

Can We Prevent Amputations?

Screening and early intervention for diabetic foot ulcers in patients with CKD may prevent amputations. The number of patients on dialysis with diabetes is on the rise; approaching 50%.¹ Patients with diabetes are at high risk for foot ulcers that, in turn, are a leading cause of hospitalization and amputation. Amputations are associated with significant morbidity and high cost.²

Risk Factors for Developing Diabetic Foot Problems

Most diabetic foot complications that result in amputation start with a skin ulcer. Several factors contribute to diabetic lower-limb skin ulcers, including:^{3,4}

- Decreased sensation
- Injury
- Foot deformity such as hammer toes, bunions, corns, calluses
- Poor circulation
- Edema
- Decreased sweating and dry skin; autonomic neuropathy
- Limited joint mobility
- Obesity
- Impaired vision; inadequate cleansing and inspection
- Poor glucose control; delayed wound healing
- Inadequate or ill fitting footwear; skin breakdown
- History of foot ulcer or lower extremity amputation
- Smoking

Preventing diabetic foot ulcers and recognizing them early is critical.

Patient Education: Tools and Information from the American Diabetes Association (ADA)

The first line of defense in preventing foot ulcers is to teach the patient about good self-care and hygiene of the feet. The ADA has a patient education instruction sheet, at:

<http://www.diabetes.org/type-2-diabetes/foot-care.jsp>. The website contains a wealth of information for both patients and professionals.

For Nurses: Comprehensive Foot Assessment

Assess the feet of all CKD patients with diabetes on initial visit and monthly. Look for structural abnormalities, pedal pulses, color, ulcerations, and signs of infection. The following components should be included in the assessment:

- Ask the patient about any complaints related to their feet such as pain, coldness, tingling, and/or numbness. Find out if they are limber enough and see well enough to inspect and wash their feet themselves, or if they need (and have) assistance. Ask about any remedies they may use to care for their feet.
- Ask about ability to walk and exercise. Ask about foot pain or difficulty while walking, including how long they have had pain. Assess for musculoskeletal deformities such as hammer toes, claw toes, corns, calluses, bunions and Charcot foot.
 - Charcot foot is a sudden softening of the bones in the foot that can occur in people who have significant neuropathy.

<http://www.diabetes.niddk.nih.gov/dm/pubs/neuropathies/> See also:
<http://www.footphysicians.com/footankleinfo/charcot-foot.htm>

- Assess for decreased sensation. Use a Semmes-Weinstein monofilament if available. For help: http://diabetes.acponline.org/custom_resources/tools/using_10g_monofilament.pdf?dbp
- Examine the skin and hair growth. Patients with poor blood circulation to the lower extremities may have skin that is fragile, shiny and hairless
- Assess feet for dryness. Autonomic neuropathy may cause drying and cracking of the skin. Recommend a bland lotion, applied on top or bottom of the feet, but not between toes.
- Inspect toenails for excessive thickness, deformity, fungal growth, or in-growth. Examine skin between the toes for cleanliness, cracks, and sores. If present, refer to a Podiatrist.
- Palpate pedal, dorsalis pedis, and posterior tibial pulses. Absence of these pulses should be reported to the physician or NP. Select the following links for hints on location:
<http://www.netterimages.com/image/2632.htm>,
<http://www.la.ac.uk/ibls/US/fab/tutorial/generic/sapulse.htm>.
- Examine socks and shoes for presence of blood or drainage, abnormal wear patterns, fit, and appropriate foot protection.² Report the presence of blood or drainage for appropriate culturing and antibiotic therapy.
- Ulcers usually develop over areas of bony prominence and the pad and heels of the foot. Bunions, calluses and hammer-toes may be prone to irritation and ulceration. If pressure points are noted, suggest that the patient see a Podiatrist. Caution against use of commercial nail salons for foot care.
- Ask the patient if they feel burning, tingling, or numbness in their feet. They could easily be unaware of an infection or ulcer. Over 80% of patients with foot wounds have symmetric polyneuropathy, or loss of sensation. Patients with neuropathy may be unable to feel an injury, and are especially prone to burns from hot water or heating pads.
- Assess feet for color, temperature, and vascular refilling. Note if the feet appear bluish, reddish, or pale. Feel the feet. Cold feet may be a symptom of poor circulation. Gently press the skin just enough to make the skin blanch. If it does not immediately “pink-up” when you release pressure, it may be a symptom of vascular problems.

If you have access to a Doppler blood pressure instrument, you can perform an assessment of the lower vascular system called the Ankle-Brachial Index (ABI). The ABI is the ratio of systolic blood pressure in the ankle compared to an arm measurement with a handheld Doppler instrument. An ABI of less than 0.9 indicates peripheral vascular disease. Complete directions for calculating the ankle-brachial index and test result interpretation can be found at <http://www.webmd.com/heart-disease/ankle-brachial-index-test>. Refer suspected vascular problems to the nephrologist and vascular surgeon.

