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.

The Journal of Foot and Ankle Surgery September/October 2006 Volume 45 Number 6 Supplement

From this to this!

The 2 minute foot exam

- Dr. R. Gary Sibbald BSc,MD,Med,FRCPC(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)

Name: _____

ID#: _____ **Phone #:** _____ **Facility:** _____

DOB (dd/mm/yy): _____/_____/_____

Gender: M □ F □ Years with diabetes: _____

Ethnicity: Black □ Asian □ Caucasian □ Mixed □ Other □

Date of Exam (dd/mm/yy): _____/_____/_____

CHECK BOTH FEET
(Circle correct response)

"YES" on either foot = HIGH RISK

		LEFT		RIGHT	
HISTORY	1. Previous ulcer	NO	YES	NO	YES
	2. Previous amputation	NO	YES	NO	YES
PHYSICAL EXAM	3. Deformity	NO	YES	NO	YES
	4. Absent pedal pulses (Dorsalis Pedis and/ or Posterior Tibial)	NO	YES	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	NO	YES
	6. Blisters	NO	YES	NO	YES
	7. Ingrown toenail	NO	YES	NO	YES
	8. Calluses (thick plantar skin)	NO	YES	NO	YES
	9. Fissure (linear crack)	NO	YES	NO	YES
NEUROPATHY *MORE THAN 4/10 SITES LACKING FEELING = "YES"*	10. Monofilament exam **(record negative reaction):** a) Right_____/10 negatives (≥ 4 negatives = Yes) b) Left_____/10 negatives (≥ 4 negatives = Yes)	NO	YES	NO	YES
		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/yy): _____/_____/_____

