Travel-Free CME

CODE FOOT: Save a Foot, Save a Life

Dave Griffin, DPM

Disclosure

The planners and presenter have nothing to disclose

Upcoming webinars

July 22: Managing Behaviors in Alzheimer's Dementia
David Mansoor, MD

July 29: Isolation and Loneliness in Older Adults

August 5: Acne, Rosacea, and other Acneiform Conditions
Kim Sanders, MPAS, PA-C

August 12: Insomnia: Diagnosis & Treatment
Jonathan Emens, MD

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CODE FOOT: Save a Foot, Save a Life

Building the OHSU Functional Limb Preservation Program

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Assistant Professor
Division of Vascular and Endovascular Surgery
Department of Surgery

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No Financial Disclosures

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Learning Objectives

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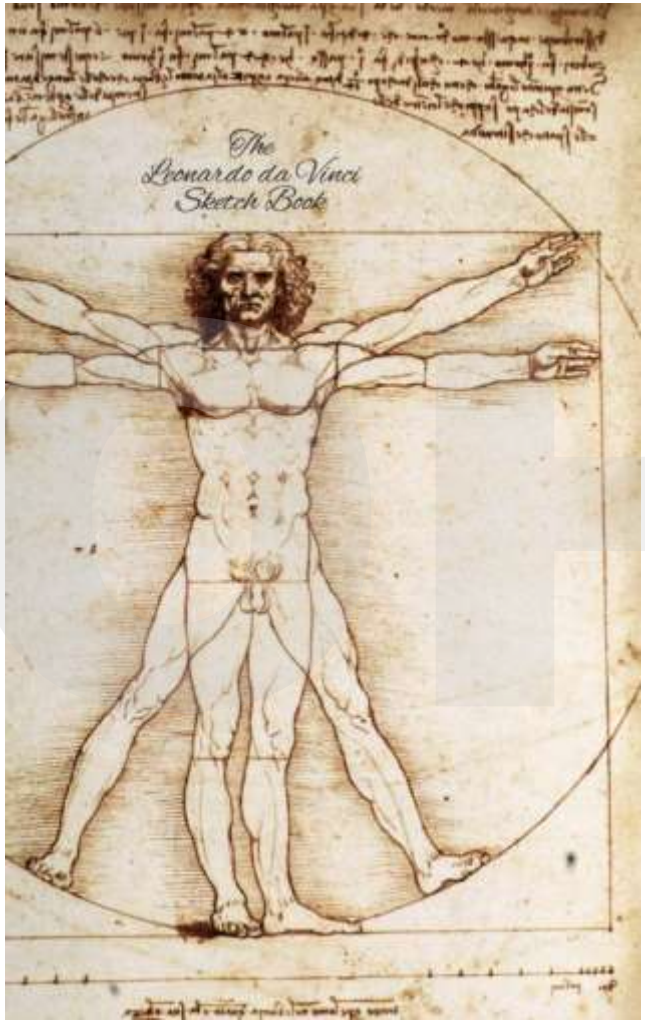
- Discuss prevention tools for DFU in 2020



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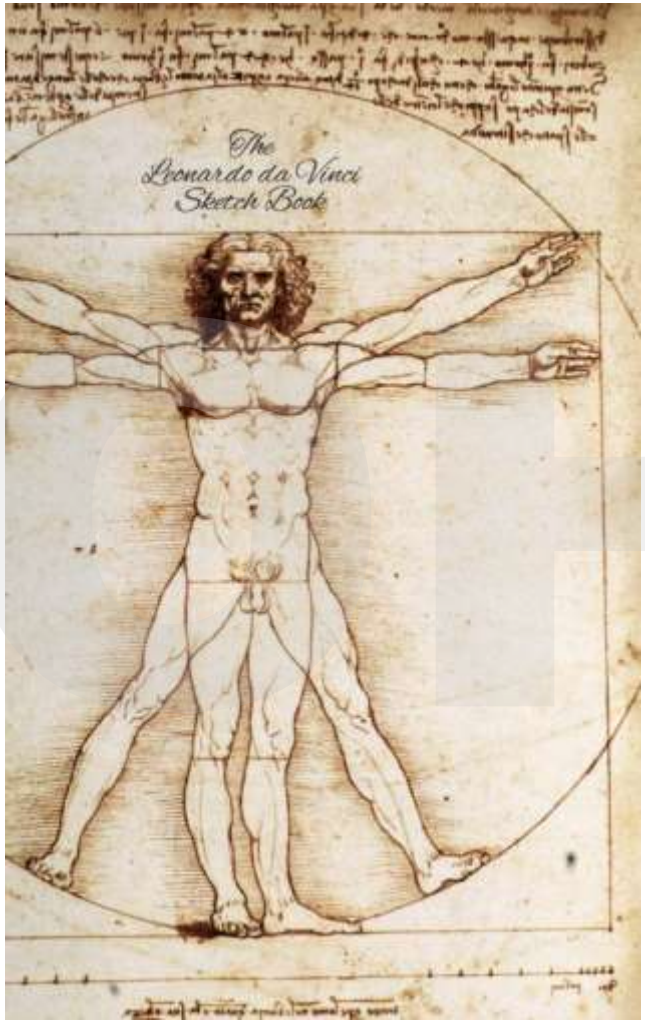

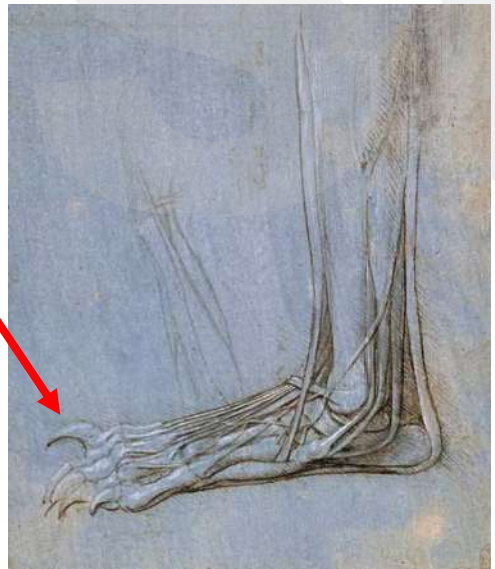

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feet

(noun)

a device used for finding Legos in the dark

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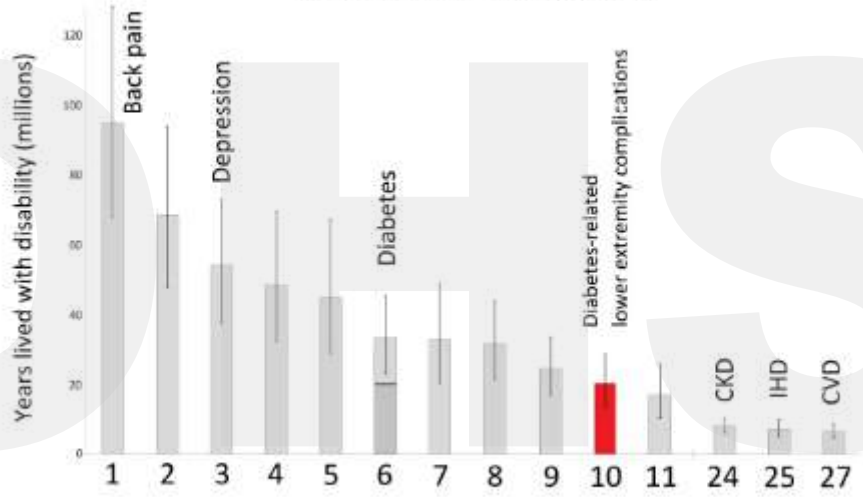
Diabetic foot complications are common

Global burden of disease



Lazzarini, Pacella, Armstrong, van Netten, Diabetic Med, 2018
Zhang, et al (Armstrong), Diabetes Care, 2020

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Why call a CODEFOOT on an infected DFU?

