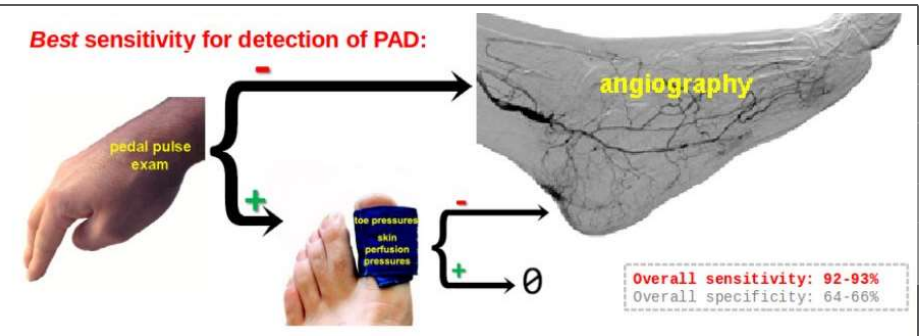
This document is intended to provide guidance for the evaluation of patients with non-healing foot ulcers. The goal of this guidance is to avoid delays in identifying underlying causes, to avoid delays in providing standard care, and to ensure the responsible utilization of health care resources. For the purposes of this guideline, a ***non-healing foot ulcer*** is defined as a full-thickness epithelial defect distal to the malleoli that demonstrates less a percent wound area reduction (PWAR) less than 50% over 4 weeks[1].

In brief**,** all patients with a non-healing foot ulcer should *at least* receive –within four weeks of meeting the definition of non-healing foot ulcer or within four weeks of initial visit – the following: (1) testing for peripheral artery disease; (2) a foot x-ray; and (3) an offloading calf-length boot.

1. Obtain either an ANGIOGRAM or TOE PRESSURES in ALL PATIENTS to evaluate for peripheral artery disease.

Digital subtraction angiography should be performed to ensure in-line flow to the affected angiosome(s) in the following circumstances[2]:

a. pedal pulses weak or absent;
b. toe pressure <60mmHg;
c. ulcer size >3cm;
d. infection requiring >3cm incision for drainage;
e. multiple ulcers;
f. ulcer located on foot, not toe (i.e. midfoot, heel, dorsum);
g. anticipated Lisfranc amputation, rotational flap, or free flap reconstruction.



Adapted from: Barshes NR, Flores E, Belkin M, et al. The Accuracy and Cost-Effectiveness of Strategies Used to Identify Peripheral Artery Disease Among Patients with Diabetic Foot Ulcers. *J Vasc Surg* 2016; 64:1682-1690.

The use of toe pressures or a toe-brachial pressure index as a substitute for an angiogram should mainly be reserved for corroborating adequate arterial circulation in patients with at least one *normal* (2+ palpable) pedal pulse AND a small (<3cm) ulcer confined to a toe.

> Exception: If at least two other improvements in management can be made (ex. initiating optimal wound care + optimal offloading therapy) in patients with toe pressures >40mmHg AND a small (<3cm) toe ulcer, angiography should be scheduled in 4 weeks, allowing time to assess for >50% percent wound area reduction.

Patients with prior ipsilateral endovascular revascularization 6+ months ago should have toe pressures obtained. Patients with prior open surgical revascularization 6+ months ago should have a duplex ultrasound evaluation to ensure patency.

2. Obtain either an X-RAY, MAGNETIC RESONANCE IMAGING or BIOPSY for ALL PATIENTS to evaluate for osteomyelitis.

ALL patients with a non-healing foot ulcer should have radiographic imaging to evaluate for osteomyelitis. This evaluation should begin with plain x-rays (ordered as toes, foot, or heel, depending on the area) done within the past 30 days. Percutaneous bone biopsy or surgery should be considered for obvious bony deformities suspicious for osteomyelitis in an area contiguous with an ulcer.

Magnetic resonance imaging or percutaneus image-guided bone biopsy (with specimens for both pathology and microbiology) should be requested in the following situations: (1) wound probes to bone; (2) x-ray changes suggestive of osteomyelitis in an area contiguous with the ulcer; (3) erythrocyte sedimentation rate >55 mm/hr, C-reactive protein >44mg/mL, procalcitonin >0.33ng/mL[3] without clinical signs of soft tissue infection; (4) continued non-healing despite adequate arterial circulation, offloading, and wound care.

