

Diabetic Foot Care: Screening and Injury Prevention

Sandra Graham, PT
Alaska Native Medical Center

Objectives

- Identify the risk factors for foot complications in patients with diabetes
- Review a comprehensive foot examination and how to assign risk categories
- Evaluate interventions that reduce the risk of ulcers and amputations

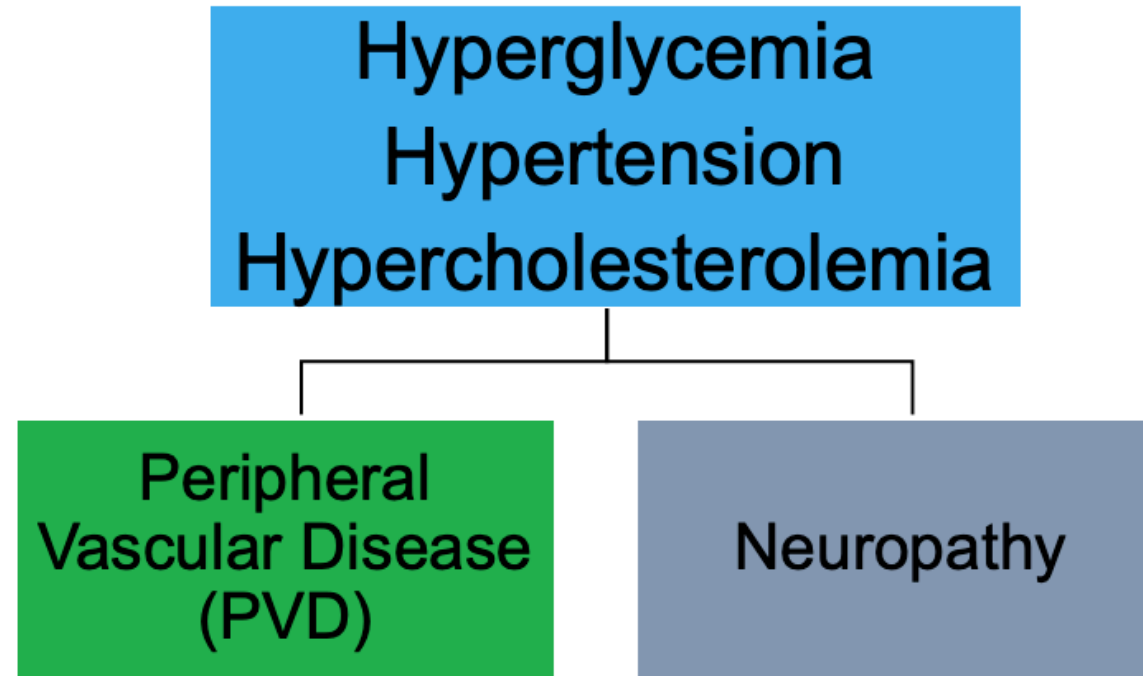
Non-Traumatic Amputations in the U.S.

- 130,000 amputations among patients with diabetes (in 2018)
- Primary cause is diabetes mellitus (90%) and usually preceded by diabetic foot ulcer (DFU)
- Annual incidence rate is 2% (but reported to be higher among Medicare beneficiaries and U.S. Veterans)
- Lifetime risk for DFU is approximately 15%–25%
- Three out of four amputations are preventable

Boulton AJM, Armstrong DG, Kirsner RS, et al. Diagnosis and Management of Diabetic Foot Complications. Arlington, VA, American Diabetes Association, 2018.