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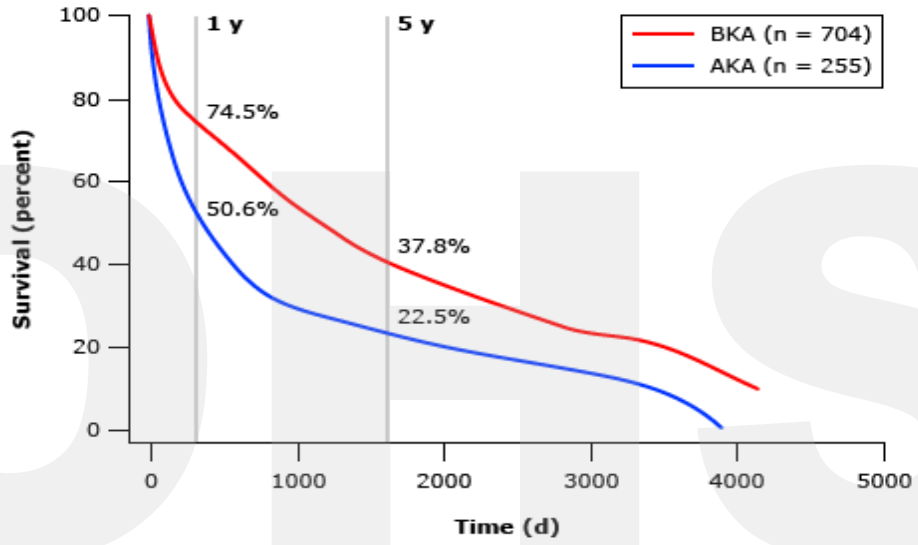
Long-term survival following below-knee and above-knee amputations



%: percent.

Reproduced from: Eidt JF, Kalapatapu VR. Amputation: Techniques and results. In: Rutherford Vascular Surgery, 7th ed, Vol. 2, Cronenwett JL, Johnston KW (Eds), Saunders Elsevier, Philadelphia 2010. Illustration used with the permission of Elsevier Inc. All rights reserved.

https://www.uptodate.com/contents/lower-extremity-amputation/print

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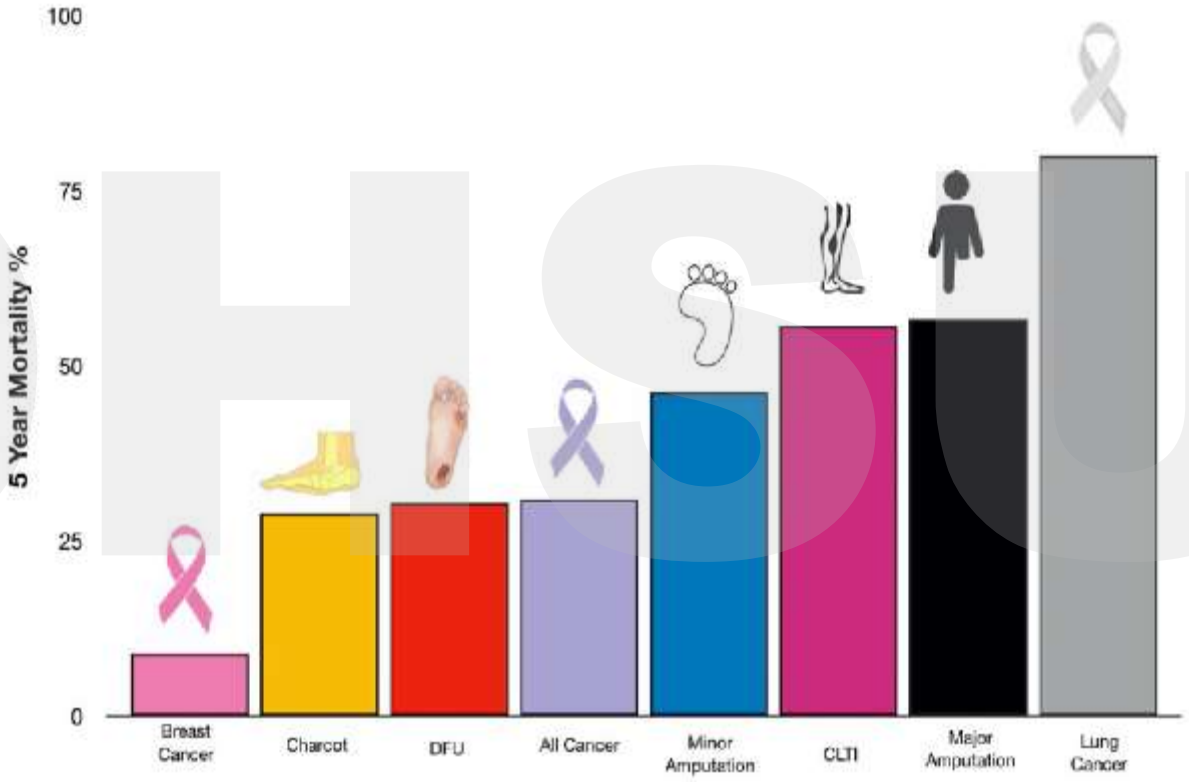

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Diabetic Foot = Cancer

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Callus = Breast Lump

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=

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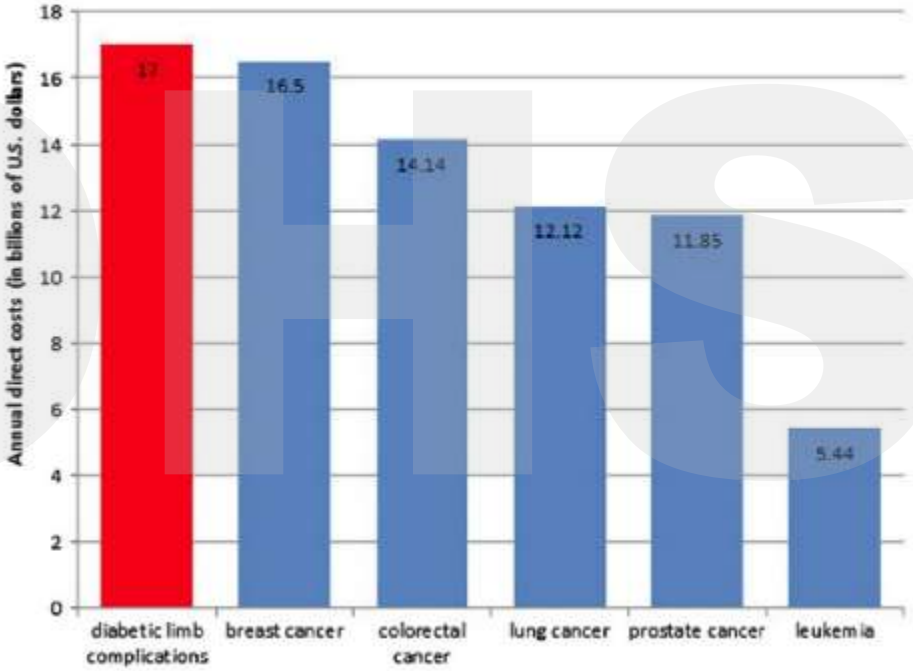

