Diabetes foot care

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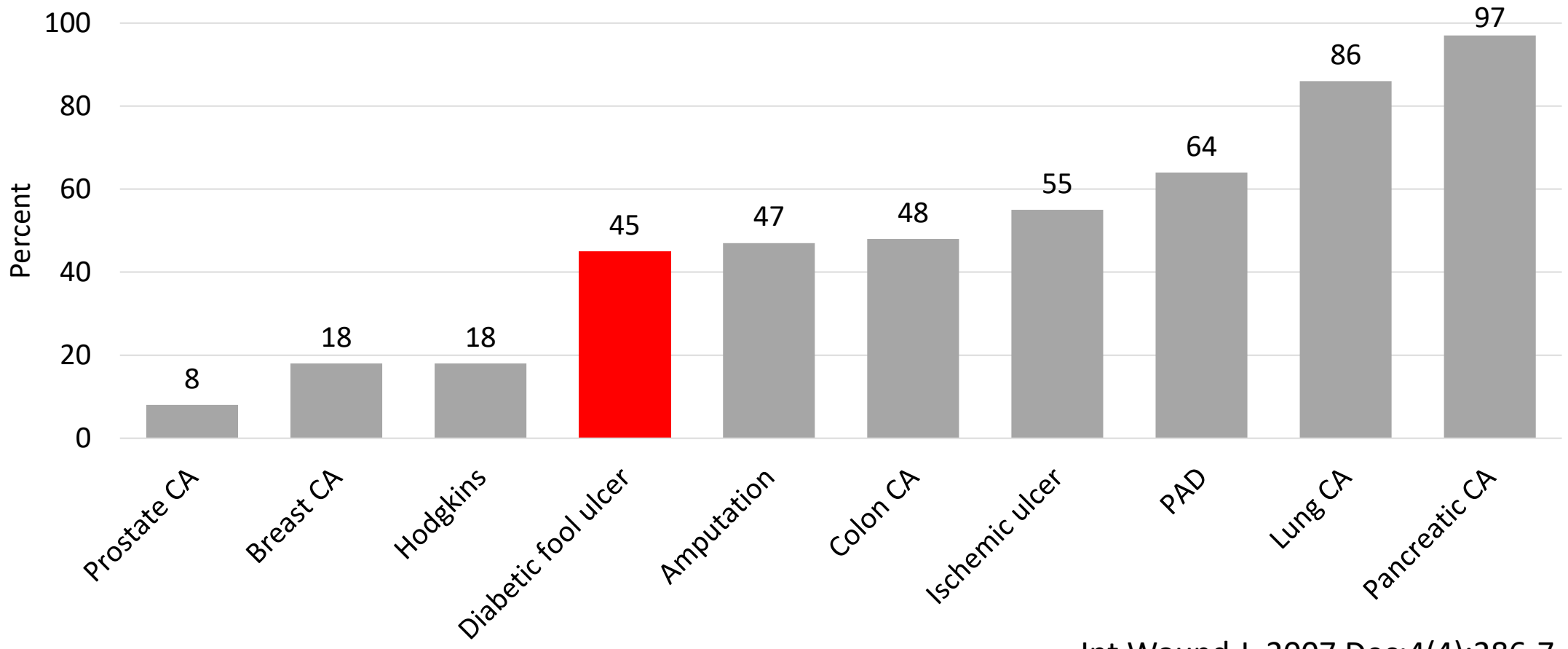
Diabetes foot ulcer

- One of the most common complications of diabetes
- Annual incidence 1% to 4%[1,2]
- Lifetime risk 15% to 25%[3,4]
- ~15% of diabetic foot ulcers result in lower extremity amputation[3,5]
- ~85% of lower limb amputations in patients with diabetes are preceded by ulceration[6,7]

1. Reiber and Ledoux. In The Evidence Base for Diabetes Care Williams et al, eds. Hoboken, NJ: John Wiley&Sons;2002:641-665
2. Boulton et al. NEJM. 2004;351:48
3. Sanders. J Am Podiatry Med Assoc. 1994;84:322.
4. Boulton et al. Lancet. 2005:366:1719
5. Ramsey et al. Diabetes Care 1999;22:382
6. Pecoraro et al. Diabetes Care. 1990;13:513
7. Apelqvist and Larsson. Diabetes Metab Res Rev 2000:16:S75

5 years mortality rates



Int Wound J. 2007 Dec;4(4):286-7.

