs to be evidence-based and relevant to the characteristics

of the target population. Completing a diabetic foot screen should guide the clinician in assessment, intervention and evaluation, and follow-up; it may also identify a need for further, in-depth assessments (Inlow, 2004).

It is important that clinicians recognize that the time needed to complete a diabetic foot screening tool varies depending on clinician/patient interaction, clinical findings, and individual patient needs. The foot care specialist clinician should focus on the completeness of the screening and follow-up treatment to ensure that all the abnormal parameters for a high-risk diabetic foot have been addressed. For the non-foot care specialist, a simple tool that can be completed in a short period of time is helpful to identify the need for specialist referral.

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Table 2. Diabetic Foot Screening tools

Tool	Description	Validated
Inlow's 60-second Diabetic Foot Screen Tool (2011)	The 60-Second Diabetic Foot Screen tool requires minutes to complete, a 10-g monofilament, clinical knowledge and assessment skills. The tool supports the clinician to assign a value to each of the 12 screening tool elements. Based on the value for each category, care plans and recommendations may be provided. The sum of the scores for each foot will guide the follow-up recommended care. The tool prompts clinicians to refer the patient for appropriate care, and within a timely manner, as suggested by the IWGDF (2012). (Available at: CAWC site at http://bit.ly/hMxgqL) (Available at: CDA site at http://bit.ly/1aVgeMH)	Yes Murphy et al., (2012) Carreau et al., (2013)
Simplified 60-second foot screen (2012)	This tool requires a minute(s) to complete, a 10-g monofilament, and basic clinical knowledge for the non-foot care specialist. The simplified sixty second foot screen tool has 10 items with a positive or negative value. Each positive screen is prompted by a referral for appropriate care and a time frame as suggested by the IWGDF (2012). (Available at: http://cawc.net/index.php/resources/60-second-diabetic-foot-screen/ www.diabeticfootscreen.com or http://bit.ly/1eThqP)	Yes Sibbald et al., 2008, 2012 Ostrow et al., 2010
Diabetic Foot Risk Assessment Diabetes Care program of Nova Scotia (2009)	This tool is a brief (5-7 minutes) and basic foot care exam that highlights certain components of the foot inspection: skin and structural abnormalities, evidence of infection, ulceration, vascular disease, neuropathy and mobility. Concludes with risk categorization (also created by this group). (Available at: http://diabetescare.nshealth.ca/guidelines-resources/)	None found

“With so many healthcare professionals in a position to screen people with diabetes for ‘high-risk foot’, it is of concern that the rates of diabetic foot screening are so low.”

Barriers to screening

Time and competing clinical priorities are cited as barriers to routine foot examination (Perkins et al, 2003). The issue is complex; the PWD may not be aware of the critical importance of regular foot screening and the healthcare provider may not have the necessary assessment skills, knowledge, and systems supports. The comprehensive ‘gold-standard’ of diabetic sensorimotor polyneuropathy, which includes a physical examination and neurological history followed by electrophysiological testing, is often deemed too time intensive to be a practical screening method (Boulton et al, 2008; Perkins et al, 2003). In response, Canadian and international diabetic foot screening tools have been developed to be completed quickly, from 60 seconds to a few minutes. These tools are accessible online to clinicians and designed to be used in a variety of clinical settings (Table 2). More elaborate and costly computational screening tools for neuropathy are also available (Periyasamy et al, 2012). When teams identify the need to incorporate a diabetic foot screening tool into their program, they need the organizational, program and interprofessional team support to successfully implement and evaluate the impact of this change.

Patient level barriers

Diabetes self-management education is crucial for persons with diabetes to aid in their understanding the importance of foot screening (CDA, 2013; Lavery et al., 2007, RNAO, 2010). Most diabetes education programs include this topic; unfortunately, people newly diagnosed with diabetes do not always attend such diabetes



education programs. High risk populations, including immigrants and those living in rural areas, are particularly less likely to attend diabetes education where education on foot care is discussed (Cauch-Dudek, 2013). In the CIHI (2009) report of adults with diabetes, almost one in three surveyed had never checked their own feet. When vision is an issue (often with diabetes retinopathy), a family member or other member of the patient’s circle of care should be recruited to examine the feet daily.

Clinical responsibility, accountability and funding

Within healthcare teams, members need to identify who is responsible, accountable and funded to complete a diabetic foot screen. Reporting the findings of a foot screen, and referring patients in a timely manner, are issues that require clear accountability and communication among and between the interprofessional team members (Abu-Qamar, 2006). In many cases, people with ‘high risk foot’ are often identified by non-foot care specialists. These team members should then refer high risk people with diabetic foot abnormalities to the specialized foot care specialists/clinicians or teams for ongoing assessment and care.