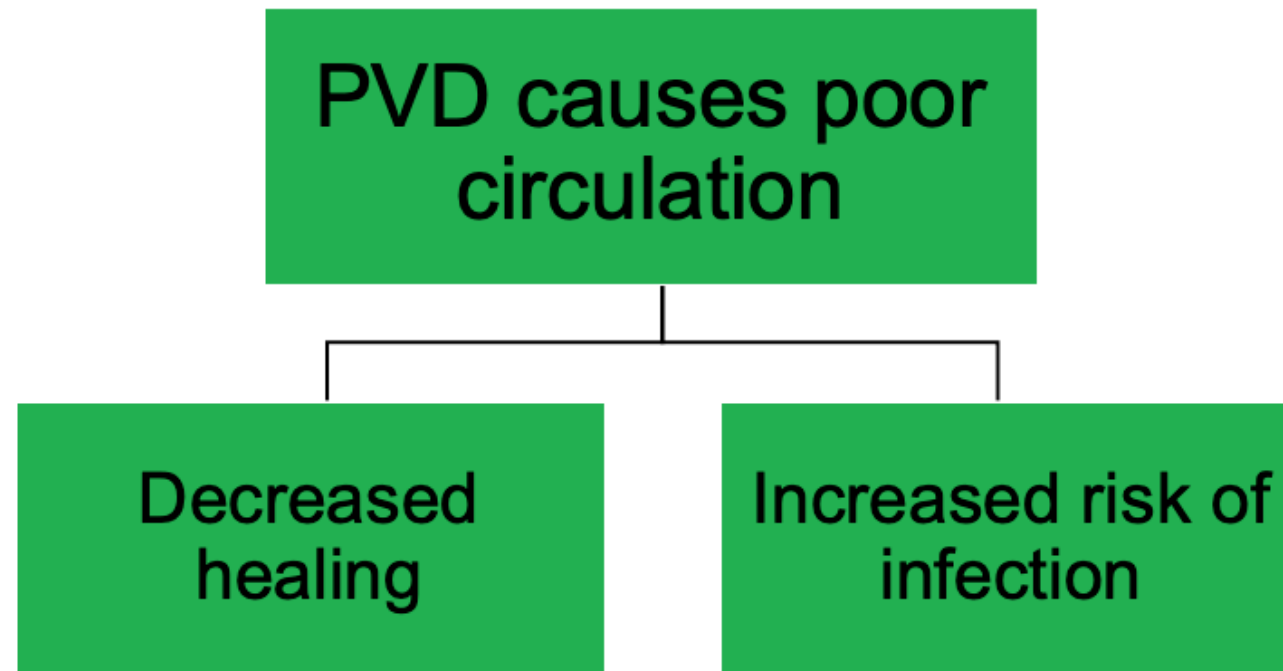
Hyperglycemia, Hypertension, and Hypercholesterolemia Can Cause...

- Peripheral Vascular Disease (PVD)
- Neuropathy



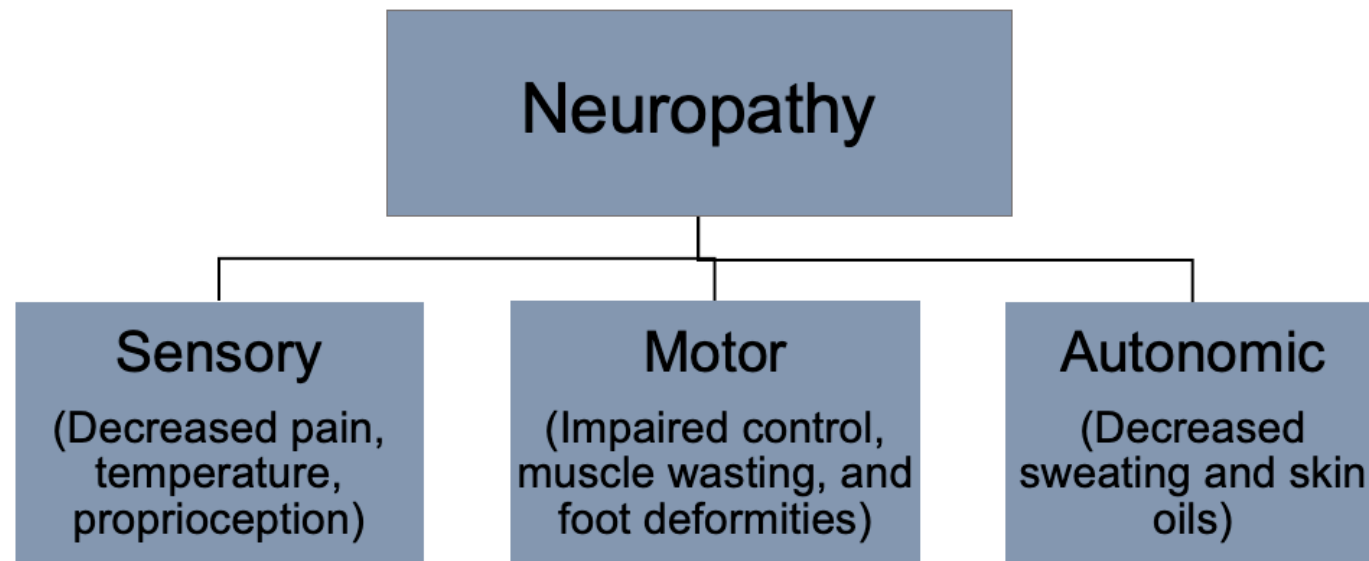
PVD Causes Poor Circulation

- Decreased healing
- Increased risk of infection



Neuropathy

- Sensory
 - Decreased pain, temperature, proprioception
- Motor
 - Impaired control, muscle wasting, and foot deformities
- Autonomic
 - Decreased sweating and skin oils