Objects of this lecture

First, Learn the mechanism of diabetic foot lesion

Second, Learn the risk factor of diabetic foot lesion

Third, Learn the education method for each stage of the disease

Fourth, Learn how to practice foot management

Fifth, Learn the types of foot examination and screening method

Sixth, Be able to evaluate foot management

Mechanism of diabetic foot

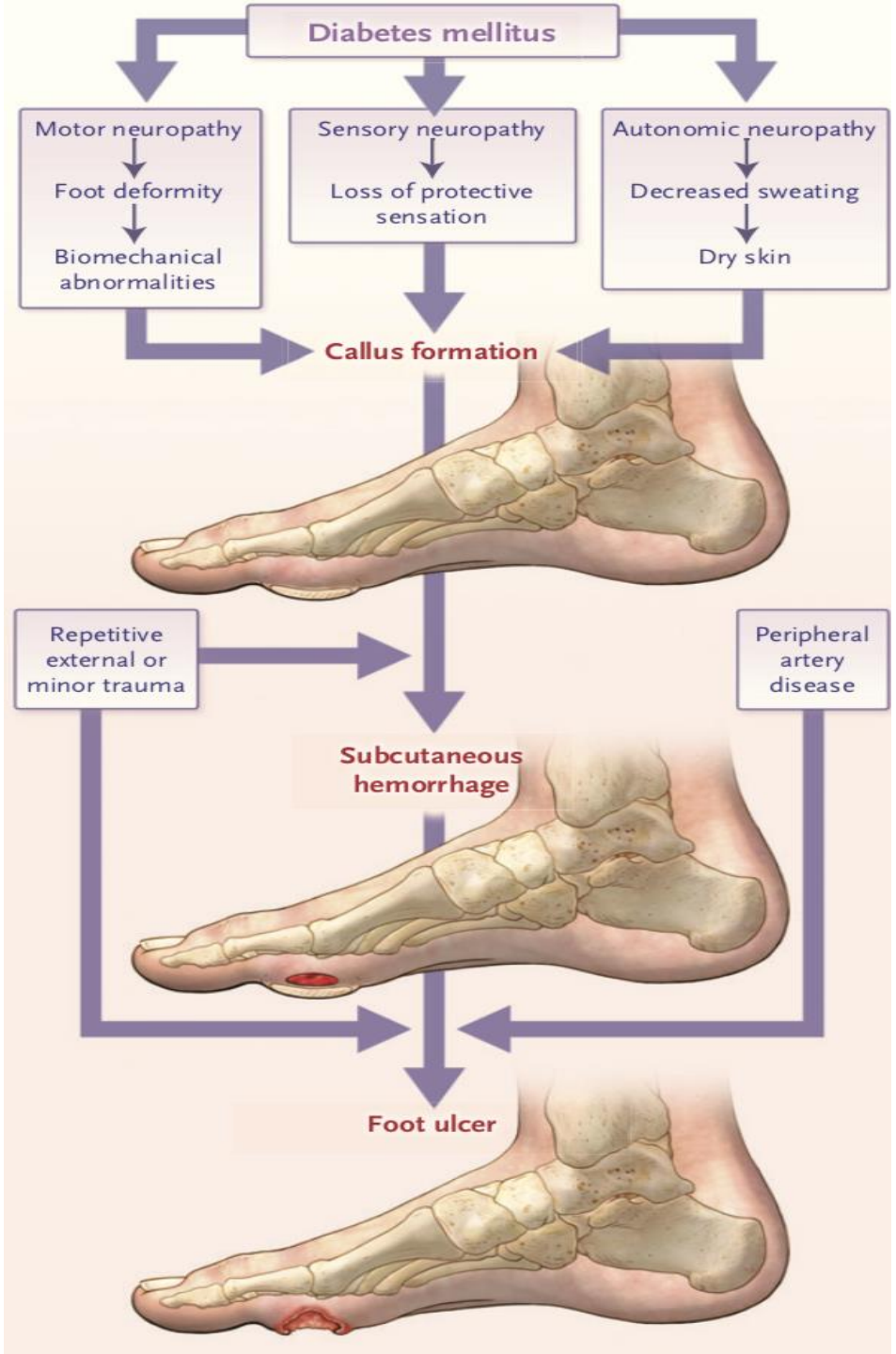


Figure 1. Common Pathway of Diabetic Foot Ulcer Occurrence and Recurrence. Diabetic foot ulcers and their recurrences are caused by a number of factors that ultimately lead to skin breakdown. These factors include sequelae related to sensory, autonomic, and motor neuropathies.

