UW TASP tele-antimicrobial stewardship program | echo

September 19, 2017

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Agenda

- Didactic: *The Diabetic Foot*
- Case Discussion
- Open Discussion

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The Diabetic Foot

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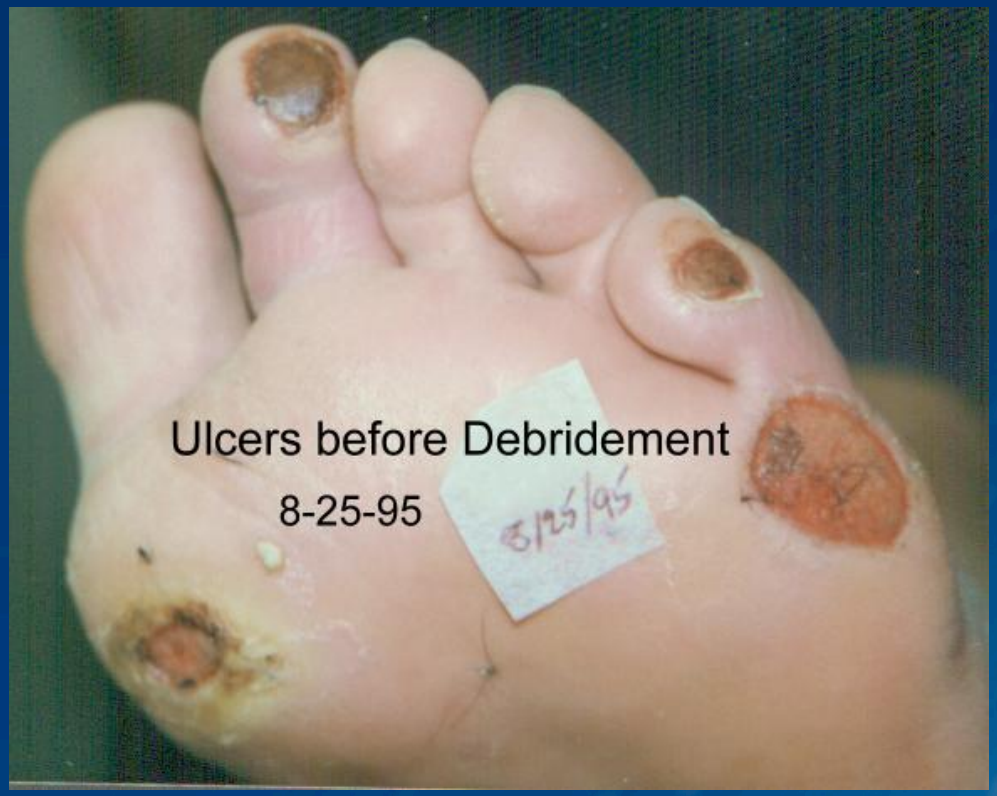
September 19th, 2017

Epidemiology

- 29 million people with DM in the US
- 25% of people >65y have DM
- Incidence is projected to increase by 55% over the next 20 (worldwide)
- 70% of people with DM have peripheral neuropathy
- With PN, ~7% risk of ulcer per year
- Three year mortality increases from 13% to 28% with an ulcer
- 50% of ulcers become infected
- Osteomyelitis in ~15% of ulcers (15% of those go on to amputation -> mortality increases to 60%)

Drivers of DM-Associated Foot Ulcers

- Neuropathy
  - Diminished sensation
  - Decreased sweat and oil glands
  - Decreased shunting of blood
  - Foot deformities (claw toes, hammer toes, Achilles' tendon stiffening)
- Vasculopathy/ischemia
- Nutritional dysfunction
- Immunopathy/infection