Barshes, et al, 2013

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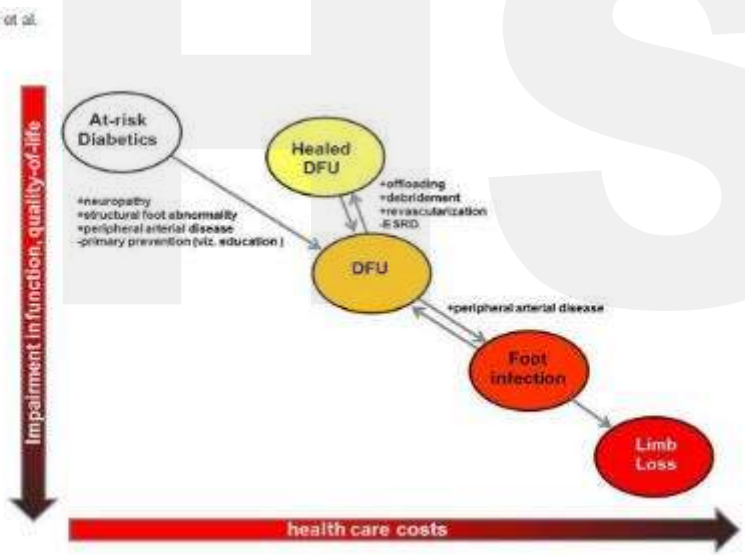
The Big Cost-Foot Infection→Amputation



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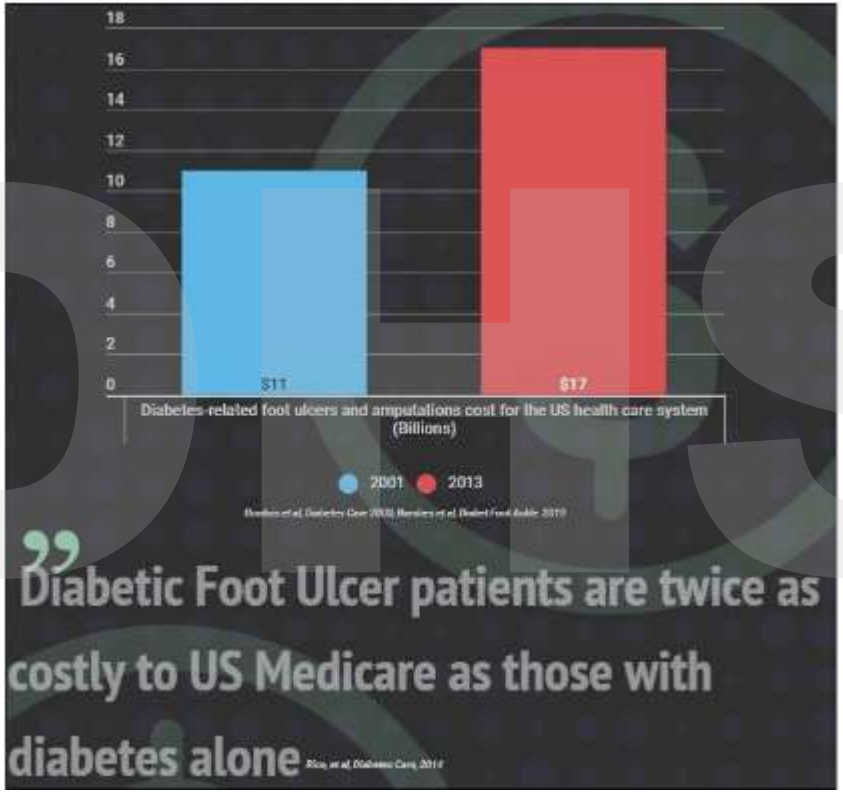