N Engl J Med. 2017 Jun 15;376(24):2367-2375.

Risk factor of diabetic foot

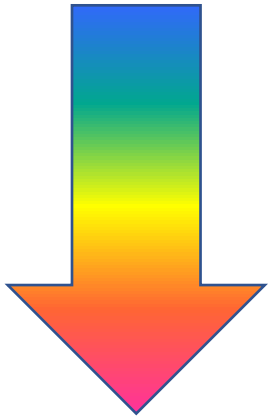
- General or Systemic Contributions
  - Uncontrolled hyperglycemia
  - Duration of diabetes (>10 yrs)
  - Peripheral vascular disease
  - Blindness or visual loss
  - Chronic renal disease
  - Older age
  - Smoking

- Local Issues
  - Peripheral neuropathy
  - Structural foot deformity
  - Trauma and improperly fitted shoes
  - Callus
  - History of prior ulcer/amputation
  - Prolonged elevated pressures
  - Limited joint mobility

J Foot Ankle Surg. 2006 Sep-Oct;45(5 Suppl):S1-66.

Frequency of examination based on degree of risk

No neuropathy



Ulcer

Group	Degree of risk	Frequency
0	No sensual neuropathy	Annually
1	Sensual neuropathy	Every 6 months
2	Sensual neuropathy / peripheral vascular disease/ foot deformity	Every 3-6 months
3	Experience of foot ulceration	Every 1 to 3 months

IDF Diabetic neuropathy Foot education Curriculum Module III-7c, 2008

The IWGDF Guidance Documents Diabetes Metab Res Rev 2016; 32(Suppl. 1): 7–15

What foot care education should people with diabetes receive?

- **Low-risk group: simple advice**
  - **Normal feet: Prevention, quit smoking, feet examination every year**
- **High-risk group: intensive education, focus on prevention**
  - **Abnormal feet : Prevention, diabetic shoe, vascular exam**
  - **Simple ulcer : Outpatient treatment**
    - **Preventing recurrence, diabetic foot, adequate referral**
  - **Complex ulcer : Inpatient treatment**

Foot examination : daily (Self)

Skin condition	Corn, callus, crack, blister, oozing, tinea pedis, temperature/color change
Foot shape	Hammer-toe, big toe deformity, etc.
Others	Ingrowing nail, wound, contusion, edema, etc

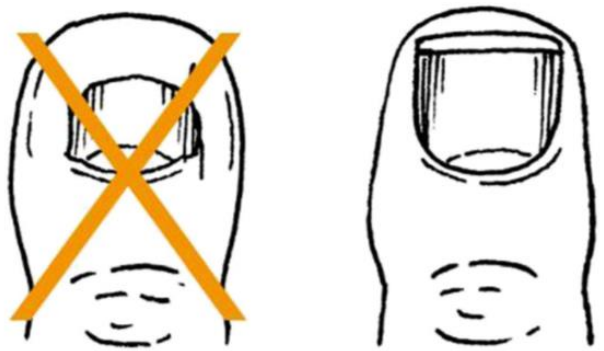
Use magnifying glass or mirror under bright light

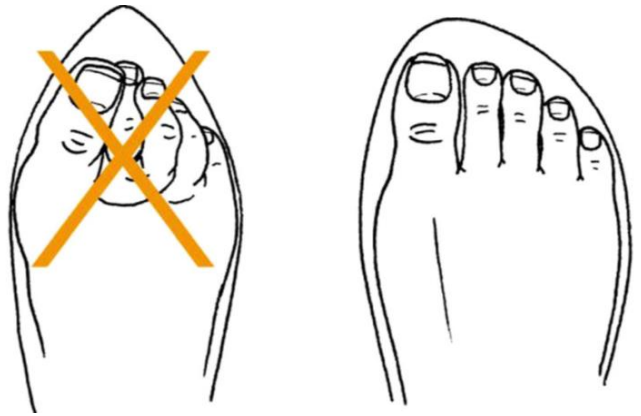
Educating feet management (Preventing burns)

