The 2 Minute Diabetic Foot Exam

Nancy Lufkin ANP-BC
Hopefully, today we will learn to:

- Reduce the economic, social, physical, and psychological impact of diabetes in Wisconsin (and throughout the US) by enhancing the quality of services.

American College of Foot and Ankle Surgeons 2006
Diabetics

- 371 million people around the world living with diabetes
- Projected there will be 552 million by 2030
- 6.79 billion 2009 people in the world (SIRI)
- An estimated 7% of Americans are afflicted with diabetes and with the longevity of this population increasing, the prevalence of diabetes–related complications will continue to rise.
Foot Ulcers

- A person with diabetes has a 15%-25% chance of developing a foot ulcer and a 50%-70% recurrence rate over ensuing 5 years.
- Up to 1 in 4 patients with diabetes will develop a foot ulcer in their lifetime ADA 8/20/2012 Boulton AJ, et al Lancet 2005
- A foot ulcer precedes a lower-limb amputation in 85% of the cases.
Risks of amputation

- Statistically 5 years after the first amputation 50% of the individuals will have a second amputation.
- Lower limb loss is also associated with a 50% death rate, carrying a worse prognosis than breast or prostate cancer.
The one year amputation rate of a person with diabetes and a foot ulcer is 15%.

The presence of diabetes increases the risk of a nontraumatic lower-limb amputation 20 fold, and worldwide 25%–90%.
Education for secondary prevention of foot Ulcers in people with diabetes

- 87 (mean age 63.5) patients in the interventions group
- 85 control patients (mean age 64.9)
- No significant differences were observed between groups were comparable at baseline (p>0.05) in ulcers were observed between groups in ulcer incidence at either 6 months (intervention 30%, control 21%) or 12 months.
- Conclusions There no evidence that this programme of targeted education was associated with clinical benefit in this population when compared with usual care.
Clinical Practice Guidelines

Foot disorders are the leading causes of hospitalization for persons with diabetes and account for billion-dollar expenditures annually in the US.

Although not all foot complications can be prevented, dramatic reductions in frequency have been achieved by taking a multidisciplinary approach to patient management.
From this to this!
The 2 minute foot exam

- Dr. R. Gary Sibbald
  BSc, MD, Med, FRCP(C)(MedDerm), MACP, FAAD, MA
- Developed a diabetic foot exam that takes 60 seconds per foot. The form that accompanies it helps to speed you on your way with the exam and decide on risk and referral needs.
- Dr. Sibbald became aware that in Guyana infected diabetic foot ulcers were the most common reason for admission to a surgical ward, almost half of the admitted patients with foot complications underwent amputations.
## Screening for the High Risk Diabetic Foot: A 60-Second Tool (2012)

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### Name: __________________________

### ID #: ____________________________

### Phone #: _________________________

### Facility: _________________________

### DOB (dd/mm/yyyy): ___________________________

### Gender: M ☐ F ☐ Years with diabetes: ___________

### Ethnicity: Black ☐ Asian ☐ Caucasian ☐ Mixed ☐ Other ☐

### Date of Exam (dd/mm/yyyy): ___________

### CHECK BOTH FEET

(Circle correct response)

"YES" on either foot = HIGH RISK

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### HISTORY

1. Previous ulcer ☐ NO ☐ YES

2. Previous amputation ☐ NO ☐ YES

### PHYSICAL EXAM

3. Deformity ☐ NO ☐ YES

4. Absent pedal pulses (Dorsalis Pedis and/or Posterior Tibial) ☐ NO ☐ YES

### FOOT LESIONS

Remember to check 4th and 5th web spaces/nails for fungal infection and check for inappropriate footwear.

5. Active ulcer ☐ NO ☐ YES

6. Blisters ☐ NO ☐ YES

7. Ingrown toenail ☐ NO ☐ YES

8. Calluses (thick plantar skin) ☐ NO ☐ YES

9. Fissure (linear crack) ☐ NO ☐ YES

### NEUROPATHY

MORE THAN 4/10 SITES LACING FEELING = "YES"

10. Monofilament exam (record negative reaction):

   a) Right _______/10 negatives (≥ 4 negatives = Yes)

   b) Left _______/10 negatives (≥ 4 negatives = Yes)

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Total # of YES: _______

Total # of YES: _______

### PLAN

a) POSITIVE SCREEN- Results when there are one or more “Yes” responses. Refer to a foot specialist or team for prevention, treatment and follow up. (Bony deformity, current ulcer, absent pulse are most urgent). These individuals are at increased risk of a foot ulcer and/or infection. Patients should be educated on what changes to observe and report, while waiting for the specialist appointment.