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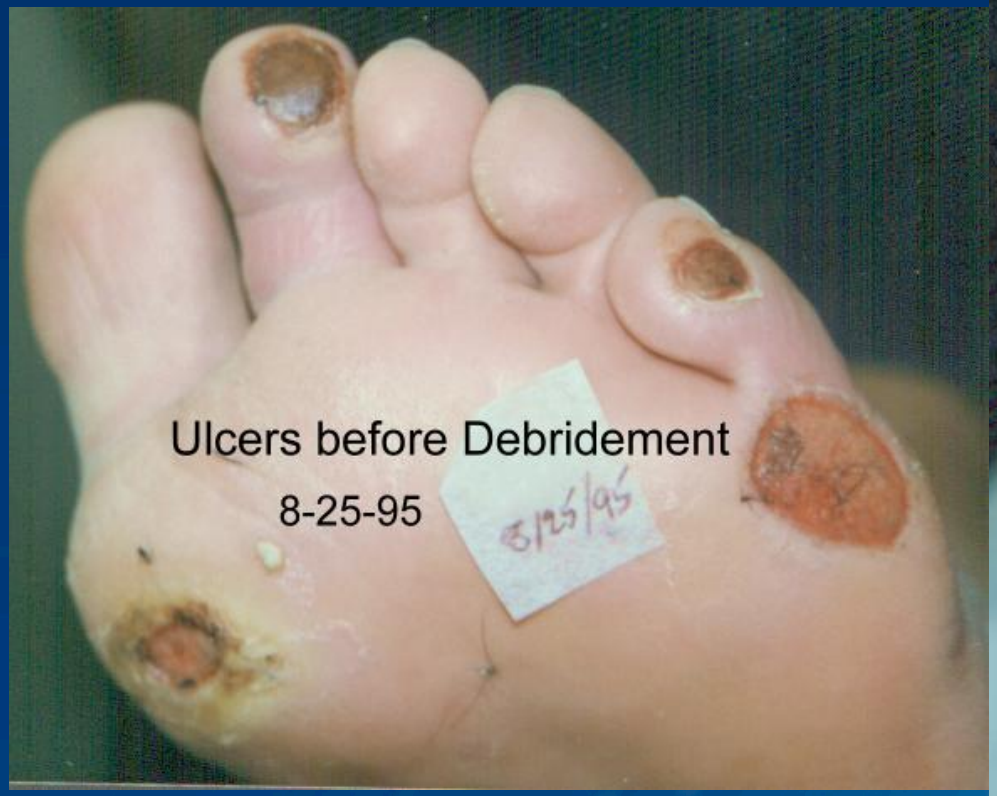