- Soaking less than 10 minutes, watch for water temperature (38 ~ 40°C most adequate)
- Use sun block on exposed skin
- Keep feet at least 3m from heater
- Turn off electric blankets
- No hot water bottles
- Never walk barefoot
- Remove water and apply lotion to maintain moisture but not between toe

Educating feet management

- Nails cut straight
- Tinea pedis must be treated thoroughly
- Socks : Soft cotton/wool, not tight around ankle
- Shoe : Flexible, air-circulating, sweat-absorbing material (Shoes are the most common cause of ulceration)
  - 1cm bigger, 1cm higher (purchase in afternoon)
  - Specially designed shoe necessary if foot deformed
  - Before putting on shoes, check for rough spots or loose objects





Recommendations for exercise when at high risk

- Walk only as far as is absolutely necessary
- Non-walking exercises such as swimming or riding an exercise bike

Requiring hospital visit within 24 hours

- Infection, ulcer: >2cm wide, >0.5cm deep
- Corn, callus: Swollen
- Color change, odor (bad smell), inflammation
- Fever >38℃
- Dull sensation
- Oozing or pus due to ingrowing nail
- Severe pain or convulsion at the leg

Comprehensive Diabetes foot examination

Component of Comprehensive Foot Exam

- Systemic review of history
- The diabetic foot exam
  - Inspection Dermatologic
  - Neurological assessment
  - Vascular assessment

Systemic review of history

- Past history
  - Ulceration
  - amputation
  - Charcot joint
  - vascular surgery
  - angioplasty
  - cigarette smoking
- Neuropathic symptoms
  - positive (e.g., burning or shooting pain, electrical or sharp sensations, etc.)
  - negative (e.g., numbness, feet feel dead)
- Vascular symptoms
  - Claudication
  - rest pain
  - nonhealing ulcer
- Other diabetes complications
  - renal (dialysis, transplant)
  - retinal (visual impairment)

Diabetes Care. 2008 Aug; 31(8): 1679–1685.

The diabetic foot exam: Inspection Dermatologic

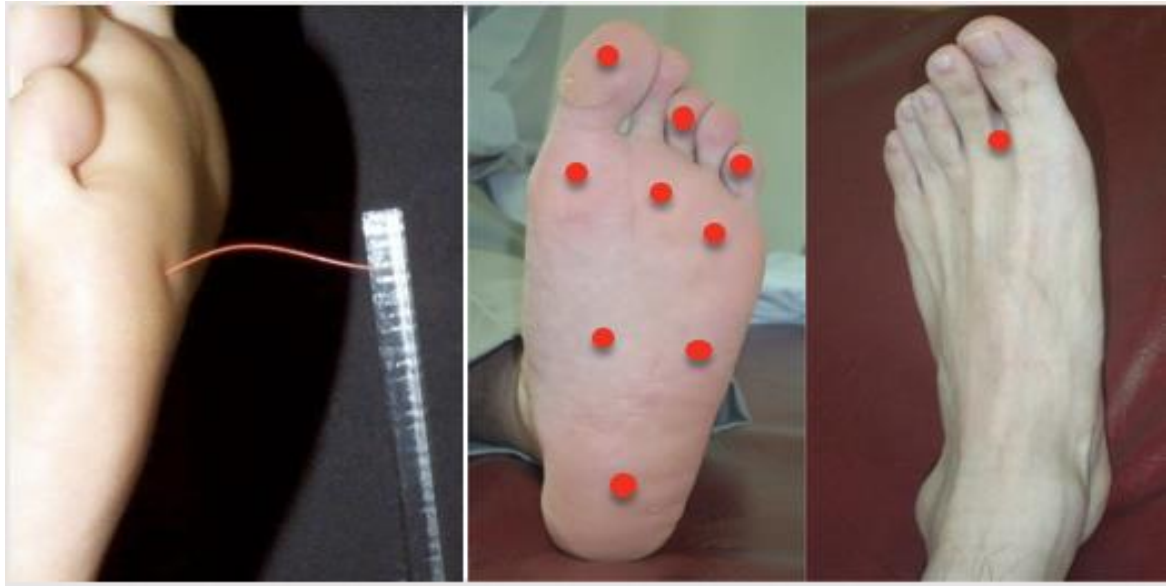
1. Inspect the foot between the toes and from toe to heel. Examine the skin for injury, calluses, blisters, fissure, ulcers, or any unusual condition.