Risk Factors for Diabetic Foot Ulcers

- Poor glycemic control
- Peripheral vascular disease
- Neuropathy; peripheral and autonomic
- Deformity
- Previous ulcers or amputations
- Tobacco use
- Visual impairment
- Chronic kidney disease and dialysis

How Can We Help People Prevent Amputations?

- Find people at high risk
 - annual foot exams and regular foot checks
- Help people take care of their feet
 - simple interventions saves lives

Patients Coming to See You for a Routine Office Visit Will Have...

- Calluses
- Problematic Nails
- Bacterial/Fungal Infections
- Ulcers

Calluses



Bacterial/Fungal Infections



Problematic Nails



Ulcers

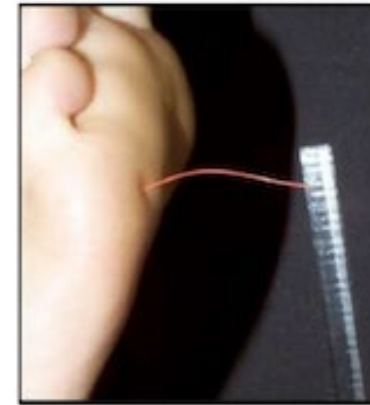


The Foot Exam



The Foot Exam Looks at Four Main Areas

- Skin, nails, and calluses
- Circulation
- Muscles and deformities
- Sensation



First, Examine Inside and Outside the Shoes—
They Often Can Tell a Much Bigger Story...



Examine Shoes and Feet



Skin, Nails, and Calluses— **Skin**

Skin (1)

- Dry, thin, and, brittle
- Tinea Pedis (athlete's foot)
- Moist



Skin (2)

- Check in between toes
- Poor hygiene and buildup of old skin



Skin (3)

Various types of dermatopathy



Skin (4)

- Your patient tells you, “My pants are catching on my heel, I think maybe the skin is a little rough back there.”
- Debridement revealed intact skin beneath



Skin (5)

Before and after a little scrub and lotion



Skin (6)

- A little bit of lotion can make a **big** difference!
- And allowing the patient to see the before and after photo on his smart phone made a big impression.



Skin, Nails, and Calluses— **Nails**

Nails (1)

- Abnormal shapes



Nails (2)

One foot with many types of nails



Nails (3)

Mycotic or fungal nails



Nails (4)

- This patient removed his own ingrown nail before the provider could get there.
- Good initiative, but not recommended!
- He ended up doing well.



Nails (5)

With practice, simple nail nippers can be used to handle a variety of nail types.



Nails (6)

What a good pair of nail nippers can do...

Before



After



Skin, Nails, and Calluses— **Calluses**

Calluses (1)

Commonly form over bony prominences such as the metatarsal heads



Calluses (2)

Calluses also form beneath a stiff great toe



Calluses (3)

And calluses form on the tips of clawed toes



Calluses (4)

Heel calluses can form deep cracks



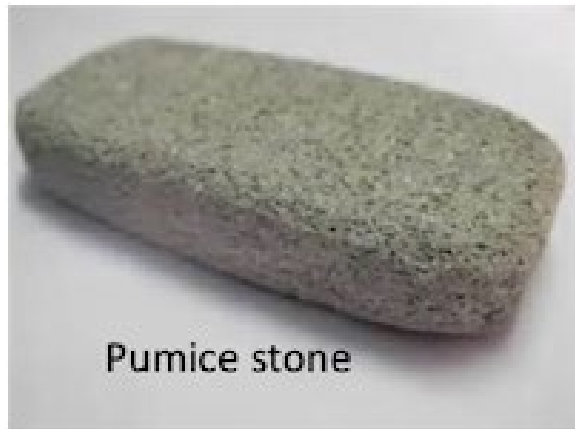
Calluses (5)

- Porokeratosis
 - a callus that grows in a sweat gland



Calluses (6)

There are many callus tools available. Choose the one appropriate to each type of callus and the skill level of the care giver.