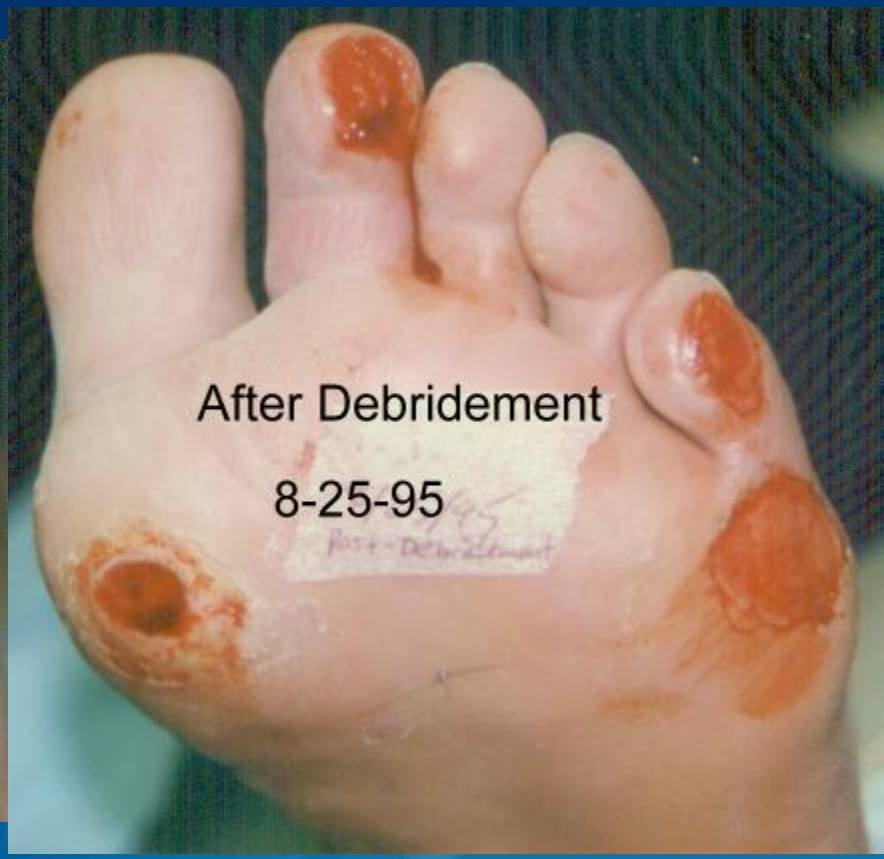

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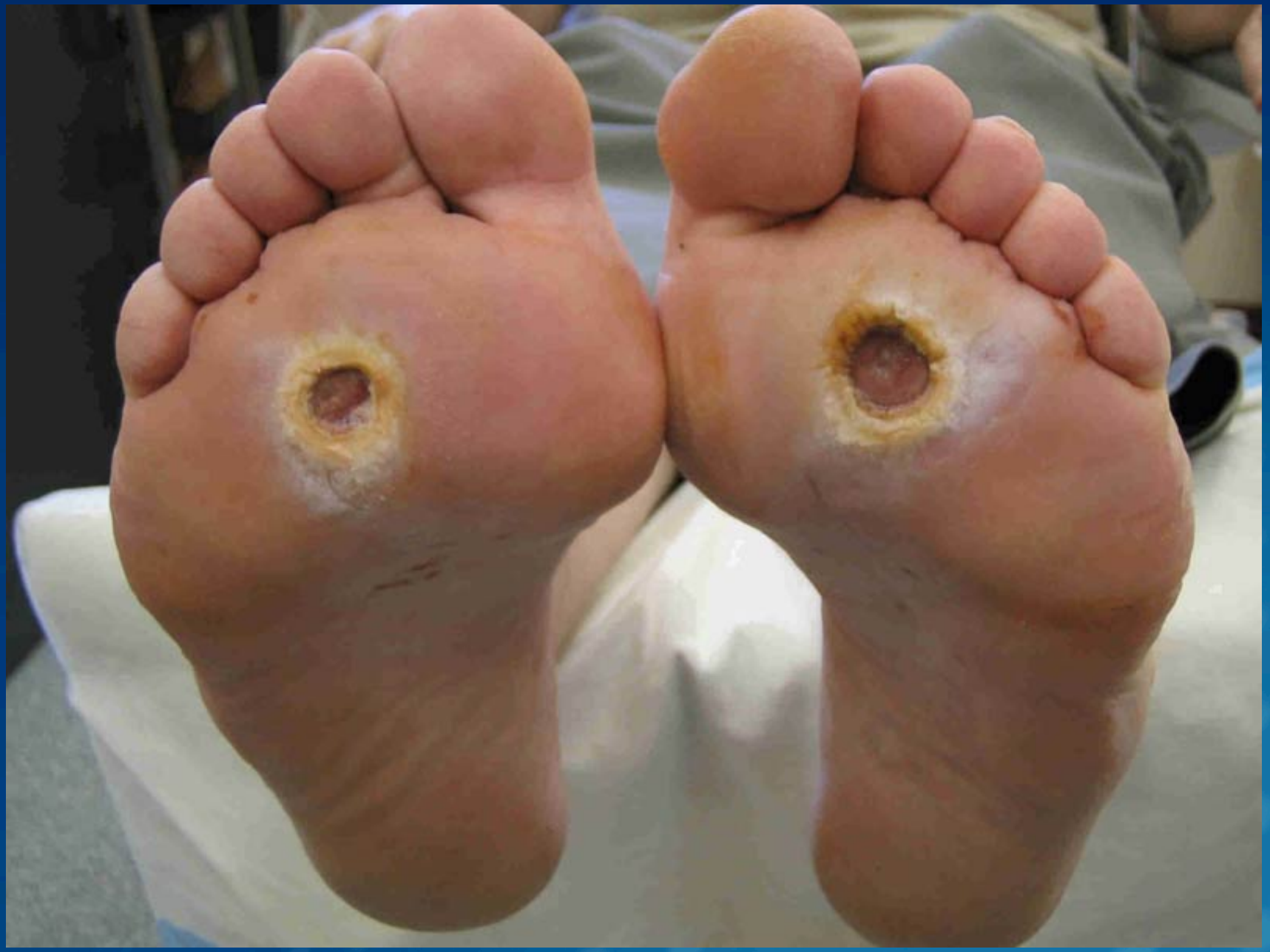


http://healthylogica.blogspot.com/2012/07/how-to-prevent-onset-of-diabetic-foot.html

Prevention of Ulcers

- Optimize DM treatment
- Assess for risk factors regularly
- For those at risk, wear offloading DM footwear

Evaluation of a Foot Ulcer

- Physical examination
  - Evidence of infection
  - Depth
- CDC, pre-albumin, BUN, creatinine, hemoglobin A1C, CRP and ESR
- Ankle brachial index (ABI) and/or transcutaneous oxygen tension measurement
- Plain film
  - Assess for foreign bodies
  - Evaluate for osteomyelitis
- Cultures not helpful unless concerned for infection