[1] P. Sheehan *et alia*, *Plast Reconstr Surg* 2006; 117(7 Suppl):239S.
[2] N.R. Barshes *et alia*, *J Vasc Surg* 2016; 64:1682.
[3] F. Hadavand et alia, Arch Acad Emerg Med 2019; 10:37.

3. Provide proper OFFLOADING FOOTWEAR to ALL PATIENTS; consider surgical offloading for some.

The Ossur® DH OffLoading Walker™ with customized offloading insert (or, if unavailable, another calf-length boot that does not allow flexion or extension at the ankle) should be provided for offloading. The Darco Wound Care Shoe System™ may be substituted only if the ulcer is on the dorsum of the foot or the dorsum of the toes. An uncushioned cast shoe should NEVER be used.

Ossur® DH Walker:
the *BEST*

Darco Wound Care Shoe™System:
sometimes ok

cast shoe:
Don't ever use, potential HARM

Some patients should be evaluated for surgical forms of offloading. Specifically, gastrocnemius recession or tendon Achilles lengthening should be considered for all patients who cannot dorsiflex past neutral position (90° angle between foot and calf) or who are undergoing forefoot amputation.

4. Provide ADVANCED WOUND CARE to ALL PATIENTS.

The following are considered contemporary options for advanced wound care (formulary options in **bold**):

	Component:	Options to use:
1	in contact with the ulcer bed, ***infection present***	**a) cadexomer iodine gel (Iodosorb, Smith & Nephew) ± Mepitel® (Molnlycke Health Care)** **b) Iodoflex or Iodoform (Smith & Nephew)** **c) SilvaSorb (Medline) gel** d) Acticoat Flex 3 (Smith & Nephew) moistened with water, not saline e) Aquacell® Ag Extra (ConvaTec) f) Tritec™ Silver (Milliken / Medline) g) Hydroferra Blue® (Hollister) h) 0.125% sodium hypochlorite (Dakin's) solution used *twice daily* and for ≤5 days
1	in contact with the ulcer bed, ***uninfected***	**a) collagenase ointment (Santyl, Smith & Nephew; avoid CarraKlenz with use)** **b) MediHoney® gel (DermaSciences) + ____** c) PluroGel® (Medline) d) Promogram™(Acelity) e) negative pressure wound therapy dressings (Acelity)
2	second (absorbant) layer + holding it in place	**a) 2x2" or 4x4" gauze ±ABD pad** b) **Alleyvn foam (Smith & Nephew)**
3	to hold it in place	**a) cast padding + ACE elastic wrap with 2" paper tape** b) Mepilex® (Molnlycke Health Care) **c) 2" paper tape or Medipore™ tape (3M)**

DO NOT:

a. use **wet-to-dry dressings**, as these permit continued bacterial growth, macerate surrounding skin, and perform non-selective, low-efficacy debridement. A randomized trial has reported a -50% reduction in wound area with collagenase vs. 0.8% increase with saline-moistened gauze[4].
b. use undiluted **Betadine solution**, **alcohol solution**, bleach, or other cleaning materials not approved for wound care.
c. use **silk** or **rayon tape** directly on skin or on dressings
d. use **implants** or **grafts** as an ulcer healing adjunct unless peripheral artery disease and osteomyelitis have been ruled out (as described above), there is no active soft tissue infection, and the area reduction of the ulcer has been documented as being less than 50% over a 4 weeks despite adequate offloading and advanced local wound care (as described above).

5. Urge complete TOBACCO ABSTINENCE in ALL PATIENTS, utilizing freely-available local and national smoking cessation resources (MEDVAMC Veterans Kick Butts meetings, 800-QUIT-NOW).

6. Ensure optimal medical management in ALL PATIENTS, including diabetes management that is largely concordant with recommendations from major U.S. medical societies. This should be done in conjunction with the patient's primary care clinician or through a specialty medical clinic.

[4] A Tallis *et alia, Clin Ther* 2013; 35:1805.