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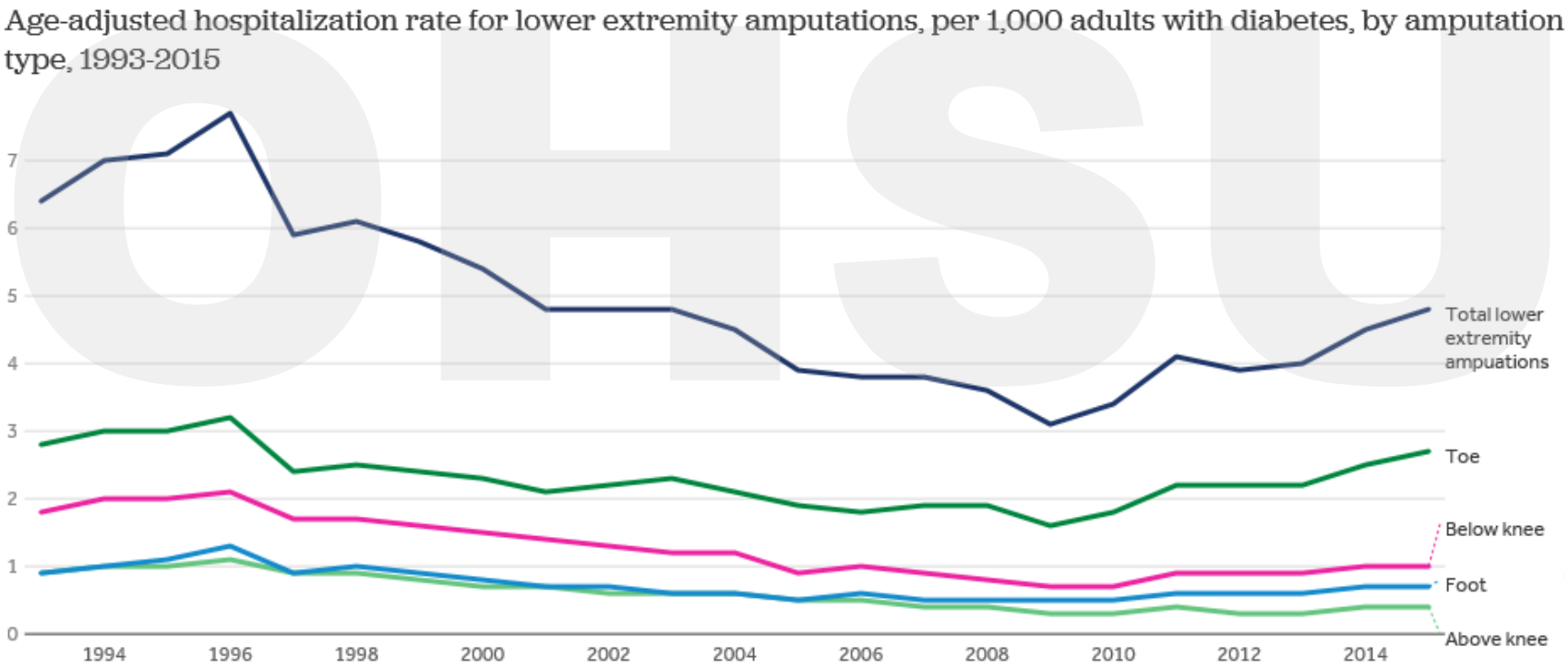
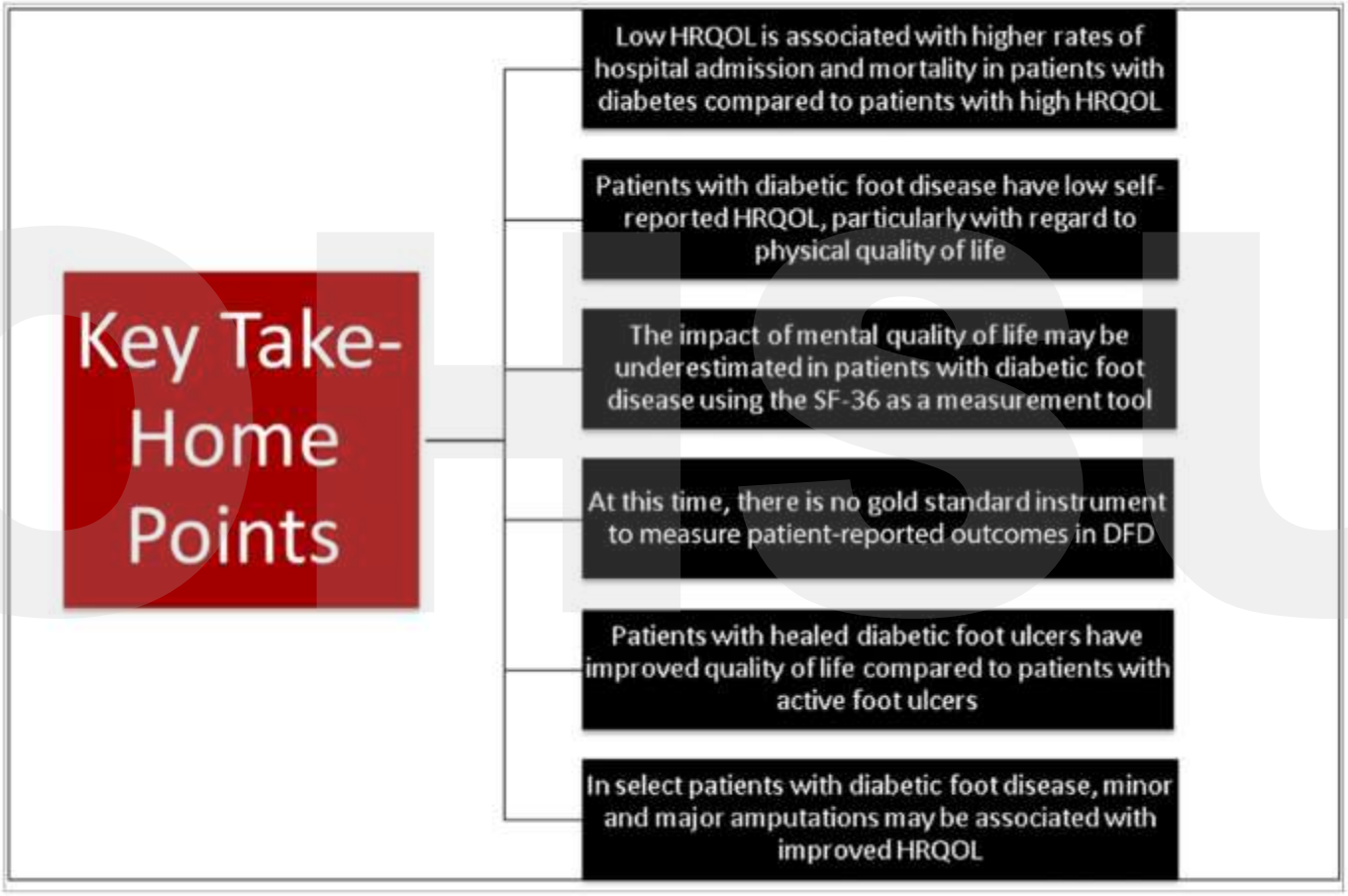
Diabetes patients have been increasingly hospitalized for lower extremity amputations since 2009



www.healthsystemtracker.org/chart-collection/diabetes-care-u-s-changed-time/#item-start

Hospital Readmissions for DFU

Key summary points on the impact of diabetes and diabetes-related foot complications on HRQOL.



Dane K. Wukich, and Katherine M. Raspovic Dia Care 2018;41:391-397

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ESRD Amputation vs Palliative Care
Engaging Hospice/Care goals Discussion Early

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Lower extremity amputation and health care utilization in the last year of life among Medicare beneficiaries with ESRD

METHODS

Mortality follow-back study

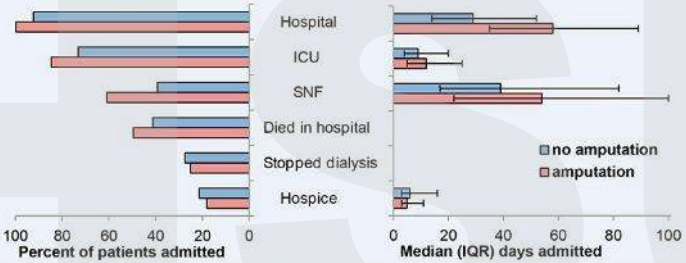
Medicare beneficiaries with end-stage renal disease (ESRD) who did and did not undergo amputation in their last year of life

N= 62,075 N=692,702

USRDS and Medicare institutional claims

RESULTS

End-of-life care among patients with ESRD



CONCLUSION

Patients with ESRD who undergo lower extremity amputation in the last year of life spend prolonged periods of time in acute and subacute care settings, are more likely to stop dialysis before death, and appear to have less access to hospice services compared with other patients with ESRD. **These findings likely signal substantial unmet palliative care needs and opportunities to improve care for seriously ill patients with ESRD who undergo lower extremity amputation.**

doi: 10.1681/ASN.2018101002

JASN

Catherine R. Butler, Margaret L. Schwarze, Ronit Katz, Susan M. Hailpern, William Kreuter, Yoshio N. Hall, Maria E. Montez Rath and Ann M. O'Hare
JASN March 2019, 30 (3) 481-491

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Importance of factors determining the low health-related quality of life in people presenting with a diabetic foot ulcer: the Eurodiale study

V. Siersma, H. Thorsen, P. E. Holstein, M. Kars, J. Apelqvist, E. B. Jude, A. Piaggesi, K. Bakker, M. Edmonds, A. Jirkovska, D. Mauricio, G. Ragnarson Tennvall, H. Reike, M. Spraul ... See all authors

First published:12 June 2013 | https://doi.org/10.1111/dme.12254 | Citations: 43

- EQ5D Survey
- #1 Inability to stand or walk
- #2 Pain/Discomfort

By placing a checkmark in one box in each group below, please indicate which statements best describe your own health state today.