   Referral to: __________________________

   Appointment time: ______________________

b) NEGATIVE SCREEN- Results when there are all “No” responses. No referral required. Educate patient to report any new changes to their healthcare provider and re-examine in 1 year.

   One Year Date for Re-Examination (dd/mm/yyyy): ___________/__________/___________

### Completed By: __________________________

### Date: __________________________
10 questions for Screening

- Previous Ulcer
- Previous amputation
- Deformity
- Ingrown toenail
- Presence of Pedal Pulses
- Active Ulcer
- Blisters
- Callus Fissure
- Monofilament exam
Pathogenesis of Diabetic Foot Ulcers

- Diabetic peripheral neuropathy is a length-dependent, mixed sensorimotor demyelinating and axonal process affecting multiple nerve fiber subtypes.
- **Most Common**
  - Sensory Neuropathy
  - This leads to loss of protective sensation
- **Less common**
  - may produce intrinsic foot muscle or
- **Motor Neuropathy**
Less Common
Motor neuropathy which leads to intrinsic foot muscle atrophy and subsequent anatomy foot deformity such as clawfoot, hammertoes, charcot foot. Range of motion limitations are also thought to result from direct glycosylation of tendons in the lower extremity.
All People with Diabetes

- Current clinical recommendations are for a comprehensive foot examination at least once a year
- If the patient has neuropathy the patient should have a visual inspection of their feet at every contact with a health care provider
- This is to identify high risk foot conditions
- Such as-----
Famous Diabetics

- Mary Tyler Moore
- Wilford Brimley
- Clarence Clemons
- Jay Cutler
- Halle Berry
WHAT CAN GO WRONG?

- Bunions
- Flat feet
- Plantar Fascitis
- Hammer Toes
- Ingrown toenails
- Broken toes
- Achilles rupture
Bunions

Hammertoes
Flat Feet vs normal
Plantar Fasciitis
HAMMERTOES
Ingrown toenail
Charcot Foot
Achilles Rupture
Which can cause---
The following factors increase the chance of developing diabetic foot ulcers. If the patient has diabetes and any of these other risk factors:

- **Diabetic Neuropathy** (numbness, tingling, or burning sensation in the feet)
- **Peripheral Vascular Disease**
- Improperly fitted shoes
- A foot deformity
- A history of **Tobacco Use Disorder**
Causes of Diabetic Foot Ulcer

• Remember-------

Diabetes can damage the nerves of the legs and feet so the patient may not feel a blister or sore when it begins to appear. If undetected, the sore may become larger and infected. This may lead to an amputation of a toe, a foot, or even a leg.
Hx of foot ulcers:
• Poor circulation
• Foot deformity
• Neuropathy
Effects of smoking on tissue
A Look At Numbers

- 45.3 million people; highest in American Indian/Alaska Native (31.9%)
- Worldwide tobacco deaths > 5 million/yr.
- In US, tobacco deaths 1/5
- On avg. smokers die 13-14 yrs. earlier than nonsmokers
- Each day ~1000 persons under 18 yrs. begins daily smoking
- ~ 69% smokers want to quit

Composition Cigarette Smoke

- Contains more than 4500 compounds
- Nicotine, CO, HCN: tobacco elements that impair healing
- Nicotine: liberates catecholamines $\rightarrow$ vasoconstriction, decreases tissue perfusion
- CO: binds hemoglobin causing O$_2$ sat curve to left
- HCN (Hydrogen Cyanide): affects cellular oxygenation
The diagram illustrates various substances found in cigarettes:

- **Butane**: Lighter fluid
- **Cadmium Batteries**
- **Candle Wax**
- **Stearic Acid**
- **Toluene**
- **Hexamine**: Industrial solvent
- **Nicotine**
- **Ammonia**: Toilet cleaner
- **Acetic Acid**: Vinegar
- **Methane**: Sewer gas
- **Arsenic**: Poison
- **Carbon Monoxide**: Car exhaust
- **Methanol**: Rocket fuel

These substances highlight the harmful and potentially hazardous components of cigarette smoke.
1. Proliferative response: impairs fibroblast function by decreasing cell count, decreasing chemotaxis and migration into wound, reduces epidermal regeneration, and increases connective tissue degradation.

