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Diabetes Foot Care

By Michael Bovin, BSc. Pharm

Learning Objectives:

Upon successful completion of this continuing education lesson the pharmacy technician will be better able to:

- Discuss the incidence of diabetes, diabetes foot ulcers and lower limb amputation
- Discuss the progression from diabetes diagnosis to foot ulceration and amputation
- Help the pharmacy team identify diabetes patients at risk of foot complications
- Work within the collaborative care practice model to provide patients with information on reducing the risk of foot ulceration

Introduction

Diabetes is becoming a never-increasing problem worldwide. It is estimated that every 10 seconds two patients are diagnosed with diabetes somewhere in the world.¹ In Canada it is estimated that close to 5.5% of the population or 1.8 million Canadians had diabetes in 2005 and close to 2.4 million Canadians will be diagnosed with diabetes by the year 2016.¹ This increase is mainly due to lifestyle choices such as poor diet and physical inactivity.¹ The aging population, immigration from high-risk populations (e.g., South Asian, Chinese or African ancestry) and growth in the aboriginal population have also contributed to the increasing number of people with diabetes in this country.¹

The frustrating component of type 2 diabetes (the most common form of diabetes) is that the

condition is typically silent until the patient starts to experience signs of complications. Most patients with diabetes are at high risk of cardiovascular complications such as strokes, heart attacks and peripheral vascular disease (a condition leading to poor circulation in the hands and feet). Poorly controlled diabetes can also lead to complications of the eyes, kidneys and feet. Each of these complications can cause significant problems for the person with diabetes and may have a dramatic effect on their quality of life.

The pharmacy technician and the entire pharmacy staff are optimally positioned to help educate patients on the proper management of their diabetes. Foot ulceration is a potentially devastating complication of diabetes. Current clinical practice guidelines recommend

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appropriate daily foot care to reduce the risk of foot ulcers in patients with diabetes.^{1,2} Studies have demonstrated that self-care of the feet in patients with diabetes is suboptimal and that patients require constant education to adopt positive behaviours.³ This offers the technician an excellent opportunity to improve the health of patients with diabetes by reminding them of the importance of taking care of their diabetes and referring patients who require further counselling to the pharmacist.

How does this condition progress from diabetic neuropathy to foot problems?

Foot problems in patients with diabetes are commonly associated with poor blood glucose control and a condition called diabetic peripheral neuropathy (DPN). DPN is a bundle of nerve disorders caused by diabetes. It is very common and develops in 40-50% of patients within 10 years of the onset of type 1 or type 2 diabetes.¹ Most patients who develop DPN experience a slow, painless loss of sensation or a change in sensation in their extremities (hands and feet) that may only be detected through appropriate screening by a foot care specialist or diabetes healthcare professional.⁴ Although the incidence of neuropathy is high in the diabetes population, as many as 50% of people with the condition have absolutely no symptoms and are unaware they are at increased risk of foot complications.⁵

The decrease in sensation caused by DPN is especially problematic. This gradual loss of feeling may prevent patients from being able to feel small objects. Their feet may also eventually lose the ability to judge temperature or sense painful or threatening problems.⁴ The lack of sensation places a patient at risk of a major injury from such minor events as a small rock in their shoe. DPN also puts a patient at risk of developing foot ulcers, infection, gangrene and ultimately amputation.¹

DPN is the primary contributing factor for 45-60% of all foot ulcers in

diabetes patients.⁶ Foot ulcers are common in people with diabetes, with an estimated 15% of patients developing a foot ulcer during the course of their illness.⁶ Between 7-20% of diabetes patients with a foot ulcer will require lower limb amputation. Foot ulcers are precursors to approximately 85% of lower limb amputations in people with diabetes.⁶ Rapid treatment of any foot ulcer is crucial to reduce the risk of developing a severe ulcer or amputation.

Another factor that potentially increases the risk of foot ulcers is the decrease in blood flow to the feet in many patients with diabetes. This is caused by blockage of the arteries in the foot by a condition called peripheral vascular disease (PVD). As a result of PVD, the foot does not receive enough nutrients and oxygen from the blood.⁶ DPN may lead to a foot injury because the patient can't feel the damage and then PVD can lead to a poor immune reaction as the cells of the foot do not receive enough nutrients and oxygen to heal the tissues properly.