Mobility
- I have no problems in walking about
- I have some problems in walking about
- I am confined to bed

Self-Care
- I have no problems with self-care
- I have some problems washing or dressing myself
- I am unable to wash or dress myself

Usual Activities (e.g. work, study, housework, family or leisure activities)
- I have no problems with performing my usual activities
- I have some problems with performing my usual activities
- I am unable to perform my usual activities

Pain/Discomfort
- I have no pain or discomfort
- I have moderate pain or discomfort
- I have extreme pain or discomfort

Anxiety/Depression
- I am not anxious or depressed
- I am moderately anxious or depressed
- I am extremely anxious or depressed

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Diabetic Foot Ulcer Healing
Common, Costly and Complicated

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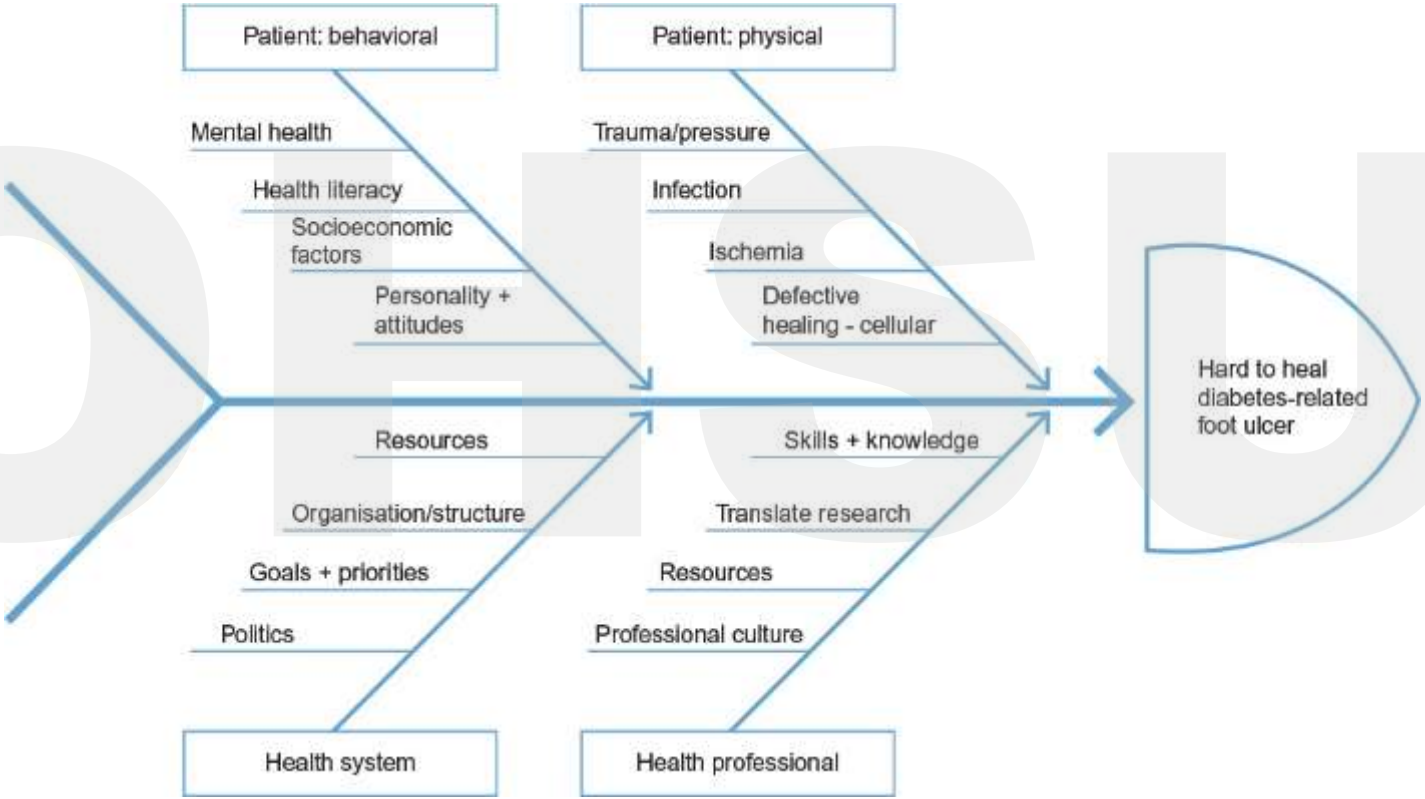

https://doi.org/10.2147/CWCMR.S84990

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DIABETES: GIVE IT AN INCH AND IT'LL TAKE A FOOT

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How to run a CODEFOOT

Evaluating a DFI

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Introduction to Diabetic Foot Exam

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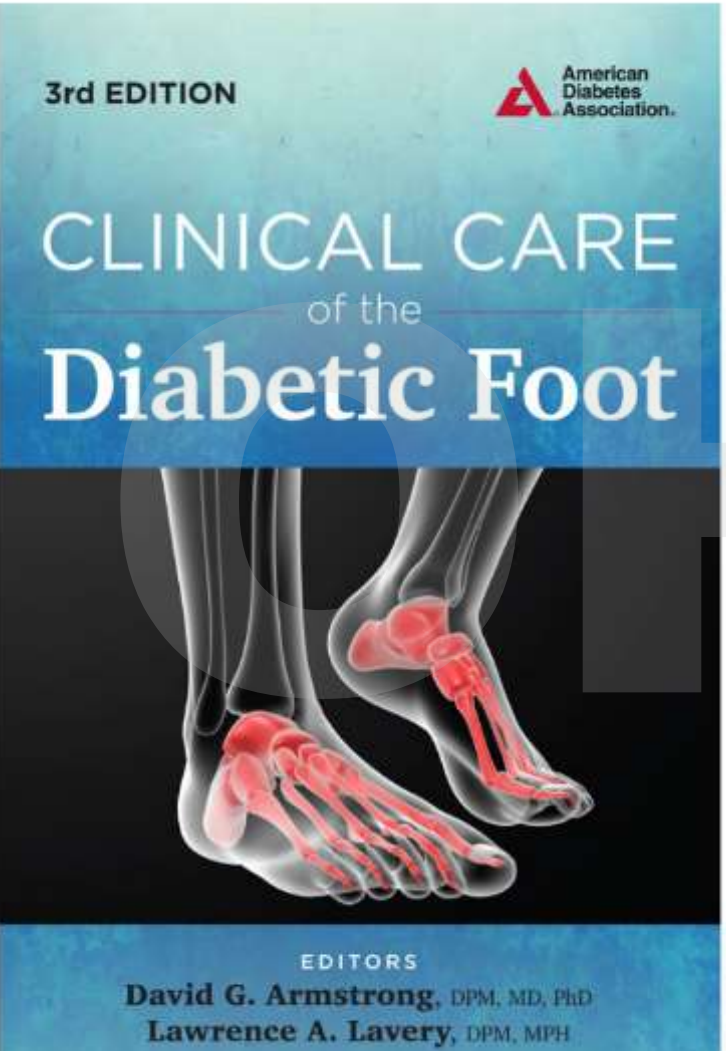
1. General Inspection
2. Vascular
3. Dermatologic
4. Musculoskeletal
5. Neurological

Ancillary testing:

- Imaging
- Labs

Diagnosis not to miss

- PVD
- Necrotizing fasciitis
- Retained purulence
- Septic joint
- Charcot foot



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CLINICAL CARE of the Diabetic Foot

David G. Armstrong, DPM, MD, PHD
Lawrence A. Lavery, DPM, MPH

American Diabetes Association.