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

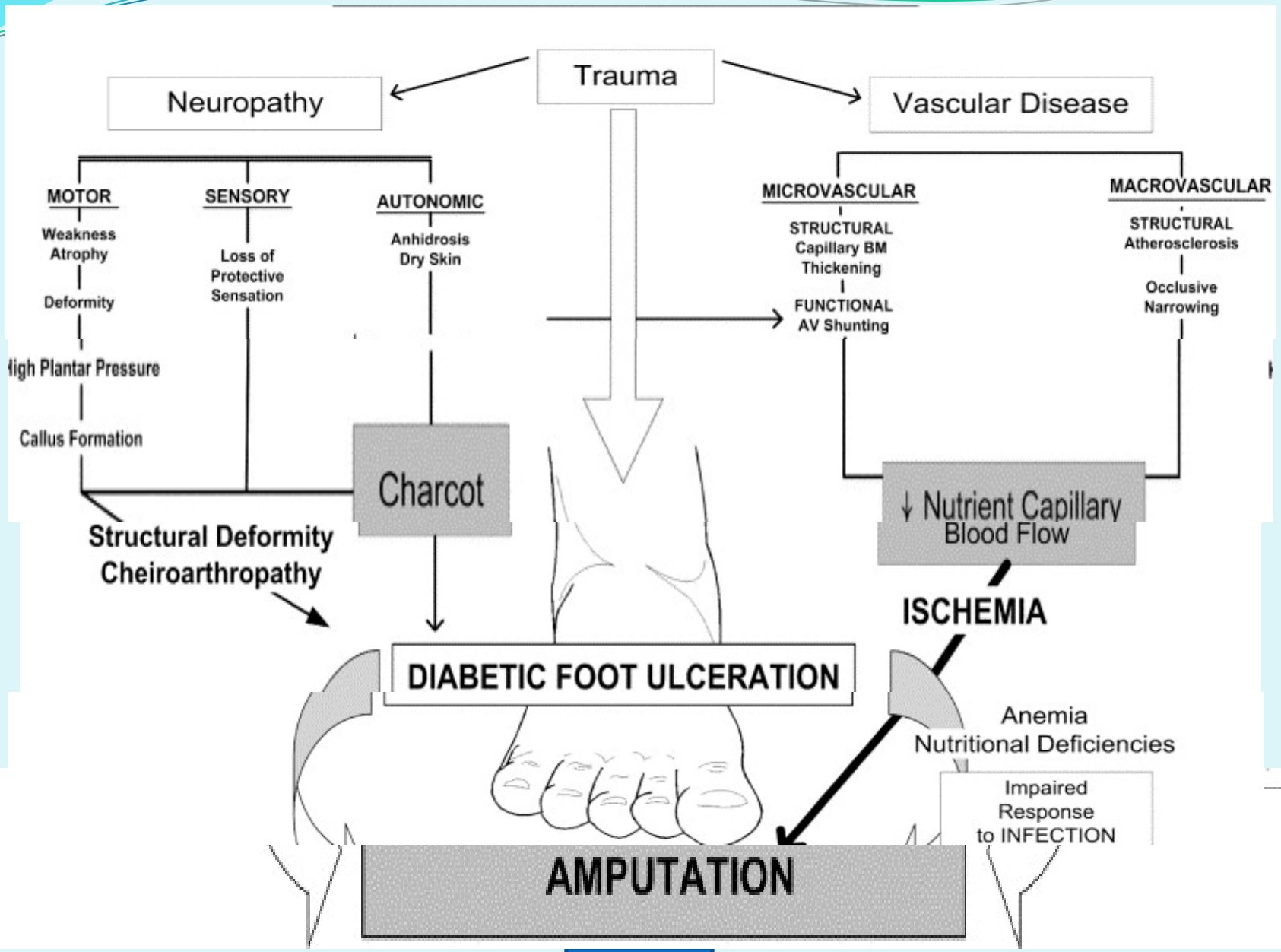
Pathogenesis of Diabetic Foot Ulcers

- 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.

DIABETES MELLITUS



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?

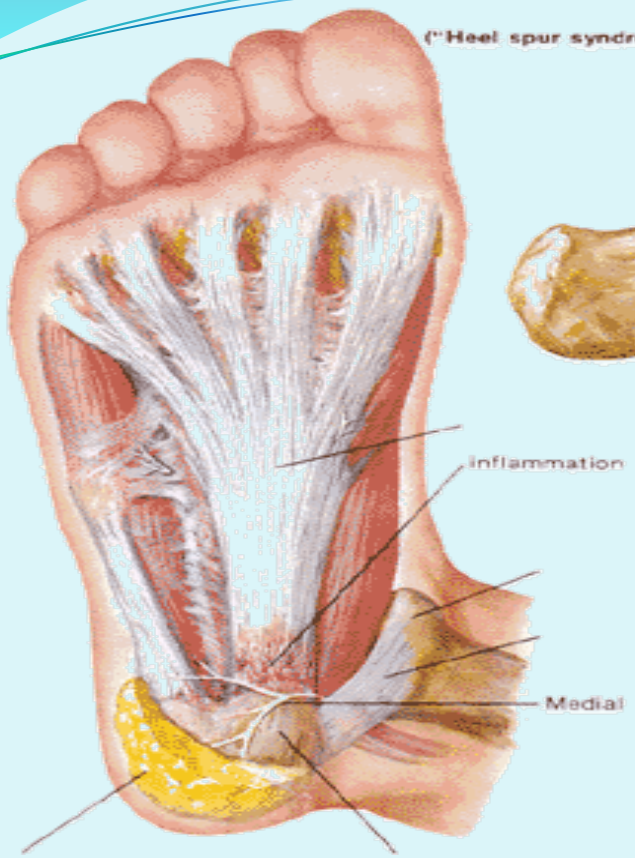
- Bunions
- Flat feet
- Plantar Fascitis
- Hammer Toes
- Ingrown toenails
- Broken toes
- Achilles rupture