Ulcer Treatment

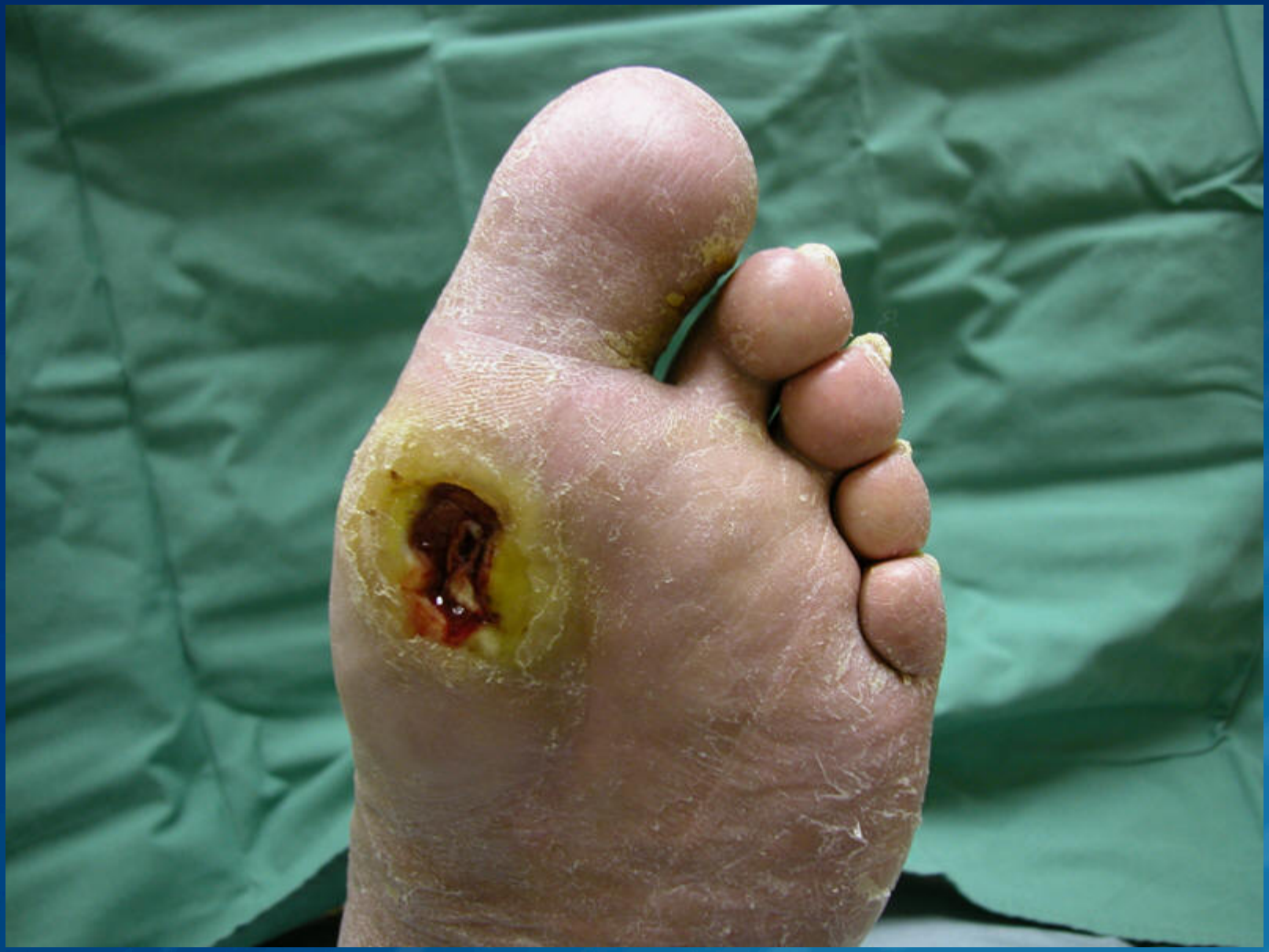
- Maintain a moist environment
- Prevent infection
- Off-load the affected area
- Debride necrotic tissue and calluses
- Maximize perfusion and nutrition
- Hyperbaric oxygen therapy (Wagner grade 3 or higher)
- Sometime surgery for Achilles' tendon lengthening

Infected Ulcers

- Once an ulcer forms, it will most likely become infected if not treated/healed (at least 50%)
- Risks: ulcer to the bone, >30 days, recurrent, trauma, peripheral arterial disease
- Usually staphylococcus and streptococcus initially
- With increasing time, depth and size, wounds are colonized and/or infected with multiple organisms, including Gram negatives and anaerobes