2. Leads to: tissue/wound necrosis, dehiscence, surgical infection, delayed healing, unhealed tissue.

3. Smoking abstinence: will reverse inflammatory cell response; however, proliferative response remains impaired.

4. Dysfunctional PMN & macrophage bactericidal activity causes reduced oxidative killing mechanisms: in vivo studies of PMN and monocyte chemiluminescence have shown that the oxidative burst in smokers is reduced by more than half compared with never smokers.
# Normal Wound Healing

## Wound Healing Phases

### Inflammatory
- 1) Immediate to 2-5 days
- 2) Bleeding stops (haemostasis)
  - i) Constriction of the blood supply
  - ii) Platelets start to clot
  - iii) Formation of a scab
- 3) Inflammation
  - i) Opening of the blood supply
  - ii) Cleansing of the wound

### Proliferative
- 1) 5 days to 3 weeks
- 2) Granulation
  - i) New collagen tissue is laid down
  - ii) New capillaries fills in defect
- 3) Contraction
  - i) Wound edges pull together
- 4) Epithelialization
  - i) Cells cross over the moist surface
  - ii) Cell travel about 3 cm from point of origin

### Maturation
- 1) Collagen forms which increases tensile strength to wounds
- 2) Scar tissue is only 80 percent as strong as original tissue
- 3) 3 weeks to 2 years
Normal Bone Healing

**Inflammation**
Soon after a fracture occurs, a hematoma forms at the injury site. Macrophages and inflammatory leukocytes move into the damaged area to scavenge debris and begin producing the pro-inflammatory agents that initiate healing.

**Soft callus**
Inflammation triggers cell division and the growth of new blood vessels. Among the new cells, chondrocytes secrete collagen and proteoglycans, creating fibrocartilage that forms the soft callus.

**Hard callus**
Through endochondral ossification and direct bone formation, woven bone replaces the soft callus to create a hard callus around the broken fragments of bone.

**Remodeling**
Over time, mechanically strong, highly organized cortical bone replaces the weaker, disorganized woven bone. Because it is continually remodeled, bone is the only tissue to heal without a scar.
Tobacco’s Effects

- Increases incidence of soft tissue injury
- Wound healing: postoperative infection
- Bone healing: delayed/nonunions, osteotomy healing, implant loosening

• Moller et al.: effect preop smoking intervention on postop complications
• Randomized: n=120, 1:1 ratio
• Assigned control group or smoking intervention
• Intervention included: counseling & NRT
• Complication rate: control (52%), smoking intervention (18%)
• Most sign. effect intervention seen in wounds (5% vs. 31%)

Postoperative Infections

- Postop ankle fractures & impact of smoking on complications
- Prospective study: n=906
- @ 6 wks. smokers had 30.1% vs. 20.3% any kind postop complication
- Smokers had 6x higher odds of developing deep wound infection

Bone Healing

- Relative risk of nonunion smokers vs. nonsmokers
- Case control study: 22 pts. matched to 22 controls
- Relative risk of nonunion increased 3.75 x for smokers vs. nonsmokers
- If pts. had no known risk factors for nonunion, risk of nonunion in smokers was 16x that of nonsmokers

STOP SMOKING: OUR RESPONSIBILITY!