Pumice stone



Callus shaver



Callus file



#10 blade scalpel



..and many others,
as seen on TV...

Calluses (7)

What a scalpel can do...

Before



After



Circulation

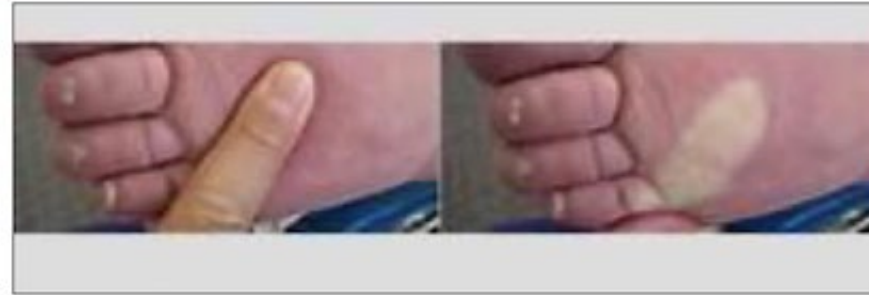
Circulation (1)

- Pulses
 - Dorsalis pedis
 - Posterior tibial



Circulation (2)

- Capillary refill time
 - Usually less than two seconds
- Edema
- Hair on the toes



Circulation (3)

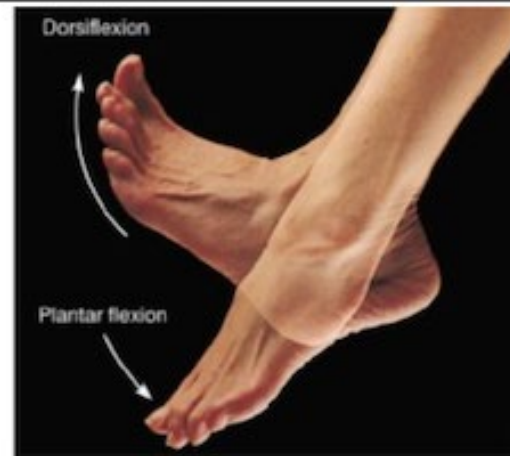
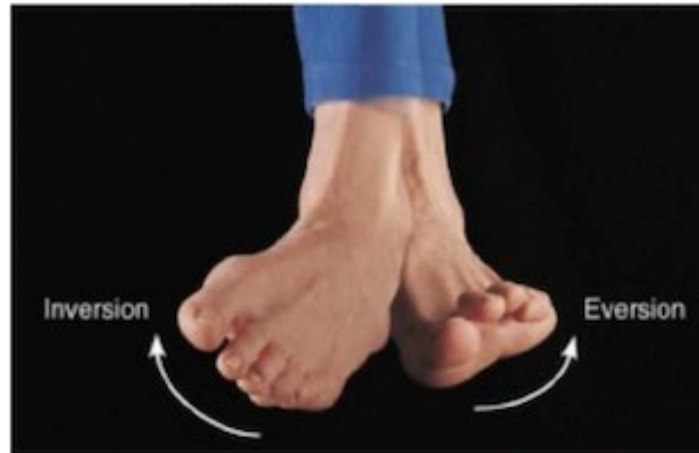
- Cotton? Wool? Synthetic? “Diabetic” Socks?
- Choose the right sock for the patient and the climate.
- There is no *one* right sock for everyone.



Muscles and Deformities— **Muscles**

Muscles (1)

Extrinsic muscles

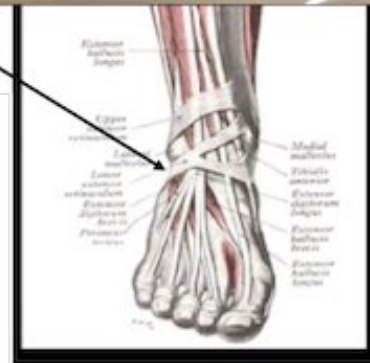


Muscles (2)

- Intrinsic Muscles support the normal shape of the foot
- The extensor digitorum brevis (EDB) can be palpated in front of the lateral ankle when wiggling the toes
- An intrinsic minus foot leads to deformities



EDB



An Intrinsic Minus Foot leads to deformities



Muscles and Deformities— **Deformities**

Deformities (1)

Yes, we need to look at both feet! No two are alike.