One of the primary goals for all health professionals is to reduce the risk of developing foot complications as well as reducing the risk of all of the complications

TABLE 1 – Risk factors for foot ulceration in diabetes^{7,8,6}

- Uncontrolled hyperglycemia (high blood sugar)
- Duration of diabetes (risk increases with longer duration)
- Peripheral vascular disease (PVD)
- Kidney or eye complications from diabetes
- Older age
- Diabetic peripheral neuropathy
- Structural foot deformities
- Trauma to the feet and poor fitting shoes
- Foot callus
- History of previous foot ulcer
- Limited joint mobility
- Male gender
- Cigarette smoking

associated with diabetes. The key is to identify patients at risk of foot problems and recommend strategies to prevent foot ulcers and amputations.

Which diabetes patients are at risk of foot problems?

Blood sugar control and the duration of diabetes are the major risk factors for the development of foot ulcers. Foot ulcers can be prevented in most patients if they properly manage their diabetes and maintain their blood sugar in the target range. Table 1 lists the risk factors for the development of a foot ulcer in patients with diabetes.

TABLE 2 – Key components of the foot exam in diabetes⁶

Examination of blood flow

- Pulses in the feet
- Skin colour changes
- Edema (swelling of the feet)
- Temperature differences throughout the foot

Skin evaluation

- Skin appearance (e.g., dry skin, texture, colour, quality)
- Calluses (thickened areas of skin on the foot)
- Fissures (crack) in the skin especially on the heels
- Change in hair growth pattern on the feet
- Any type of ulceration
- Tinea pedis (athlete's foot)
- Appearance of nails

Muscle and bone evaluation

- Bunion (an angular bend of the big toe, causing a bump to develop at its base; may become inflamed and painful)
- Hammertoe (toe is permanently bent down, resembling a hammer)
- Charcot deformities (a condition caused by DPN where the muscles and joints lose the ability to support the joint properly. This may lead to foot deformities that can rub against shoes and increase the risk of an ulcer)
- Joint mobility

TABLE 3 – Key components to educate a diabetes patient on foot care^{1,9-11}**Disease description, prevention and prognosis**

- A discussion of the significance of diabetes and the role of complications on the long-term quality of life and survival of the person with diabetes.
- Patients should be educated on the relationship of diabetes to foot ulceration such as:
 - diabetes is a lifelong problem and the incidence of foot complications increases with age and duration of diabetes;
 - there is no cure for diabetic neuropathy. Once the patient loses the sensation in their feet they are at higher risk of ulceration;
 - if neuropathy occurs, the patient should be educated on the significance of this and the behaviours necessary to prevent further complications.
- Patients can reduce the risk of developing foot problems by:
 - properly managing their blood sugar;
 - keeping their blood pressure and cholesterol at acceptable levels;
 - implementing a daily foot hygiene program (discussed in Table 4);
 - quitting smoking.

Proper selection of footwear for people with diabetes

- Always buy properly fitted shoes. Some patients will require orthotics to reduce the burden on areas of their feet.
- The toe box should be roomy to avoid pressure on the toes.
- Heel fit — a snug fit here is best. The shoe should not move up and down at the back.
- Heel height — no higher than one inch and the wider the better.
- Shoe should fasten with lace, velcro or a strap; fastenings should be high enough up the foot to hold it firmly.
- Shoe lining should be smooth. The front of the shoe should be as plain as possible to avoid seams in the lining of the shoe.
- Wearing socks / tights helps reduce friction within shoes.
- Avoid wearing older socks that show signs of excessive wear, such as damaged seams or holes.
- Socks with bulky seams should be worn inside out.
- Soles should be well cushioned.
- Over-the-counter insoles should be avoided as they may cause blisters if they are not the right size.
- Buy shoes in the late afternoon (since foot swelling can occur by then).

When to contact their health professional

- Any trauma to the feet, no matter how minor, needs medical attention. Even minor injuries can lead to serious infection.
- Persistent mild-to-moderate pain in the feet or legs is a sign that something is wrong. Constant pain is never normal.
- Any new blister, wound, or ulcer less than two centimetres in diameter can become a more serious problem.
- Any new areas of warmth, redness, or swelling on the feet or legs are frequently early signs of infection or inflammation. Addressing them early may prevent more serious problems.
- Pain, redness, or swelling around a toenail could mean they have an ingrown toenail. This is a leading cause of foot infections and ulceration in patients with diabetes. Prompt and early treatment is essential.
- New or constant numbness in your feet or legs can be diabetic neuropathy.
- Difficulty walking can result from arthritis (Charcot's joints), often a sign of abnormal strain or pressure on the foot or of poorly fitting shoes. Early attention is key to preventing more serious problems, including falls, as well as lower extremity skin breakdown and infections.
- Constant itching in the feet can be a sign of fungal infection or dry skin, both of which can lead to ulceration.
- Calluses or corns developing on the feet should be professionally removed. Home removal using over-the-counter products is not recommended.