- **Why:** 1. increases risk of post-op complications, 2. “teachable moment”
- **When:** perioperative (@ least 12 hrs. before) & postoperative
- **(1 week)abstinence**
- **How:**
  - 1. Counseling: physician advice < 3 min., group, telephone
  - 2. Pharmacotherapy (NRT): gum, inhalers, patches, lozenges, bupropion, clonidine, chantix

Let’s try to prevent this!
VHA FOOT CARE RISK CATEGORIES

HIGH RISK

- Documented PAD
- Documented Sensory neuropathy
- Prior history of foot ulcer or amputation
- Frequent office visits
VHA FOOT CARE RISK CATEGORIES

• MODERATE RISK
  • Visually impaired
  • Physically impaired
  • Neuromuscular diseases, i.e. Parkinson’s disease
  • Severe arthritis and spinal disc disease
  • Cognitive dysfunction
  • Chronic anticoagulation therapy
VHA FOOT CARE RISK CATEGORIES

Lower Risk

- Greater than 70 years old without other risk factors
- Diabetes without foot complication
- Obesity
- Annual visit
The National Diabetes Education Program (NDEP). A partnership among the National Institutes of Health, the Centers of Disease Control and Prevention and others such as Indian Health Service, VHA, American Podiatric Medical Association suggested these Risk Categories And how they should be followed.
RISK CATEGORY

HIGH
- One or more of the following
- Loss of protective sensation
- Absent pedal pulses
- Foot deformity
- History of foot ulcer prior amputation

LOW
- None of the five high risk characteristics listed
High Risk Patients

- Annual comprehensive exam
- Visual foot exam at every visit
- Teach preventive self care
- Refer to specialists and educator
- Assess for and prescribe appropriate foot wear
- Certify medicare patients for therapeutic shoe benefits
Medicare provides coverage for depth-inlay shoes, custom-molded shoes and shoe inserts for people with diabetes who qualify under Medicare Part B.
How to Certify by MD/Provider

- Has diabetes & Has one or more of the following conditions in one or both feet;
- HX of partial foot amputation
- Hx of pre-ulcerative callus
Services Otherwise Excluded From Coverage
NP services may not be covered if they are otherwise excluded from coverage even though a NP may be authorized by State law to perform them. For example, the Medicare law excludes from coverage routine foot care, routine physical exams, and services that are not reasonable and necessary for the diagnosis or treatment of an illness or injury or to improve the functioning of a malformed body member. Therefore, these services are precluded from coverage even though they may be within a NP’s scope of practice under State law. May 2006 CMS
Foot Exam: Part B covers a foot exam every 6 months for people with diabetic peripheral neuropathy and loss of protective sensations, as long as they haven’t seen a foot care professional for another reason between visits. In 2012, Pt pays 20% of the Medicare-approved amount for the doctor’s services. In a hospital outpatient setting, they have a copayment. ICD-9 codes 250.00-250.93 NDEP
Symptoms of Diabetic Foot Ulcer

These factors increase the chance of developing a foot ulcer.

- Sores, ulcers, or blisters on the foot or lower leg
- Pain
- Walking with difficulty
- Discoloration in feet: black, blue, or red
- Cold feet
- Swollen foot or ankle
- Fever, skin redness or swelling, or other signs of infection
Tests may include the following:

Wound culture to determine if an infection is present

X-ray - to determine if there is evidence of infection in the bones such as Osteomyelitis
CT scan - to evaluate a suspected abscess
MRI scan - to evaluate an abscess or rule out osteomyelitis
Doppler or arteriographic studies - to assess for adequate blood flow to feet, which is necessary for healing
Blood glucose and glycohemoglobin test
Complete blood count to determine if there is an infection
CRP to assess inflammation
<table>
<thead>
<tr>
<th>Grade</th>
<th>Lesion</th>
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<tr>
<td>0</td>
<td>No open lesions; may have deformity or cellulitis</td>
</tr>
<tr>
<td>1</td>
<td>Superficial diabetic ulcer (partial or full thickness)</td>
</tr>
<tr>
<td>2</td>
<td>Ulcer extension to ligament, tendon, joint capsule, or deep fascia without abscess or osteomyelitis</td>
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<tr>
<td>3</td>
<td>Deep ulcer with abscess, osteomyelitis, or joint sepsis</td>
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<tr>
<td>4</td>
<td>Gangrene localized to portion of forefoot or heel</td>
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**WAGNER ULCER CLASSIFICATION SYSTEM**

Extensive gangrenous involvement of the entire foot
SFVHA when we admit a patient with infected diabetic foot ulcer we use----=