Prevention of Ulcers and Amputations

To prevent foot complications in patients with diabetes regularly screen for problems. Locking-Cusolito, et al⁵ conducted a onetime assessment of risk in 230 subjects in a hemodialysis unit in Canada. They found that dry skin, cracked/fissured skin, claw toes, calluses and ingrown toe nail, all of which increase the risk for ulcers, were common and are very responsive to simple interventions such as moisturizing, therapeutic footwear and basic podiatry care. Although 75% of the subjects had adequate vision and 60% had adequate dexterity and 55% had adequate flexibility for self care, only 2.6% of the subjects were performing adequate foot self-care. See tips about adequate self-care, above under Patient Education.

A multidisciplinary foot-screening program is an excellent way to identify potential problems before they become complications. An example is a foot screening program developed by the Louisiana State School of Medicine called Lower Extremity Amputation Prevention Program (LEAP). To find ideas you can use, follow the link

<http://www.medschool.lsuhs.edu/dfp/download.html>. The website contains examples and instructions for foot screening, illustrations, and a simple, one-page evaluation form.

Management of Foot Infections Related to Diabetes

If ulceration or infection is present, obtain a vascular surgical consultation and orders for cultures and appropriate antibiotic therapy. Assessment for underlying osteomyelitis is very important and requires four to six weeks of culture-directed antibiotic therapy.³ Treatment may include rest and elevation of the affected foot, debridement of necrotic and fibrotic tissue, application of topical medications and dressings. Treatment of underlying vascular ischemia may be necessary. Read an excellent review of the nurse's role in managing diabetic foot ulcers at

<http://www.nursingcenter.com/pdf.asp?AID=604643>

Summary

- Patients with diabetes and CKD are at high risk for lower limb amputation.
- The first line of defense in preventing foot ulcers is patient education.
- Forming a designated team to screen patient's feet regularly is a good way to start.
- Assessment for potential problems will assure timely interventions and referrals to prevent amputations.

Create a "Foot Day" in Your Practice

All CKD patients should have foot assessment on admission and regularly thereafter. The frequency should be established by care-givers at a manageable but regular interval. For example, in a dialysis unit, "foot day" could be held once per month, perhaps in conjunction with medication reviews. Use the table below to get started. Be sure to tailor to your practice and patient needs.

Create a “Foot Day”		
Task	Components	Action Steps
Obtain support from management	Medical Director, Facility Nursing Director	Foot screening will require resources and be largely un-reimbursed. Enlist facility leadership to support the prevention of diabetic or vascular ulcers. Explain that it is cost-effective because it will help to keep patients out of the hospital.
Choose “Foot Team” for referrals	Physician, NP, Primary Nurse, Podiatrist, Vascular Surgeon	Identify practitioners willing to see your patients. Can/will they come to your clinic?
Establish date and frequency	All patients should be screened on admission and regularly thereafter	Determine what is reasonable for your setting. When do you have the most RN staff? Do you want to accomplish other tasks on this day, such as medication checks, team meetings, etc that require the presence of extra staff?
Obtain supplies	Basins for soaking, bland lotion (such as Cetaphil), Teflon dressings, triple ointment.	Supplies will depend upon the type of screening and basic care your facility can provide. Staffing, space, ability to provide privacy and aseptic technique for wound care may limit this. But consider that if you find a wound on screening, you will need supplies to deal with it.
Assign and define roles	NP, Primary RNs, a “Foot Care Nurse”	Consider the care model used in your facility. Do you have teams, primary care, or another model? How will this activity fit in? Or, are there one or two nurses, or a “foot team” who want to take on this challenge? Determine boundaries for care your unit can provide and specify what should be referred.
Develop Screening tools and policies and procedures.	A comprehensive foot screening model is available on-line from Louisiana State University. The link below includes sample forms and detailed instructions on foot assessment. Tailor these materials to your own needs and develop your policies and procedures based on the screening you undertake. http://www.medschool.lsuhsu.edu/dfp/download.html	

Other Helpful Resources

National Diabetes Education Program <http://ndep.nih.gov/resources/feet/prevention-early-intervention.htm>

Resources for professionals including a monograph titled *Feet can last a lifetime*, includes reference and resource materials, illustrations, foot exam format and checklist, sources for monofilaments, diagram for testing with monofilament and patient education materials.

National Diabetes Information Clearinghouse <http://www.diabetes.niddk.nih.gov>

Resources for lay people and professionals caring for individuals with diabetes containing an A-Z list of diabetes topics including a 9 page patient education handout, *Prevent diabetes problems: Keep your feet and skin healthy*.

American Diabetes Association <http://www.diabetes.org>

This useful site contains general information for patients and professionals, including a helpful tool kit on diabetes and cardiovascular disease, weight loss, and recipes.

References

1. United States Renal Data System, 2007 Annual Data Report. <http://www.usrds.org>
2. National Diabetes Education Program, 2008, <http://ndep.nih.gov>
3. Frykberg, R. (2002). Diabetic foot ulcers: Pathogenesis and management. *American Family Physician*, 66 (9), 1655-1662.
4. Armstrong, D. & Lavery, L. (1998). Diabetic foot ulcers: Prevention, diagnosis and classification. *American Family Physician*, 57 (6), 1325-1337.
5. Locking-Cusolito, H., Harwood, L., Wilson, B., Burgess, K., Elliot, M., Gatto, K. et al (2005). Prevalence of risk factors predisposing to foot problems in patients on hemodialysis. *Nephrology Nursing Journal*, 31 (1) 53-61.