Diagnosis of an Infected Ulcer

- Obvious purulent drainage
- And/or 2 of the following:
  - Erythema
  - Pain
  - Tenderness
  - Warmth
  - Induration
- Mild, moderate, severe



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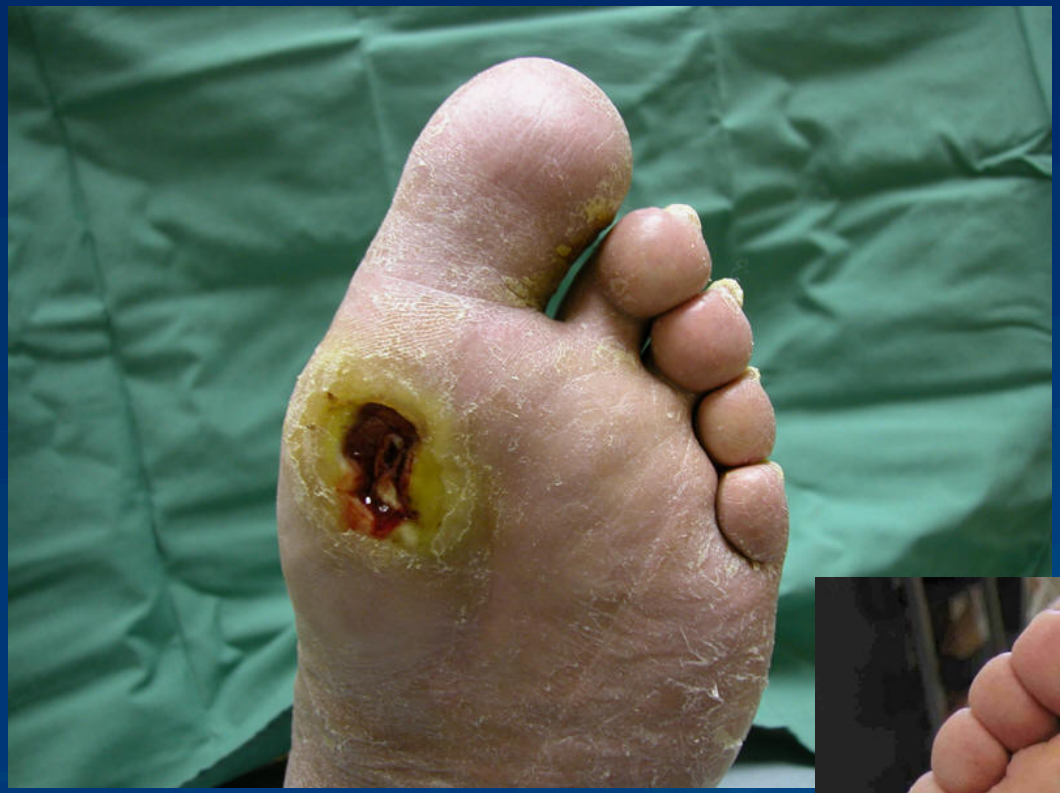
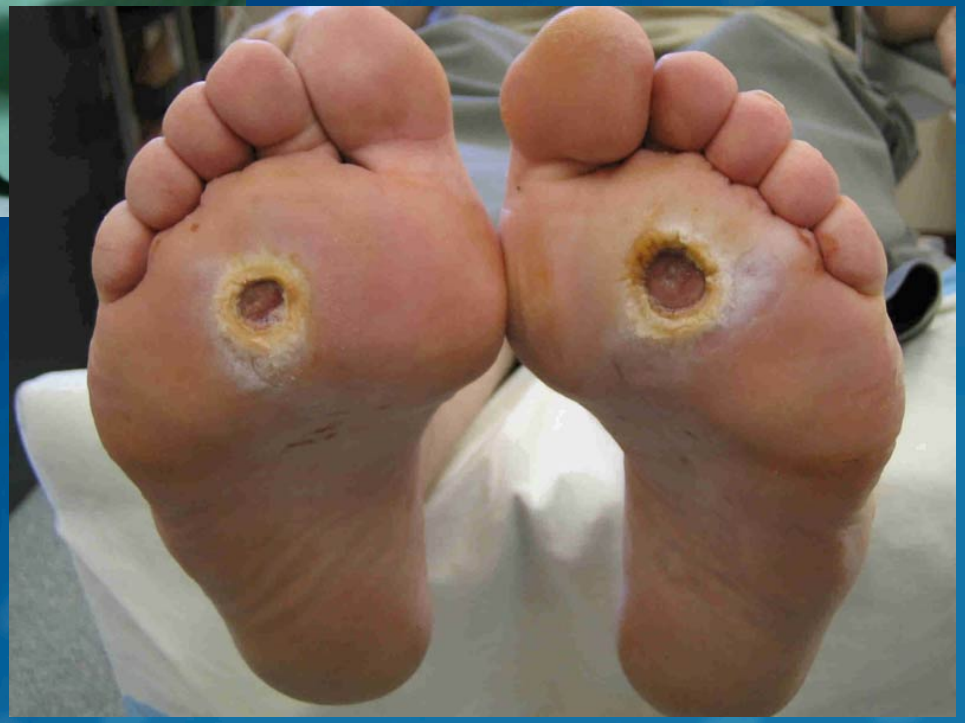