Patients living with diabetes are likely to encounter a variety of professionals in the course of their diabetes care including:

- Physicians: general practitioners, endocrinologists and other medical specialists, (infectious disease, dermatology), orthopedic surgeons and other surgical specialists (general and vascular surgery).
- Nurses: nurse practitioners, inpatient and community nurses, enterostomal therapists, wound specialty nurses, and foot care nurses.
- Foot care specialists: chiropodists, podiatrists and pedorthists.
- Allied healthcare practitioners: pharmacists, dieticians, and rehabilitation specialists.

With so many healthcare professionals in a position to screen PWD for ‘high-risk foot’, and the many opportunities for such screening, it is of concern that the rates of diabetic foot screening are so low. Clearly a knowledge translation gap exists between best practice related to diabetes foot prevention and management and actual practice. It is essential that

foot screens are completed as per recommended guidelines and that patients have regular follow-up based on the risk as defined by the IWGDF (2012).

More clarity is required in Canada to formalize who is responsible for conducting foot screenings. Through clear role descriptions, established expectations and funding (where necessary), foot screening rates and this important preventative intervention can be improved.

Recent Canadian developments

The recent Council of the Federation report (2012) titled *From Innovation to Action in Health Care* sends a strong signal that Canadian healthcare policy makers are prioritizing efforts to prevent diabetes foot disease complications. For example, in 2012 the Council of the Federation Clinical Practice Guideline Working Group recommended the assessment and management of foot ulcers for people with diabetes CPG (RNAO, 2013) as one of the guidelines to be implemented across Canada.

In addition, funding from PHAC to CAWC for four consecutive years has helped raise awareness of the prevention of diabetic foot disease across Canada, for example through the CAWC's 'PEP Talk: Diabetes, Healthy Feet and You' campaign (www.cawc.net). As a significant outcome, Diabetic Foot Canada, a new division and alliance at the Canadian Association of Wound Care and of major Canadian health organizations, has been formed to support the prevention and management of diabetic foot complications (accessed at <http://www.diabeticfootcanadajournal.ca/>). Leading this alliance are the following:

- Canadian Association of Wound Care
- Canadian Diabetes Association
- Registered Nurses Association of Ontario
- Canadian Federation of Podiatric Medicine
- Canadian Home Care Association.

One of the alliance goals is to prevent diabetic foot disease, including preventable lower limb amputations, through evidence-based CPGs and timely management of abnormalities as per the benchmarks of the International Working Group for the Diabetic Foot (2012). All of these recent activities in Canada indicate a system that recognizes the seriousness of diabetes foot

disease and is committed to focus not only on the management of but also the prevention of diabetes foot disease and its complications.

Recommendations

1. Health systems must recognize the seriousness of diabetes-related foot complications. The value of diabetic foot screening can play in combating these complications. One concrete step in this challenge is to use diabetic foot care metrics as a key indicator for diabetes management, along with HgA1c, blood pressure, kidney disease and eye disease.
2. National, provincial, and local diabetic foot care strategies should be developed and use evidence-based diabetic foot screening and risk stratification tools.
3. Healthcare organizations must develop clinical expertise on the diabetic foot by implementing diabetes foot assessment, education, and screening into routine assessments.
4. Healthcare organizations must develop a dedicated funding plan that supports diabetic foot screening, re-screening of the non-high-risk foot as per guidelines. Adopt a validated diabetes foot screening tool.
5. Healthcare organizations should incorporate foot care into self-management programs to establish and reinforce the importance of foot care to people with diabetes and their circle of care.
6. Healthcare organizations should have ongoing evaluation, audits, and benchmarks to evaluate and implement quality improvement measures for the screening and management of the high-risk diabetic foot.

Conclusions

Canada needs to embrace CPG recommendations and move forward into action. Healthcare organizations and healthcare professionals have the responsibility to incorporate diabetic foot screening and high-risk complication management into routine interprofessional care. People with diabetes must be empowered to take responsibility for their foot health and deserve access to knowledgeable healthcare professionals. Together, policy makers, payers, providers, professionals and patients can prevent limb loss contributing cost-effective healthcare and quality of life. ■

“Healthcare organizations and healthcare professionals have the responsibility to incorporate diabetic foot screening and high-risk complication management into routine interprofessional care.”

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