Bunions

Hammertoes

Flat Feet vs normal

Plantar Fasciitis

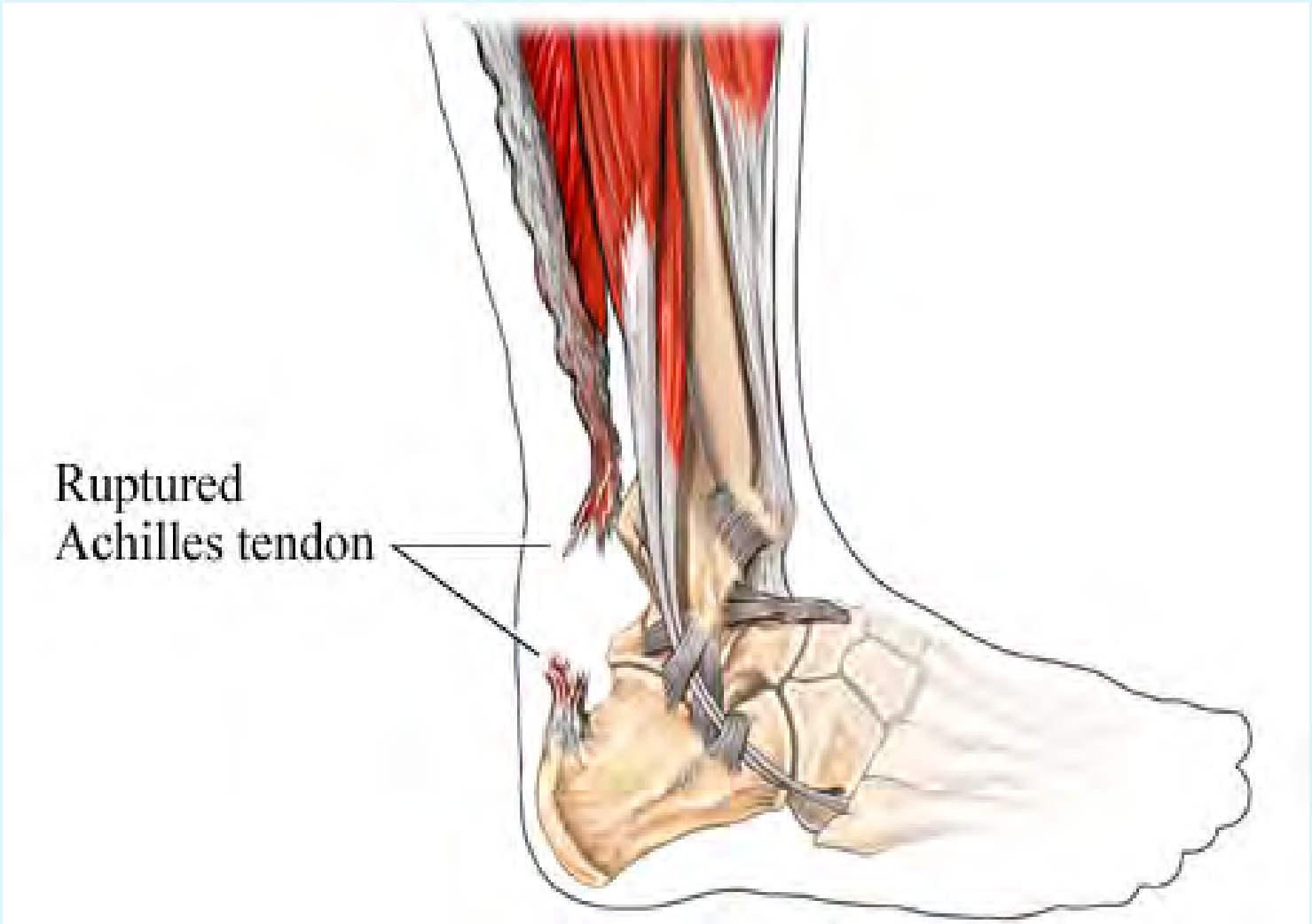


HAMMERTOES

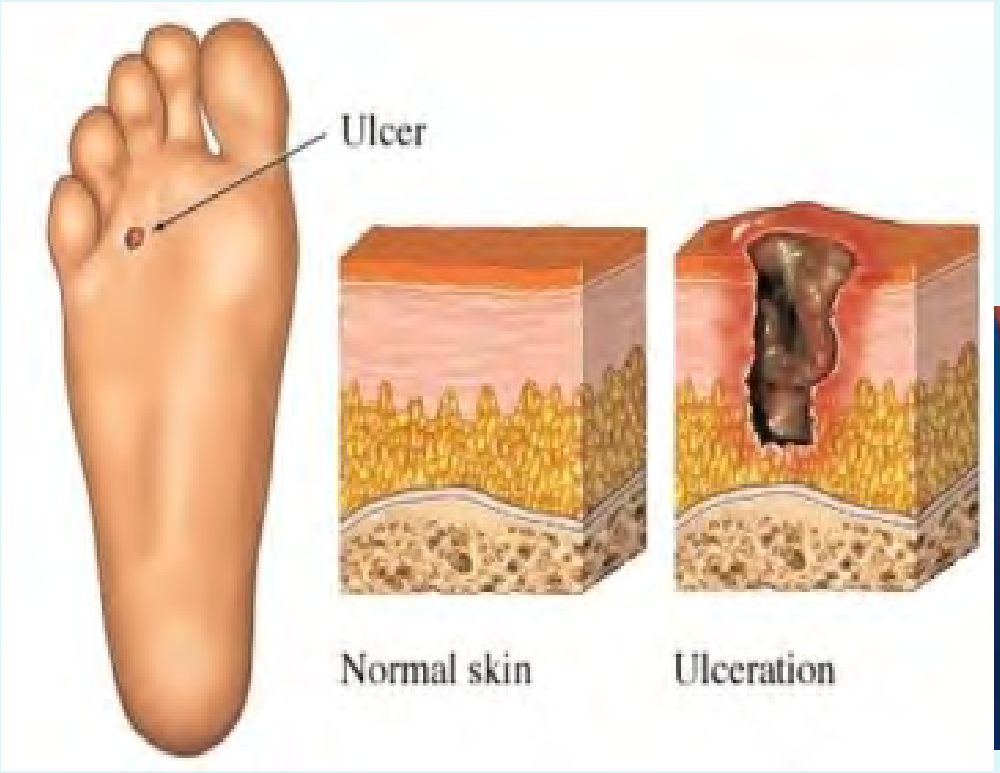
Ingrown toenail

Charcot Foot

Achilles Rupture



Which can cause---



Diabetic Foot Ulcer Risks

- 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

CDC. Retrieved on November 19, 2012. http://www.cdc.gov/tobacco/data_statistics/fact_sheets/fast_facts/index.htm.