How do we prevent the development of foot ulcers?

Prevention of foot ulcers in patients with diabetes involves a commitment from both health professionals and the person with diabetes.

Health professional

Health professionals are responsible for both foot exams and patient education. Foot exams are a crucial component to reduce the risk of ulceration and amputation. There are two main components to an exam: a DPN test and an overall foot health exam.

The current Canadian Diabetes Association (CDA) Clinical Practice Guidelines recommend regular screening for diabetic peripheral neuropathy.¹ This involves conducting a monofilament test. This is a simple and non-invasive test where the diabetes professional places a metal or plastic wire against certain areas of the feet. This wire will bend when a certain amount of pressure is applied and it can help detect areas of the feet where there is a potential loss of sensation. A tuning fork can also be used to test for neuropathy, but it is less accurate than the monofilament test. The current CDA guidelines recommend all patients with diabetes have their feet tested for neuropathy at least once a year.¹ For any reader interested in learning more about these tests, they are discussed in Appendix 4 of the current CDA clinical practice guidelines that are available at <http://diabetes.ca/files/cpg2008/cpg-2008.pdf>.

The foot exam is an evaluation of the overall health of the tissues of the foot. This exam involves a review of the look and feel of the foot. Some of the key components to the foot exam are listed in Table 2. Patients should also be made aware of the components of the foot exam, and advised to check their feet daily and immediately report any changes to their diabetes health professional.

Patient education is a crucial component to the prevention of foot ulcers. Patients require education on the daily care of their feet (discussed in the next section), awareness of issues that will place them at

TABLE 4 – Common components to a daily foot hygiene regimen^{1,6,10}

- Examine your feet every day using a mirror or magnifying glass to look at the tops, bottoms and sides. Be on the lookout for increased redness, bruises, scratches or dry skin or cracking. Any swelling, warmth, redness or pain should be reported to your health professional as soon as possible.
- Avoid bare feet: always wear shoes. Slippers should be worn indoors. Shoes should especially be worn at the pool or beach. When wearing sandals, be certain to use sunscreen on exposed areas of your feet to prevent sunburn.
- Wash with a mild soap and dry feet thoroughly, especially between the toes, each and every day. Test the water temperature with the wrist, forearm or elbow, not the feet. The water should be lukewarm (below 37° C) to avoid burning the feet.
- Do not soak the feet for more than 10 minutes. Soaking the feet for longer may lead to maceration and softening of the skin. This may make your feet more prone to injury.
- Treat dry skin with a sparingly applied barrier cream or lotion.
- Apply lotion to heels and soles to prevent dry or cracked skin. Do not apply lotion between the toes and wipe off excess cream.
- Cut toenails straight across and file down sharp edges. Try to avoid cutting the nails too short as this may promote ingrown toenails.
- To improve circulation to your feet, do not sit with your legs crossed. Do your best to keep moving your feet periodically.
- Daily exercise is encouraged. Routine exercise can help improve circulation in your feet and help to control high blood sugars.
- Wear soft cotton socks. There are specialized socks for diabetes patients that apply some compression to reduce swelling and have minimal seams.

higher risk of an ulcer and to know when they should seek medical attention. Table 3 lists some of the key components to a patient education program.

Patients

Diabetes patients must take an active role in reducing the risk of developing foot ulcers. This includes a commitment to perform daily foot hygiene and to work with their health professionals to ensure they receive the best possible care. Patient involvement is crucial as only 23-49% of patients in the primary care setting have their feet evaluated by a physician on a yearly basis.⁷ All health professionals should assess the patient for their ability to perform daily foot care. For example, some elderly patients have vision or mobility deficits, which would prevent them from properly examining and caring for their feet.¹²

Table 4 lists some recommendations that are important components of diabetes daily foot hygiene. The CDA and the

National Institutes of Health in the U.S. have some excellent reference material on daily foot care for patients and they are available at:

- www.diabetes.ca/about-diabetes/living/complications/foot-care/
- http://diabetes.niddk.nih.gov/dm/pubs/complications_feet/feet.pdf

Role of the Pharmacy Technician

Diabetes is a lifelong condition that requires constant lifestyle management to ensure optimal care. People with diabetes require ongoing education to remind them of the importance of good control to lower their risk of complications. Pharmacy technicians have many patient interactions such as when filling prescriptions for a diabetes medication, OTC purchases of diabetic supplies or when training a patient on a new blood glucose meter. By knowing the components of a diabetes foot care program and warning signs of foot problems, the pharmacy technician working with the

pharmacist team can help educate patients and identify patients with problems that require referral to a physician.