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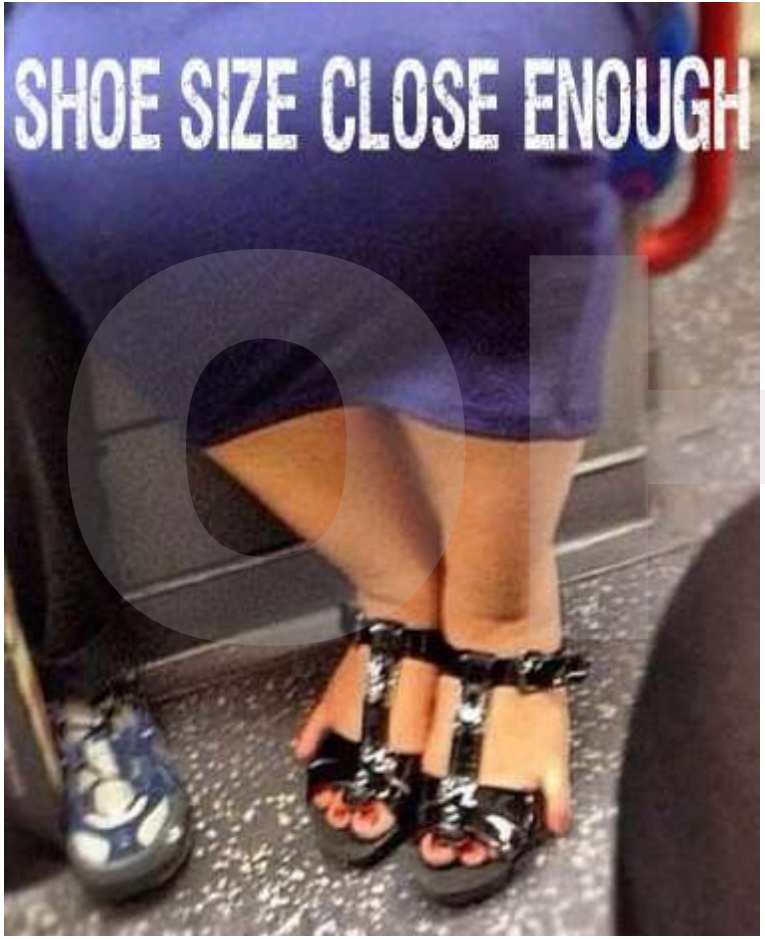
General Inspection

- Socks and shoes
  - Do these shoes fit these feet ?
- Look for foot deformities
- Could this be Charcot?

21-82 % of DFU Due To Improper Fitting Shoes



Diabet Med. 1997 Oct;14(10):867-70.
Factors contributing to the presentation of diabetic foot ulcers.
Macfarlane RM1, Jeffcoate WJ

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Risk Factors for Foot Ulcers

Previous amputation

Past foot ulcer history

Peripheral neuropathy

Foot deformity

Peripheral vascular disease

Visual impairment

Diabetic nephropathy (especially patients on dialysis)

Poor glycemic control

Cigarette smoking

Andrew J.M. Boulton, MD, DSc (Hon), FRCP
Manchester Royal Infirmary, Division of Medicine, Manchester, U.K.

Essential Features of History

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Past history

- Ulceration
- Amputation
- Charcot joint
- Vascular surgery
- Angioplasty
- Cigarette smoking

Neuropathic symptoms

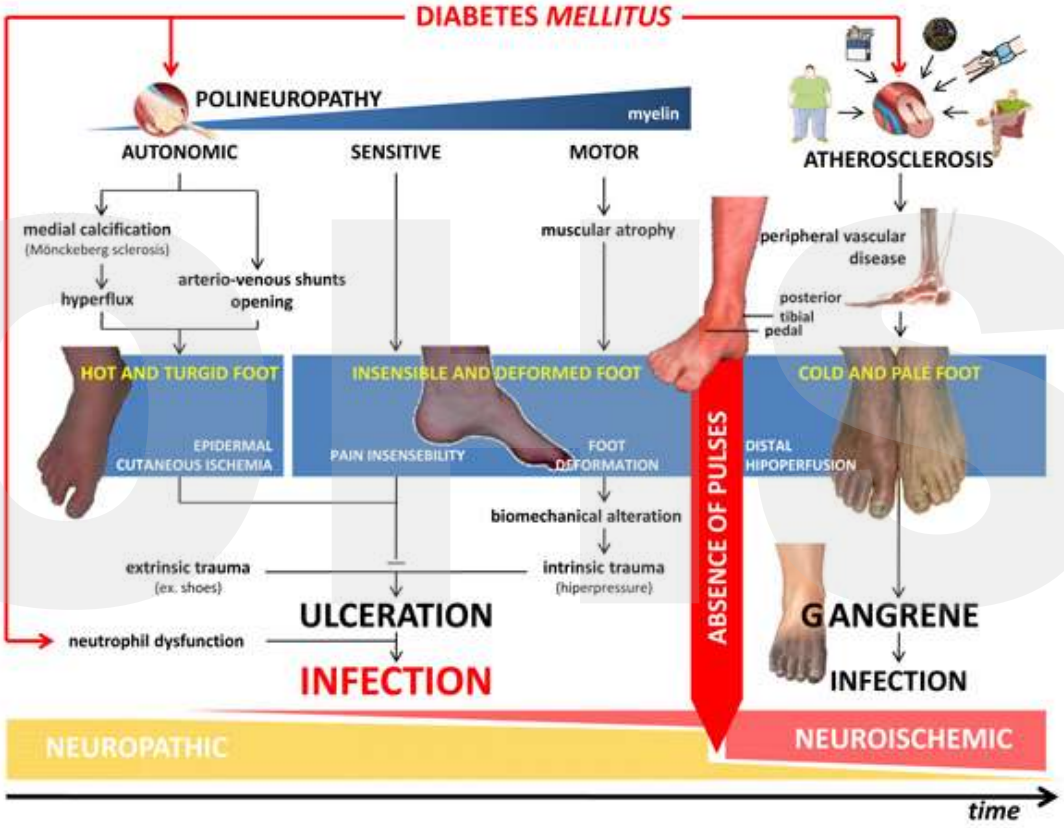
- Positive (e.g., burning or shooting pain, electrical or sharp sensations)
- Negative (e.g., numbness, feet feel dead)