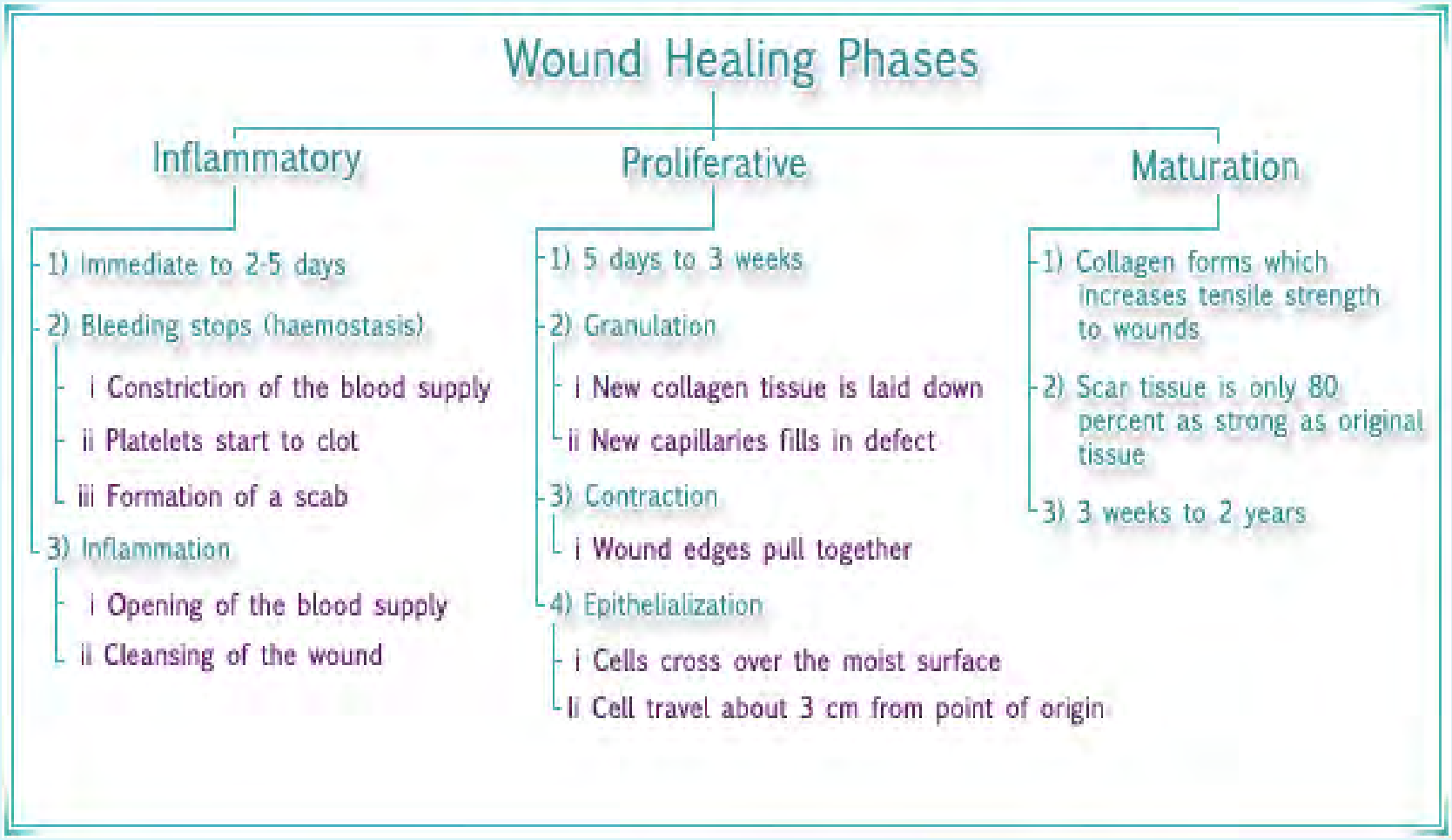
Composition Cigarette Smoke

- Contains more than 4500 compounds
- Nicotine, CO, HCN: tobacco elements that impair healing
- Nicotine: liberates catecholamines ---> vasoconstriction, decreases tissue perfusion
- CO: binds hemoglobin causing O2 sat curve to left
- HCN (Hydrogen Cyanide): affects cellular oxygenation