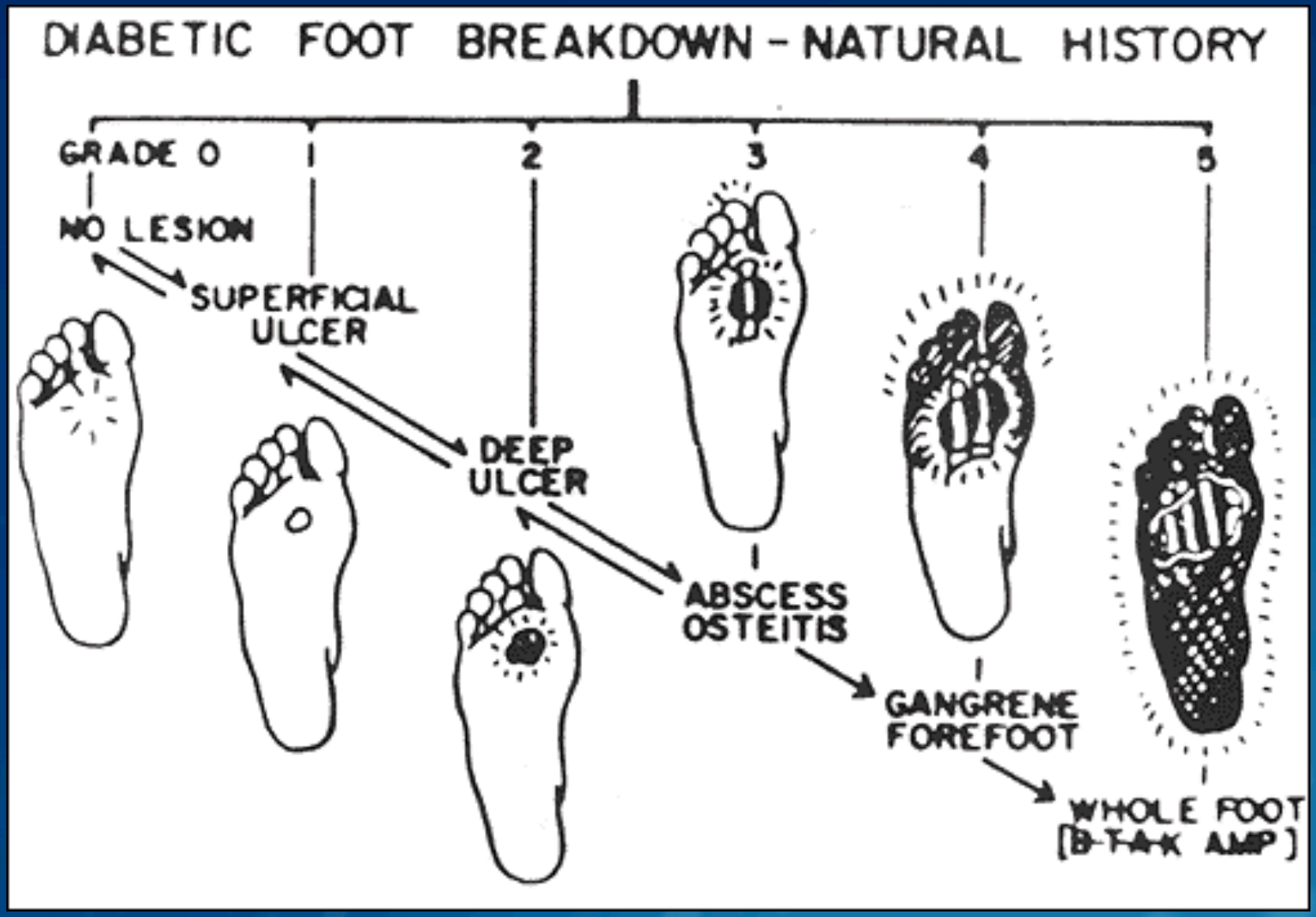


http://www.antimicrobe.org/printout/e26printout/e26assess/e26ass14.jpg

Osteomyelitis?