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QUESTIONS

You have just finished educating Mrs. Singh on the proper use of a new blood glucose meter. She has recently been diagnosed with diabetes and is a bit overwhelmed. She has discussed proper foot care with her diabetes educator and pharmacist but she wants to make sure she is doing everything right. She is really worried about foot problems as her uncle recently lost his lower leg due to complications from his diabetes.

1. What percentage of people with diabetes will develop a foot ulcer during the course of their illness?

- a. <1%
- b. 5%
- c. 10%
- d. 15%

2. Approximately what percentage of diabetes patients with a foot ulcer will require lower limb amputation?

- a. 1%
- b. 2%
- c. 15%
- d. 50%

Mrs. Singh mentions that she recently had a monofilament test done by her diabetes educator.

3. What is the monofilament test checking for?

- a. Peripheral vascular disease
- b. Diabetic peripheral neuropathy
- c. Foot blood flow
- d. a and b

4. Which of the following statements best describes a monofilament test?

- a. It is an invasive test that is cumbersome for the patient
- b. A wire is applied with enough force to allow it to bend
- c. A wire is inserted into the foot below the skin
- d. The wire is only applied to the bottom of the big toe

5. What other test can be used as a substitute for the monofilament test

- a. Foot pulses exam
- b. Examination of blood flow
- c. Tuning fork test
- d. There is no substitute for a monofilament test

Please select the best answer for each question or answer online at www.canadianhealthcarenetwork.ca for instant results.

6. Which of the following statements is TRUE regarding diabetic peripheral neuropathy?

- a. Most patients with this condition will have severe pain associated with it.
- b. Diabetic neuropathy occurs in approximately 50% of people with diabetes within 10 years of diagnosis.
- c. Diabetic peripheral neuropathy only occurs in patients with type 2 diabetes.
- d. Diabetic neuropathy is the primary contributing factor to 30% of diabetic foot ulcers.

7. How does peripheral diabetic neuropathy contribute to the development of a diabetic foot ulcer?

- a. It decreases blood flow to the feet
- b. It causes severe pain and this causes a breakdown of skin tissue
- c. It blocks the ability of vital nutrients getting to the foot
- d. It causes the patient to lose the ability to detect temperature or the ability to sense injury and trauma

8. Which of the following is NOT a risk factor for diabetic foot ulcers?

- a. Kidney complications from diabetes
- b. Cigarette smoking
- c. Female sex
- d. Older age

9. Which of the following statements is NOT a recommended component of proper diabetes education

- a. The patient should be told the risk of complications with diabetes.
- b. Patients should be told that diabetic neuropathy can be cured if the patient gets the blood sugars under control.
- c. Patients should be educated about the consequences of neglecting their feet and the possible progression from ulcer to amputation.
- d. If neuropathy occurs, the patient should be educated on its significance and the behaviours necessary to prevent further complications.

10. Which of the following can help reduce the risk of developing diabetic foot problems?

- a. Good sugar control
- b. Good blood pressure and cholesterol level control
- c. Quit smoking
- d. All of the above

Mrs. Singh has forgotten some of the information about selecting proper footwear and when she should contact her physician about foot problems.

11. When Mrs. Singh is selecting good footwear, what should she be looking for?

- a. A snug heel fit
- b. Heels one inch or greater
- c. Slide-on shoes that do not require laces or Velcro
- d. An insole that is removable, as the OTC insoles are better at reducing the risk of foot problems

12. When discussing appropriate socks for a diabetes patient which of the following is a good recommendation?

- a. Socks should be worn minimally as they increase the risk of dry skin and tissue maceration
- b. Socks with a bulky seam should be worn inside out
- c. Diabetic socks have extra compression and practically eliminate the risk of foot ulcers
- d. Any sock with holes should not be used regularly but can be used when walking around the house

13. When should Mrs. Singh contact her physician?

- a. Minor trauma to her feet
- b. Change in the temperature of her feet
- c. Numbness of her feet
- d. All of the above

14. Which of the following is a component of proper foot hygiene?

- a. Examine the feet daily
- b. Walk barefoot only in the house
- c. Wash feet in a hot bath with a mild soap
- d. Apply moisturizers to the sole, heel and between the toes

15. Which of the following foot conditions can be managed by Mrs. Singh?

- a. Minor trauma to the feet
- b. Calluses or corns
- c. Fungal infections
- d. Dry skin

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