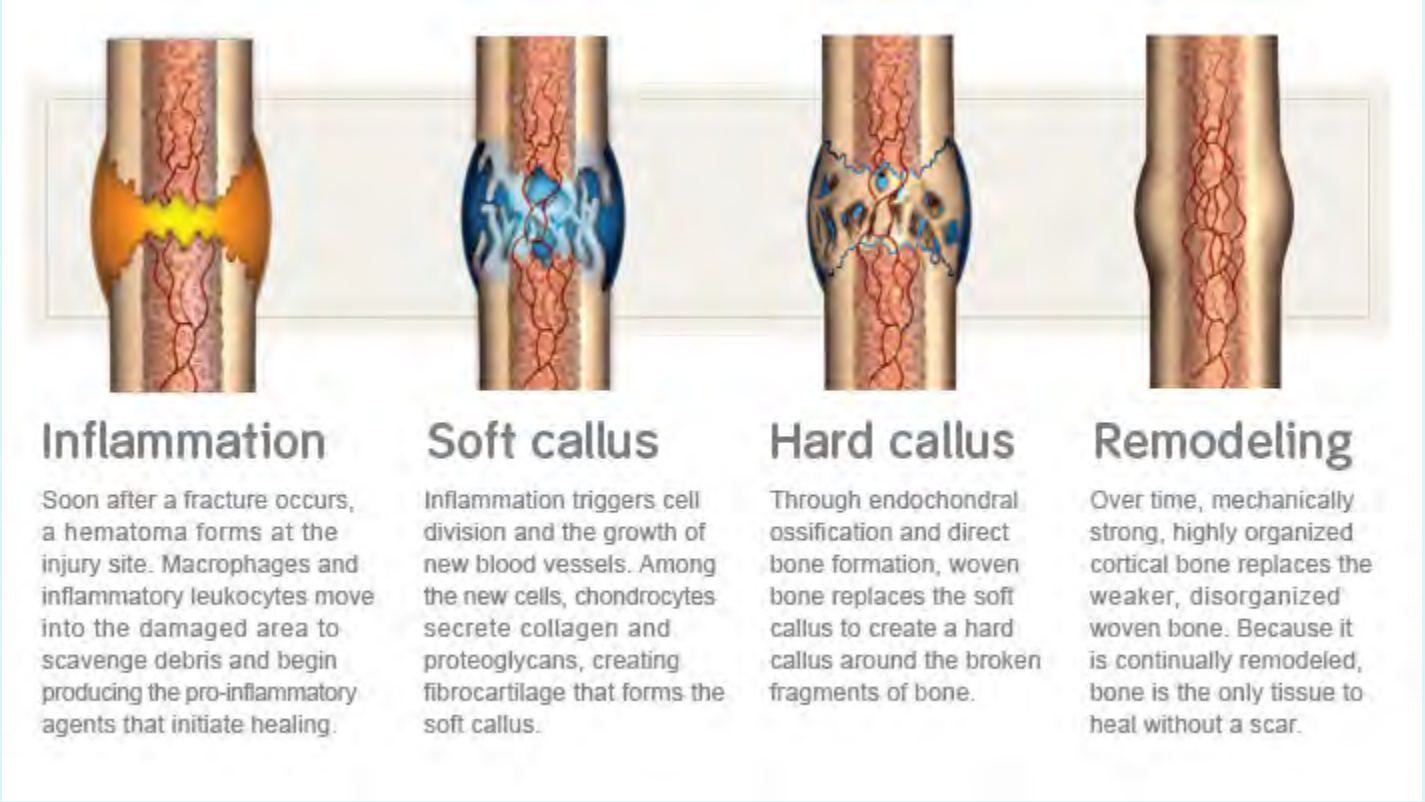

CADMIUM
BATTERIES
STEARIC
ACID
CANDLE WAX
BUTANE
LIGHTER
FLUID
TOLUENE
INDUSTRIAL
SOLVENT
HEXAMINE
BARBECUE LIGHTER
NICOTINE
INSECTICIDE
AMMONIA
TOILET CLEANER
BUG
ACETIC ACID
VINEGAR
METHANE
SEWER
GAS
ARSENIC
POISON
CARBON
MONOXIDE
CAR
EXHAUST
METHANOL
ROCKET FUEL
PAINT

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

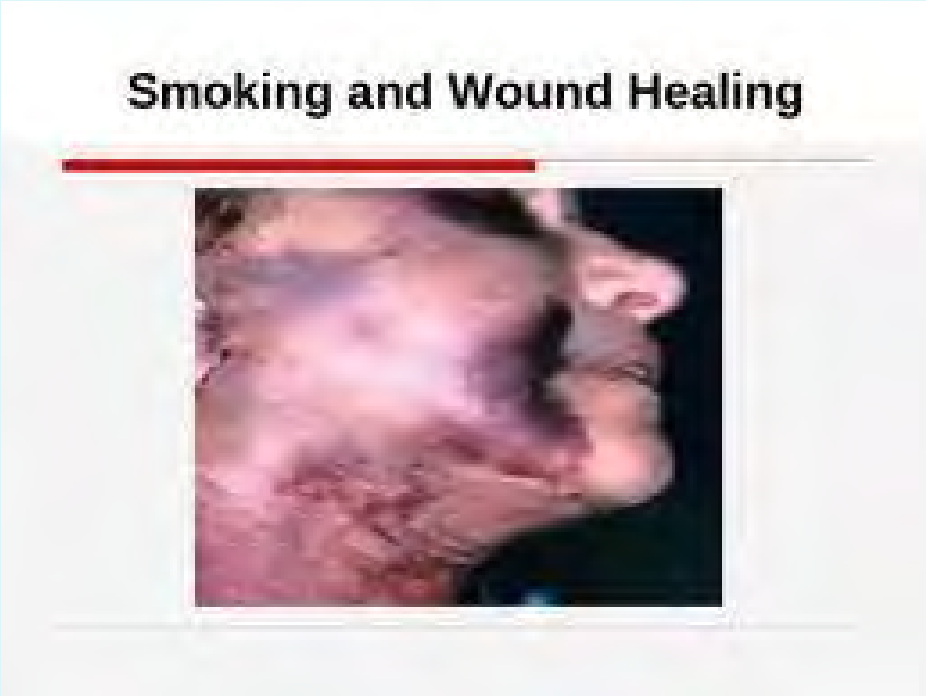


Normal Bone Healing



Tobacco's Effects

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



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Postoperative Infection

- 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%)

Moller, A., Villebro, N., Pedersen, T. & Tonnesen, H. (2002). Effect of preoperative smoking intervention on postoperative complications: a randomised clinical trial. *The Lancet*, 359, 114-117.