- Metal probe
  - NPV, 98%
  - Sensitivity 66%
  - Specificity 85%
- Imaging
  - Plain film, Sp 67%, Sn 60%
  - MRI is most specific and sensitive

Wagner Classification



Clinical Manifestation of Infection	PEDIS Grade	IDSA Infection Severity
No symptoms or signs of infection	1	Uninfected
Infection present, as defined by the presence of at least 2 of the following items: • Local swelling or induration • Erythema • Local tenderness or pain • Local warmth • Purulent discharge (thick, opaque to white or sanguineous secretion)		
Local infection involving only the skin and the subcutaneous tissue (without involvement of deeper tissues and without systemic signs as described below). If erythema, must be >0.5 cm to ≤2 cm around the ulcer. Exclude other causes of an inflammatory response of the skin (eg, trauma, gout, acute Charcot neuro-osteoarthropathy, fracture, thrombosis, venous stasis).	2	Mild
Local infection (as described above) with erythema > 2 cm, or involving structures deeper than skin and subcutaneous tissues (eg, abscess, osteomyelitis, septic arthritis, fasciitis), **and** No systemic inflammatory response signs (as described below)	3	Moderate
Local infection (as described above) with the signs of SIRS, as manifested by ≥2 of the following: • Temperature >38°C or <36°C • Heart rate >90 beats/min • Respiratory rate >20 breaths/min or $PaCO_2$ <32 mm Hg • White blood cell count >12 000 or <4000 cells/μL or ≥10% immature (band) forms	4	Severe[a]

Abbreviations: IDSA, Infectious Diseases Society of America; $PaCO_2$, partial pressure of arterial carbon dioxide; PEDIS, perfusion, extent/size, depth/tissue loss, infection, and sensation; SIRS, systemic inflammatory response syndrome.

DFI score

Table 3. Diabetic Foot Infection Wound Score (Items Comprising the Diabetic Foot Infection Wound Score Wound Parameters and Wound Measurements and the Method for Scoring Each)

Item	Assessment	Scoring
Wound parameters[a]		
Purulent discharge	Absent	0
	Present	3
Other signs and symptoms of inflammation[a]	Absent	0
Nonpurulent discharge	Mild	1
Erythema	Moderate	2
Induration		
Tenderness		
Pain	Severe	3
Local warmth		
Range of wound parameters (10-item) subtotal		0–21
Range of wound parameters (8-item) subtotal		0–15
Wound measurements[a]		
Size (cm^2)	<1	0
	1–2	1
	>2–5	3
	>5–10	6
	>10–30	8
	>30	10
Depth (mm)	<5	0
	5–9	3
	10–20	7
	>20	10
Undermining (mm)	<2	3
	2–5	5
	>5	8
Range of wound measurements subtotal		3–28
Range of total 10-item[b] DFI wound score		3–49
Range of total 8-item[b] DFI wound score		3–43

Table 5. Recommendations for Collection of Specimens for Culture From Diabetic Foot Wounds

Do
• Obtain an appropriate specimen for culture from almost all infected wounds • Cleanse and debride the wound before obtaining specimen(s) for culture • Obtain a tissue specimen for culture by scraping with a sterile scalpel or dermal curette (curettage) or biopsy from the base of a debrided ulcer • Aspirate any purulent secretions using a sterile needle and syringe • Promptly send specimens, in a sterile container or appropriate transport media, for aerobic and anaerobic culture (and Gram stain, if possible)
Do not
• Culture a clinically uninfected lesion, unless for specific epidemiological purposes • Obtain a specimen for culture without first cleansing or debriding the wound • Obtain a specimen for culture by swabbing the wound or wound drainage

Table 9. In Which Situations Is Diagnostic Bone Biopsy Most Recommended?