Vascular symptoms

- Claudication
- Rest pain
- Nonhealing ulcer

Other diabetes complications

- Renal (dialysis, transplant)
- Retinal (visual impairment)



https://jdfc.org/spotlight/diabetic-foot-infections-current-diagnosis-and-treatment/

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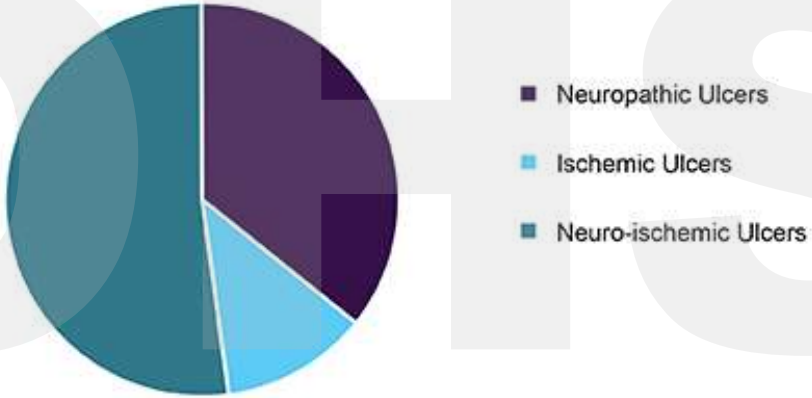
North America diabetic foot ulcer treatment market share, by ulcer type, 2017 (%)



Source: www.grandviewresearch.com

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VIP'S

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V—vascular/ischaemia	Pulse palpation and if possible ankle-brachial pressure index (ABPI)
I—infection/biofilm/inflammation	Visual signs, redness, swelling, slough, smell, reported pain
P—pressure	Is it caused by mobility (likely diabetic foot ulcer) or immobility (likely pressure ulcer)?
S—sensation (neuropathy)	Touch the toes and, if possible, monofilament test

V=Vascular

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Vascular

- Foot Pulses
- Doppler exam
- ABI if indicated

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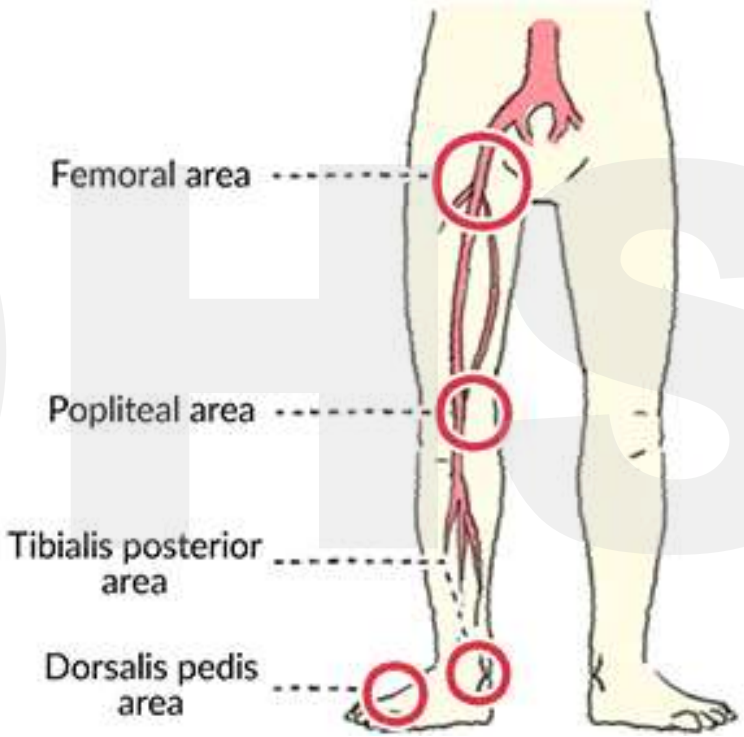
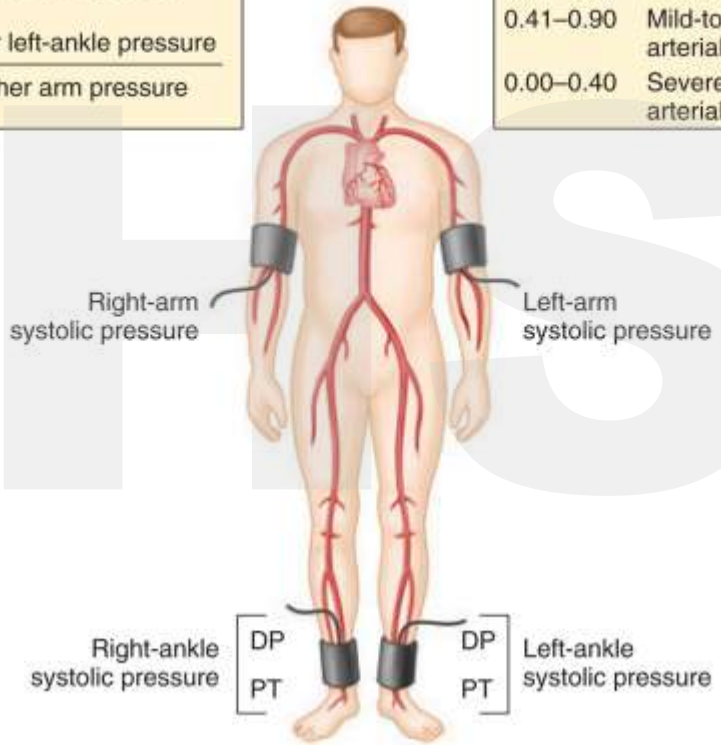


Fig 1. Ankle-brachial index – Doppler assessment of dorsalis pedis

Right ABI	$\frac{\text{Higher right-ankle pressure}}{\text{Higher arm pressure}}$
Left ABI	$\frac{\text{Higher left-ankle pressure}}{\text{Higher arm pressure}}$