2. Look for thin, fragile, shiny, and hairless skin — all signs of decreased vascular supply.

3. Feel the feet for excessive warmth and dryness.

If any new foot abnormality is found, the patient should be scheduled immediately for a comprehensive foot examination.

The diabetic foot exam: Neurological assessment
10-g monofilament test



Scoring

Number of numb spots
- 2 or more: loss of sensation
- 4 or more: increased risk of foot ulcer

Precautions

- 10 g Monofilament (5.07 Semmes-Weinstein)
- Patients should not observe the examination
- Contact monofilament perpendicular to the skin and apply pressure so the filament bends (within 3 seconds)
- Patients must answer “yes” if sensitive
- Avoid ulcers or calluses

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The diabetic foot exam: Neurological assessment
Questionnaire for diabetic peripheral neuropathy

This survey tests the senses of your legs and feet. Please check yes ☐ or no ☐ to express how you normally feel.

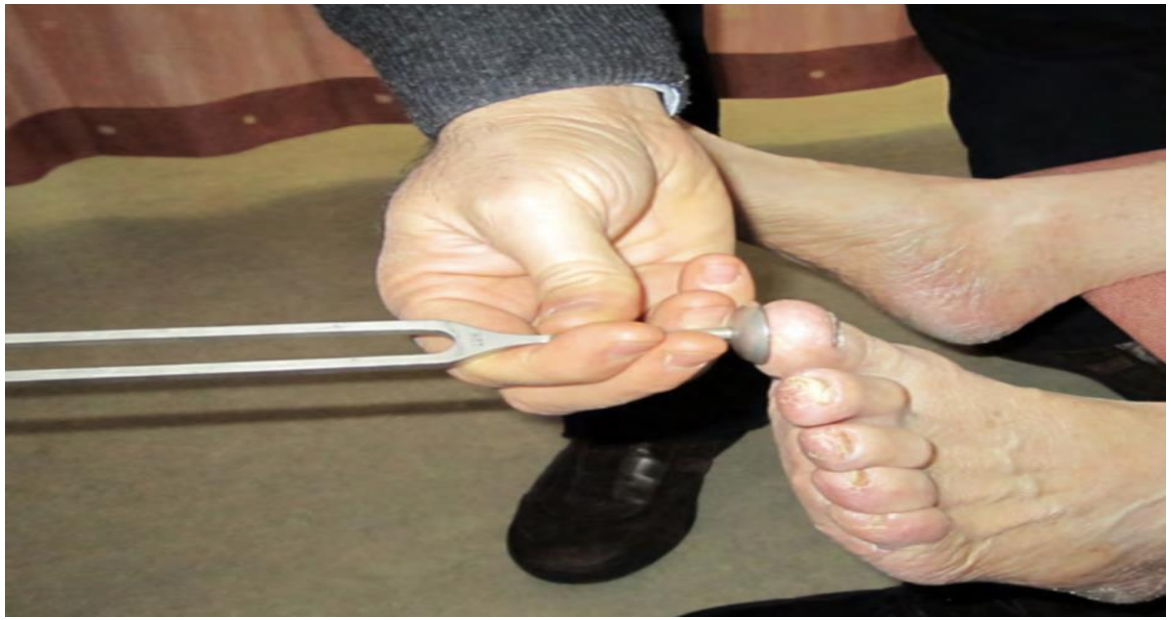
1. Are you legs and/or feet numb?	1. Yes ☐ 0. No ☐
2. Do you ever have burning pain in your legs and/or feet?	1. Yes ☐ 0. No ☐
3. Are your feet too sensitive to touch?	1. Yes ☐ 0. No ☐
4. Do you get muscle cramps in your legs and/or feet?	0. Yes ☐ 0. No ☐
5. Do you every have prickling feelings in your legs and/or feet?	1. Yes ☐ 0. No ☐
6. Does it hurt when the bedcovers touch your skin?	1. Yes ☐ 0. No ☐
7. Are you able to tell hot water from cold water when taking a bath?	0. Yes ☐ 1. No ☐
8. Have you ever had an open sore on your foot?	1. Yes ☐ 0. No ☐
9. Has your doctor ever told you that you have “diabetic neuropathy”?	1. Yes ☐ 0. No ☐
10. Do you feel weak all over most of the time?	0. Yes ☐ 0. No ☐
11. Are your symptoms worse at night?	1. Yes ☐ 0. No ☐
12. Do our legs hurt when you walk?	1. Yes ☐ 0. No ☐
13. Are you able to sense your feet when you walk?	0. Yes ☐ 1. No ☐
14. Is the skin on your feet so dry it cracks open?	1. Yes ☐ 0. No ☐
15. Have you ever had an amputation?	1. Yes ☐ 0. No ☐