IV Vancomycin and Zosyn
Or
IV Vancomycin and Irtapentem
Deppending on the
<table>
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<tr>
<th>Scenario</th>
<th>Drug of choice</th>
<th>Alternatives</th>
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<tbody>
<tr>
<td>Mild to moderate, localized</td>
<td>Dicloxacillin (Pathocil)</td>
<td>Cephalexin (Keflex);</td>
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<tr>
<td>cellulitis (outpatient)</td>
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<td>amoxicillin/clavulanate potassium</td>
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<tr>
<td></td>
<td></td>
<td>(Augmentin);</td>
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<td></td>
<td></td>
<td>oral clindamycin (Cleocin)</td>
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<tr>
<td>Scenario</td>
<td>Drug of choice</td>
<td>Alternatives*</td>
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</tr>
<tr>
<td>Moderate to severe cellulitis</td>
<td>Nafcillin (Unipen)</td>
<td>Cefazolin (Ancef);</td>
</tr>
<tr>
<td>(inpatient)</td>
<td>or oxacillin</td>
<td>clindamycin IV;</td>
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<tr>
<td></td>
<td></td>
<td>vancomycin (Vancocin)</td>
</tr>
<tr>
<td>Scenario</td>
<td>Drug of choice</td>
<td>Alternatives</td>
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<tr>
<td>Moderate to severe Cellulitis with Ischemia or Significant Local necrosis</td>
<td>Ampicillin/sulbactram</td>
<td>Ticarcillin/clavulanate (Timentin); piperacillin/tazobactam (Zosyn); clindamycin plus ciprofloxacin (Cipro); ceftazidime (Fortaz) or cefepime (Maxipime) or cefotaxime (Claforan) or ceftriaxone (Rocephin) plus metronidazole (Flagyl); cefazolin (for Staphylococcus aureus); nafcillin (Unipen); oxacillin</td>
</tr>
<tr>
<td>Scenario</td>
<td>Drug of Choice</td>
<td>Alternative</td>
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<tr>
<td>Life- or limb-threatening infection</td>
<td>Ticarcillin/clavulanate or piperacillin/tazobactam, with or without an aminoglycoside</td>
<td>Clindamycin plus ciprofloxacin or tobramycin (Nebcin); clindamycin plus ceftazidime or cefepime or cefotaxime or ceftriaxone; imipenem/cilastin (Primaxin) or meropenem (Merrem); vancomycin plus aztreonam (Azactam) plus metronidazole; vancomycin plus cefepime; ceftazidime plus metronidazole</td>
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Practice Pearls

- The high risk diabetic foot (for future ulceration) can be identified with a 60 second tool 2012
- Screening of feet for persons with diabetes mellitus couple with management of hemoglobin A1c levels and blood pressure are important components of the plan of care
• Foot screening has identified that 37% to 48% of persons with diabetes have a high risk of developing an ulcer.

• Increased foot ulcer risk is associated with previous amputations, previous ulcers, peripheral vascular disease or neuropathy.
Continuation

• A 10-g monofilament examination (4 or out of 10 negative responses) can determine a loss of protective sensation.
• Inspection of the foot can detect bone or skin abnormalities
  • Bony changes: claw or hammer toes, charcot changes
  • Skin changes: ingrown toenail, callus, blister, ulcer, fissure
Cost

- According to the CDC 2011 fact sheet total direct and indirect diabetes cost in the US as 2007 is $174 billion, with $116 billion for direct medical costs and $58 billion for indirect costs.(2)

- The cost annually to the US healthcare system is estimated to be $10.9 Billion

- Anywhere from $16,488 to $66,215 per amputation. Table 1 (10-15)
A lower limb amputation, with half these being major amputations

As part of the comprehensive amputation prevention program introduced in 2008(25), there was a need to develop a simplified tool that did not require a calculation for risk status and that could be administered in less than 1 minute
The 3 S’s of DM Ulcer Prevention

Screening

Stop Smoking

Shoes

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REFERENCES

American College of Foot and Ankle Surgeons: Diabetic Foot Disorders, A clinical practice guideline. September/October 2006 Volume 45, Number 5.


VHA Directive 2009-030 Attachment A June 16, 2009 Prevention


Ramsye et al. Diabetes care 199

Reiber, Diabet. Med. 1996;13 (supp1) S6-S11