- Patient or provider prefers definitive diagnosis to justify choice of early surgery in favor of prolonged treatment
- Cultures of soft tissue or blood suggest high risk of osteomyelitis with antibiotic-resistant organism(s)
- There is progressive bony deterioration or persistently elevated inflammatory markers during empiric or culture-directed therapy (should consider surgical resection)
- Suspect bone is a planned target for insertion of orthopaedic metalware

Table 8. Suggested Empiric Antibiotic Regimens Based on Clinical Severity for Diabetic Foot Infections[a]

Infection Severity	Probable Pathogen(s)	Antibiotic Agent	Comments
Mild (usually treated with oral agent[s])	*Staphylococcus aureus* (MSSA); Streptococcus spp	Dicloxacillin	Requires QID dosing; narrow-spectrum; inexpensive
		Clindamycin[b]	Usually active against community-associated MRSA, but check macrolide sensitivity and consider ordering a "D-test" before using for MRSA. Inhibits protein synthesis of some bacterial toxins
		Cephalexin[b]	Requires QID dosing; inexpensive
		Levofloxacin[b]	Once-daily dosing; suboptimal against *S. aureus*
		Amoxicillin-clavulanate[b]	Relatively broad-spectrum oral agent that includes anaerobic coverage
	Methicillin-resistant *S. aureus* (MRSA)	Doxycycline	Active against many MRSA & some gram-negatives; uncertain against streptococcus species
		Trimethoprim/ sulfamethoxazole	Active against many MRSA & some gram-negatives; uncertain activity against streptococci

Table 8. Suggested Empiric Antibiotic Regimens Based on Clinical Severity for Diabetic Foot Infections[a]

Moderate (may be treated with oral or initial parenteral agent[s]) or severe (usually treated with parenteral agent[s])	MSSA; *Streptococcus* spp; Enterobacteriaceae; obligate anaerobes	Levofloxacin[b]	Once-daily dosing; suboptimal against *S. aureus*
		Cefoxitin[b]	Second-generation cephalosporin with anaerobic coverage
		Ceftriaxone	Once-daily dosing, third-generation cephalosporin
		Ampicillin-sulbactam[b]	Adequate if low suspicion of *P. aeruginosa*
		Moxifloxacin[b]	Once-daily oral dosing. Relatively broad-spectrum, including most obligate anaerobic organisms
		Ertapenem[b]	Once-daily dosing. Relatively broad-spectrum including anaerobes, but not active against *P. aeruginosa*
		Tigecycline[b]	Active against MRSA. Spectrum may be excessively broad. High rates of nausea and vomiting and increased mortality warning. Nonequivalent to ertapenem + vancomycin in 1 randomized clinical trial
		Levofloxacin[b] or ciprofloxacin[b] with clindamycin[b]	Limited evidence supporting clindamycin for severe *S. aureus* infections; PO & IV formulations for both drugs
		Imipenem-cilastatin[b]	Very broad-spectrum (but not against MRSA); use only when this is required. Consider when ESBL-producing pathogens suspected
	MRSA	*Linezolid*[b]	Expensive; increased risk of toxicities when used >2 wk
		Daptomycin[b]	Once-daily dosing. Requires serial monitoring of CPK
		Vancomycin[b]	Vancomycin MICs for MRSA are gradually increasing
	Pseudomonas aeruginosa	***Piperacillin-tazobactam***[b]	TID/QID dosing. Useful for broad-spectrum coverage. *P. aeruginosa* is an uncommon pathogen in diabetic foot infections except in special circumstances (2)

Table 11. Suggested Route, Setting, and Duration of Antibiotic Therapy, by Clinical Syndrome

Site of Infection, by Severity or Extent	Route of Administration	Setting	Duration of Therapy
Soft-tissue only			
Mild	Topical or oral	Outpatient	1–2 wk; may extend up to 4 wk if slow to resolve
Moderate	Oral (or initial parenteral)	Outpatient/ inpatient	1–3 wk
Severe	Initial parenteral, switch to oral when possible	Inpatient, then outpatient	2–4 wk
Bone or joint			
No residual infected tissue (eg, postamputation)	Parenteral or oral	…	2–5 d
Residual infected soft tissue (but not bone)	Parenteral or oral	…	1–3 wk
Residual infected (but viable) bone	Initial parenteral, then consider oral switch	…	4–6 wk
No surgery, or residual dead bone postoperatively	Initial parenteral, then consider oral switch	…	≥3 mo

Surgical Management

- Aggressive incision, drainage and debridement of non-viable soft tissue and bone
- Multiple debridements often necessary
- Amputation
  - Mild 2.8%
  - Moderate 46.2%
  - Severe 77.7%
- Early surgical intervention + IV abx associated with fewer BKA and shorter LOS

Other Care

- Wound care
- Negative pressure wound therapy
- Hyperbaric oxygen therapy