Deformities (2)

Overlapping hallux valgus and clawing of lesser toes



Deformities (3)

Hammertoe overlapping a bunion



Deformities (4)

Pes Cavus (high arch)



Deformities (5)

Pes Planus (flat foot) with Hallux Limitus (stiff toe)



Deformities (6)

- Charcot or Rocker Bottom Foot Deformity
 - Profound sensory and proprioceptive neuropathy
 - Preserved circulation (hyperemia)



Deformities (7)

Midfoot bony collapse leads to the classic rocker bottom deformity



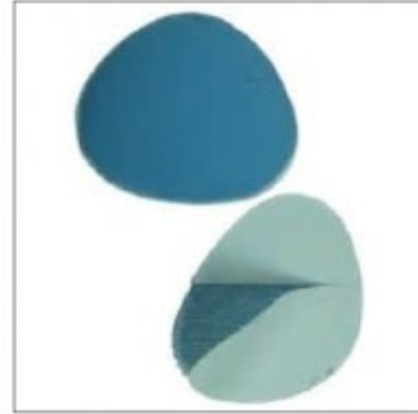
Deformities (8)

- Helpful things for common deformities
 - Dual density insoles
 - Longitudinal arch supports



Deformities (9)

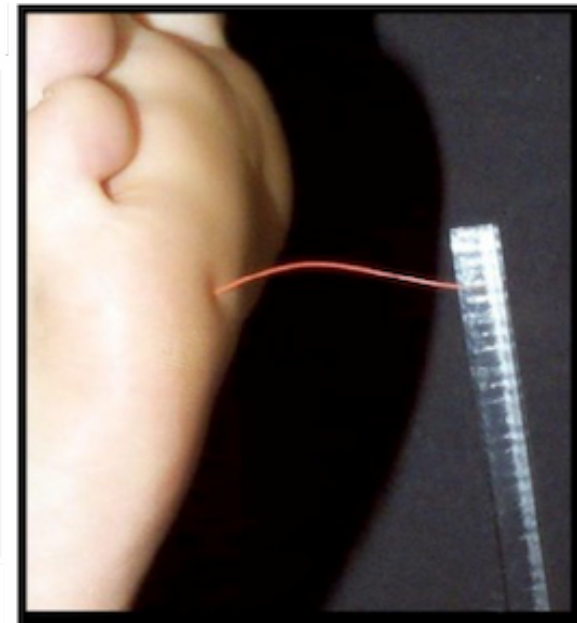
- More helpful things...
 - Metatarsal pads
 - Silicone toe pads
 - Not for those with reduced circulation!



Sensation

Sensation (1)

- Determine the presence or absence of Protective Sensation with the 10 gram (Semmes-Weinstein 5.07) monofilament
- 10 test sites each foot
 - Record present (plus/+) or absent (minus/-)
- Apply the filament perpendicular to the skin



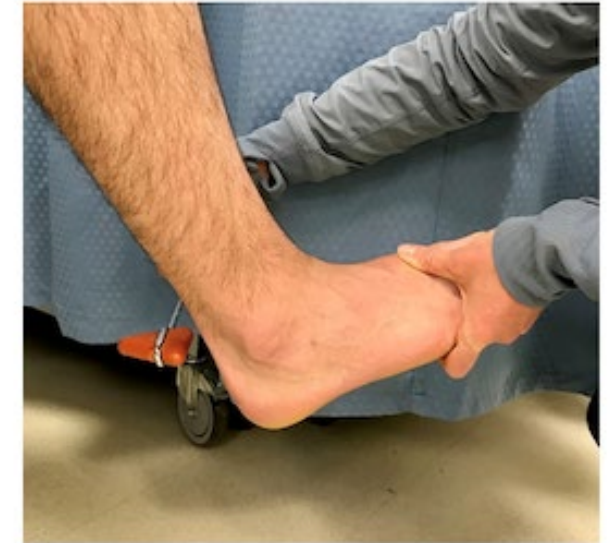
Sensation (2)

- Vibration Sensation
 - 128 Hz tuning fork
- Muscle Stretch Reflex
- 2019 IWGDF Guidelines on the prevention of foot ulcers in persons with diabetes recommend the addition of one other test.
- Temperature and pinprick are two others.