Total: _____ / 13 points

* Question 4 and 10 belong to vascular symptoms: they are excluded from total points regardless of the answer
* Question 7 and 13 count as 1 point when answered “No”.
* Suspect neuropathy if total score >2; diagnosis made if total score >7

Korean Diabetes Association, Diabetic Neuropathy Management Guideline.. 2007

The diabetic foot exam: Neurological assessment
Using a 128-Hz tuning fork



Interpretation

The test is positive if the patient correctly answers at least two out of three applications, and negative ('at risk for ulceration') with two out of three incorrect answers.

Precautions

1. Ask the patients to close their eyes.
2. Put the patient's feet on flat surface and tap on the tuning fork.
3. Place the vibrating fork on patient's distal Hallux (big toe) joint and ask them if they can feel vibration (Show the patient on a bony prominence on their hand first).
4. Have the patient answer yes or no when asked if they can feel the vibration.
5. If they cannot feel vibration on the hallux continue checking bony prominences moving proximally until the patient feels the vibration. (malleolus and tibial tuberositas)

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The diabetic foot exam: Neurological assessment
Measure vibration perception threshold (VPT)

Interpretation

Measure VPT using electromechanical instruments such as the Biothesiometer or Vibrameter.8 A VPT value of >25 V in at least one foot has been associated with a higher cumulative risk of neuropathic ulceration. Values between 16 and 24 V indicate intermediate risk, and values <15 V, represent low risk and is considered normal.

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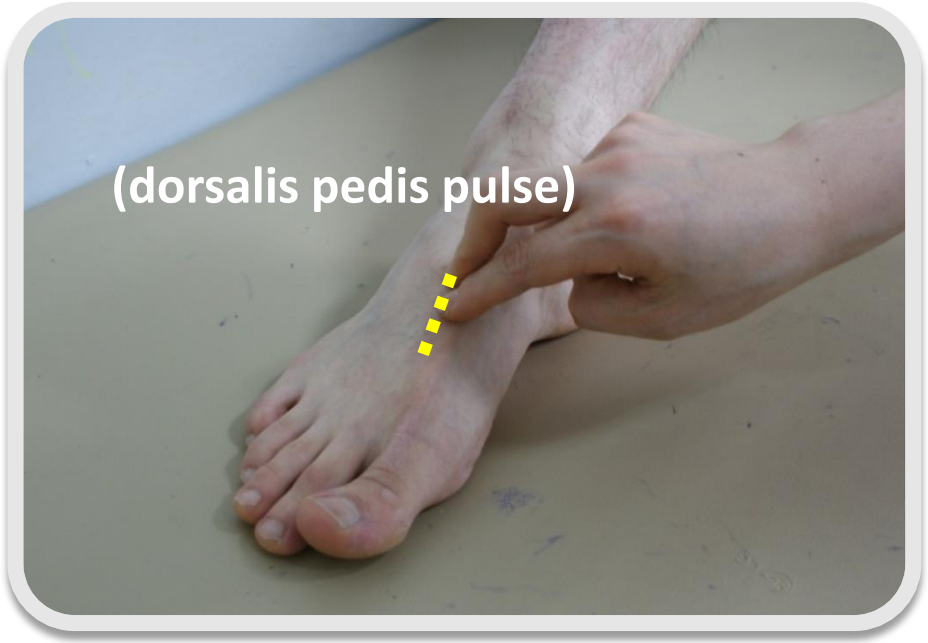
The diabetic foot exam: Vascular assessment

Foot pulses



Just lateral to extensor of the big toe. If not palpable, measure along the more lateral side of the foot.

Roll the fingers and touch the medial malleolus and lower part of middle area.