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

Nasell, H., Ottosson, C. Tornqvist, H. et al. (2011). The impact of smoking on complications after operatively treated ankle fracture – a follow-up study of 906 patients. *Journal of Orthopaedic Trauma*, 25(12): 748-755.

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 nonsmokers

Cobb, TK, Gabrielson, TA, Campbell, DC, et al (1994). Cigarette smoking and nonunion after ankle arthrodesis. *Foot & Ankle International*, 15(2): 64-67.

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, buproprion, clonidine,chantix

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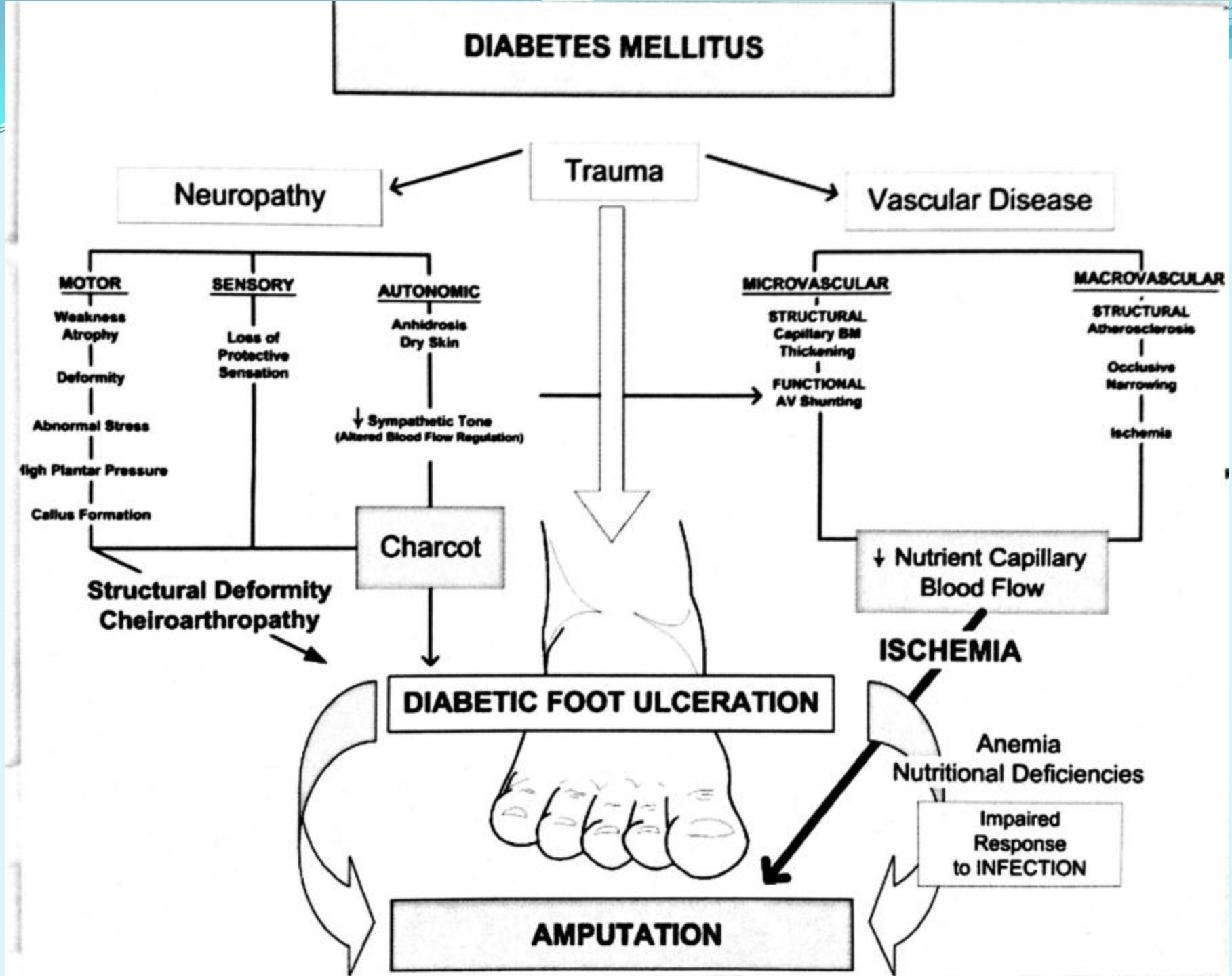
DIABETES MELLITUS
Trauma
Neuropathy
Vascular Disease
MOTOR
Weakness
Atrophy
Deformity
Abnormal Stress
High Plantar Pressure
Callus Formation
SENSORY
Loss of Protective Sensation
AUTONOMIC
Anhidrosis
Dry Skin
↓ Sympathetic Tone
(Altered Blood Flow Regulation)
MICROVASCULAR
STRUCTURAL
Capillary BM Thickening
FUNCTIONAL
AV Shunting
MACROVASCULAR
STRUCTURAL
Atherosclerosis
Occlusive Narrowing
Ischemia
Charcot
Structural Deformity
Cheiroarthropathy
↓ Nutrient Capillary Blood Flow
ISCHEMIA
DIABETIC FOOT ULCERATION
Anemia
Nutritional Deficiencies
Impaired Response to INFECTION
AMPUTATION