Vibration Sensation
128 Hz tuning fork



Muscle Stretch Reflex



Sensation (3)

- Be aware, there can be other causes and patterns for absence of protective sensations, such as:
 - Lumbar pathology
 - Trauma to peripheral nerves

Deformity + Neuropathy + Pressure =
Ulcer



Assigning Foot Risk Categories

Foot Risk Categories

- **Risk Category: Zero** (*Very low risk*)
 - *Protective sensations intact; no abnormal findings*
- **Risk Category: One** (*Low risk*)
 - *Loss of protective sensations, no PVD; with or without long-standing, non-changing deformities*
- **Risk Category: Two** (*Moderate risk*)
 - *PVD with or without loss of protective sensations; decreased pulses; presence of swelling or edema*
- **Risk Category: Three** (*High risk*)
 - *History of previous ulcer or amputation; venous insufficiency*
- *Urgent- current ulcer*

2018 Monograph from ADA.

2019 IWGDF Guideline on the prevention of foot ulcers in persons with diabetes.

Follow-up Care and Examination

- **Risk Category: *Zero (Very Low)***
 - Repeat foot exam annually
- **Risk Category: *One (Low)***
 - Referral to Foot specialist/Clinic within a month
 - Recheck feet every 4–6 months
- **Risk Category: *Two (Moderate)***
 - Referral to Foot specialist/Clinic within 1–3 weeks
 - Recheck feet every 1–2 months
- **Risk Category: *Three (High) or Urgent***
 - “Immediate or next available” referral to Foot specialist/Clinic
 - Follow up visit as determined by specialist

You've Done an Exam...
You've Determined a Risk Category...
Now What?

Foot Care

“It’s not rocket science. Wash your feet. Cut your nails. Keep the skin supple. Wear appropriate shoes and socks.”

—*Karl Boesenberg, DPM*

Alaska Native Medical Center

Patient Education

Every patient should receive it ... BUT ... customize it to each individual

Check Your Feet Every Day or Have Someone Help You

Problems:

- Self conscious
- “Don’t want to bother other people”
- “Family doesn’t help me”
- “Can’t see good”
- “Back or knee or hip is too stiff”
- “Hands don’t work good”
- “I’m too fat to reach them”

Wash and Dry Your Feet Every Day, Including Between Your Toes

Common problems:

- Warm water may not be easy to get
- People soak their feet too long
- Steam baths instead of tubs or showers

Trim Your Toenails Straight Across

All of the previous problems, plus:

- Deformed or difficult toenails
- People use different tools
 - Knives
 - Box cutters
 - Scissors
 - Wire cutters
 - Pliers
 - Craft sanders

Footwear

Does every patient with diabetes need special diabetic shoes?

Footwear (1)

- If someone has protective sensation and no deformity, a variety of shoes are appropriate.
- If they lack protective sensation and have a deformity, they require protective shoes.

Footwear (2)

Typical Alaskan footwear:
Suitable for Most People and Most Occasions



Footwear (3)

Different foot shapes need different shoe shapes (also called “shoe lasts”)



Footwear (4)

Sometimes showing someone a picture can be worth a thousand words



Footwear (5)

- Shoes need to fit each foot.
- Check and see: are they long, wide and deep enough?
- Toe deformities may require extra depth.



Footwear (6)

- Examples of extra-depth footwear



Callus Care

Callus Care (1)

“By preventing calluses, you will prevent most of the amputations.”

—*Charles Edwards, DPM*

Alaska Native Medical Center



Callus Care (2)

Calluses under the great toe are common and should be taken very seriously. They are a frequent factor in amputations.



Callus Care (3)

Carefully removing the callus shows what's really going on beneath



Callus Care (4)

- Immediate intervention is critical.
- A post-op shoe with a cut out insole was used, and the patient was asked to not walk too much.
 - Photos are taken one and two days later. There is already a thin layer of epithelium!



Callus Care (5)

- One year later...the skin is looking healthy. Hurray!

After



Before



Callus Care (6)

Another example of how effective simple callus removal can be...

Before...



One Year Later!



Summary

- Three out of four amputations are preventable
- Find people at high risk
 - Annual foot exams and regular foot checks
- Help people take care of their feet
 - Simple interventions save lives

Conclusion

Look at feet, save lives.



Contact Information

Sandra Graham PT
Rehabilitation Department
Alaska Native Medical Center
slgraham@anthc.org