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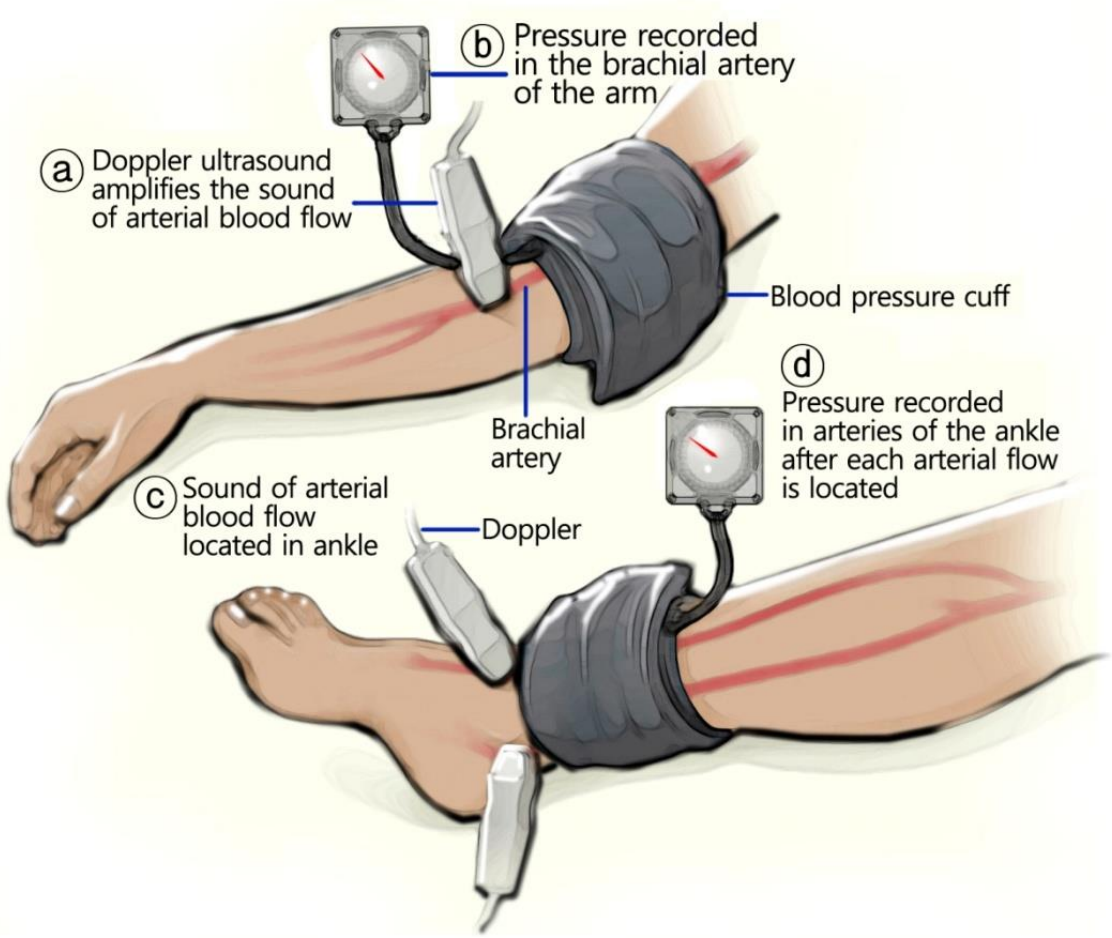
Diabetes Care. 2008 Aug; 31(8): 1679–1685.

The diabetic foot exam: Vascular assessment
Ankle-brachial index (ABI)= Ankle SBP/ Branchial SBP

ABI	Interpretation
>1.40	Noncompressible vessels, Vascular clacification
1.00-1.40	Normal
0.91-0.99	Acceptable
≤ 0.90	Abnormal-peripheral artery disease



IDF Clinical Practice Recommendations on the Diabetic Foot 2017
Diabetes Care. 2008 Aug; 31(8): 1679–1685.

Assessment and record of feet examination

	Right	Left
10g monofilament + Sensation - No sensation		
External foot	□ Deformed □ Dry, callus □ Infection, skin break □ Others ( )	□ Deformed □ Dry, callus □ Infection, skin break □ Others ( )
Pulse	□ Palpable □ Not palpable (dorsalis pedis, posterior tibial)	□ Palpable □ Not palpable (dorsalis pedis, posterior tibial)
Foot ulcer	□ Yes □ No	□ Yes □ No

Key messages

- Educate all people with diabetes for foot care.
- Frequency of foot screening is based on risk stratification but done at least annually.
- Shoes are the most common cause of ulceration
- Identify problems early and treat promptly
- Health professionals need to be trained in diabetic foot care