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

WAGNER ULCER CLASSIFICATION SYSTEM

Grade	Lesion
0	No open lesions; may have deformity or cellulitis
1	Superficial diabetic ulcer (partial or full thickness)
2	Ulcer extension to ligament, tendon, joint capsule, or deep fascia without abscess or osteomyelitis
3	Deep ulcer with abscess, osteomyelitis, or joint sepsis
4	Gangrene localized to portion of forefoot or heel
5	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

Scenario	Drug of choice	Alternatives *
Mild to moderate, localized cellulitis (outpatient)	Dicloxacillin (Pathocil)	Cephalexin (Keflex); amoxicillin/clavulanate potassium (Augmentin); oral clindamycin (Cleocin)

Scenario	Drug of choice	Alternatives*
Moderate to severe cellulitis (inpatient)	Nafcillin (Unipen) or oxacillin	Cefazolin (Ancef); ampicillin/ sulbacta Unasyn); clindamycin IV; vancomycin (Vancocin)

Scenario	Drug of choice	Alternatives
Moderate to severe Cellulitis with Ischemia or Significant Local necorsis	Ampicillin/ sulbactram	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

Scenario	Drug of Choice	Alternative
Life- or limb-threatening infection	Ticarcillin/clavulanate or piperacillin/tazobactam, with or without an aminoglycoside	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

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

GENERIC - Simplified 60-Second Screen for the HIGH-RISK DIABETIC FOOT (2012) © Sibbald 2012

Name: _____
ID (e.g. OHIP)#: _____
Phone #:_____ Facility:_____
DOB (dd/mm/yy):_____/_____/_____
Gender: M □ F □ Years with diabetes:_____
Race: Asian □ Asian Indian □ Black □ Caucasian □
Native American □ Other/ Mixed □
Date of Exam (dd/mm/yy): _____/_____/_____

CHECK BOTH FEET
(Circle correct response)
ANY "YES" on either foot = HIGH RISK

		LEFT		RIGHT	
HISTORY	1. Previous ulcer	NO	YES	NO	YES
	2. Previous amputation	NO	YES	NO	YES
PHYSICAL EXAM	3. Deformity	NO	YES	NO	YES
	4. Absent pedal pulses (Dorsalis Pudis and/ or Posterior Tibial)	NO	YES	NO	YES
FOOT LESIONS *Remember to check 4th and 5th web spaces/nails for fungal infection and check for inappropriate footwear.*	5. Ingrown Toenail	NO	YES	NO	YES
	6. Active Ulcer	NO	YES	NO	YES
	7. Callous (thick plantar skin)	NO	YES	NO	YES
	8. Blisters	NO	YES	NO	YES
	9. Fissure (linear crack)	NO	YES	NO	YES
NEUROPATHY *MORE THAN 4/10 SITES LACKING FEELING = "YES"*	10. Monofilament exam (record negative reaction): a) Right_____/10 negatives (≥ 4 negatives = Yes) b) Left_____/10 negatives (≥ 4 negatives = Yes)	NO	YES	NO	YES
		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, ulcer/wound, 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/yy):_____/_____/_____

Completed By: _____ Date: _____

Additional Note:
See reverse side for recommendations from the *International Diabetes Federation, & International Working Group on the Diabetic Foot.*

Local referral patterns may vary depending on expertise and available resources.

Stop Smoking

Shoes

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