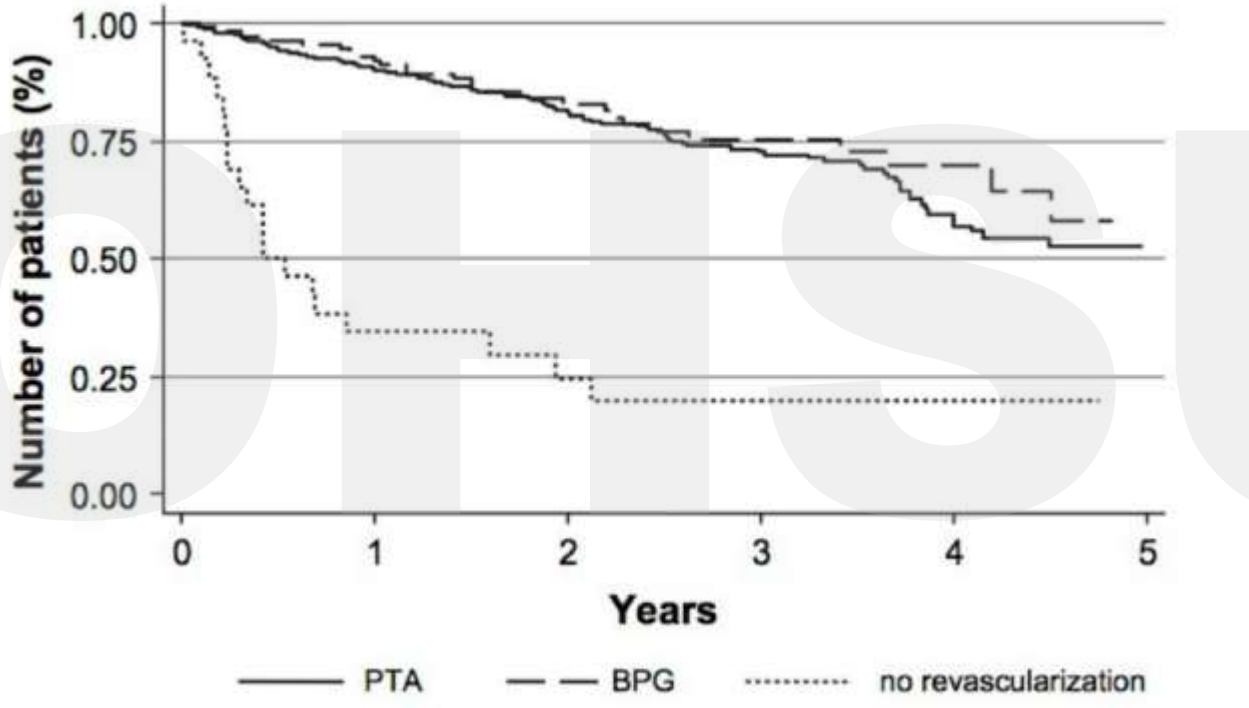
Interpretation of ABI	
>1.30	Noncompressible
0.91–1.30	Normal
0.41–0.90	Mild-to-moderate peripheral arterial disease
0.00–0.40	Severe peripheral arterial disease



PAD

In general, healing is usually severely impaired when

- The ABI is <0.6 *or*
- The toe pressure is <30 mmHg *or*
- The TcPo2 is <30 mmHg.



Faglia, et al, Eur J. Vasc Endovasc Surg, 2006

**BEST-CLI Trial (2016-Current) more to come

I=Infection

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Dermatological

- Skin status: color, thickness, dryness, cracking
- Sweating
- Infection: check between toes for fungal infection
- Ulceration
- Calluses/blistering: hemorrhage into callus?

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Ulcer Assessment

- Location
- Size
- Depth
- Debride
- *Probe to bone

JAMA. 1995 Mar 1;273(9):721-3.

Probing to bone in infected pedal ulcers. A clinical sign of underlying osteomyelitis in diabetic patients.

Grayson ML[1], Gibbons GW, Balogh K, Levin E, Karchmer AW.

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JAMA®
The Journal of the American Medical Association

- 76 patients with infected diabetic foot ulcer
- 'probe-to-bone' test
  89% positive predictive value

Diabetes Care. 2007 Feb;30(2):270-4.

Probe-to-bone test for diagnosing diabetic foot osteomyelitis: reliable or relic?

Lavery LA[1], Armstrong DG, Peters EJ, Lipsky BA.

- 247 patients with diabetic foot ulcer
- 'probe-to-bone' test
  57-62% positive predictive value
  98% negative predictive value
  - A negative test argues strongly against the diagnosis of osteomyelitis.

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TIME IS TISSUE: TIME TO TREATMENT IS DIRECTLY ASSOCIATED WITH TIME TO HEALING

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Photo courtesy of Peter Blume, DPM

Diabetic Foot Infection

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Infection presence defined by at least 2 of the following:

- Local swelling or induration
- Erythema
- Local tenderness or pain
- Local warmth
- Purulent discharge

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Diabetic Foot Infection

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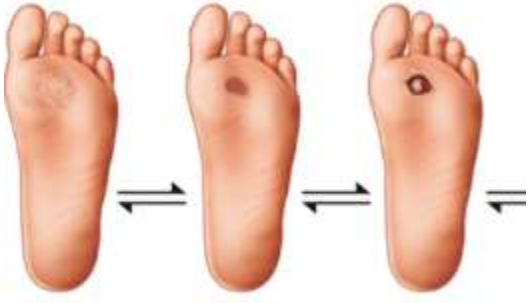
Mild

- Local involvement without deeper tissues
- 0.5-2cm erythema surrounding ulcer



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Diabetic Foot Infection

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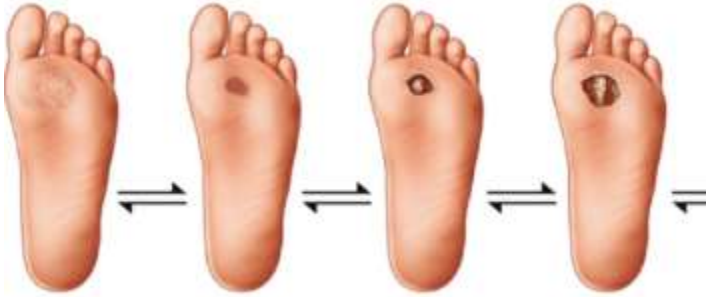
Mild

- Local involvement without deeper tissues
- 0.5-2cm erythema surrounding ulcer

Moderate

- Erythema >2cm
- OR involving structures deeper than the skin
- No systemic inflammatory response



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Diabetic Foot Infection

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Severe

- Local infection
- SIRS criteria ≥2
  - Temperature >38C or <36C
  - Heart rate >90bpm
  - RR >20 breaths/min or PaCO2<32mmHg
  - WBC >12,000 or <4000 or >10% immature bands

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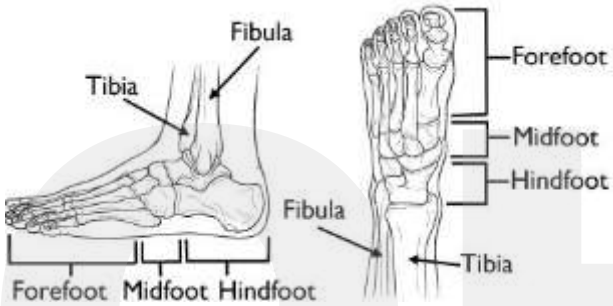
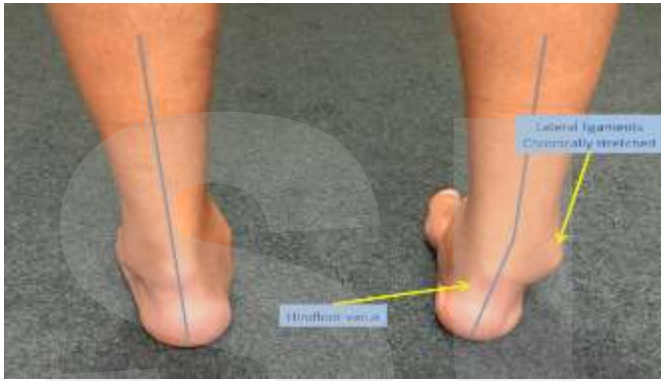
P=Pressure/Deformity





Reduce pressure: Offloading—Shift weight and decrease shear forces

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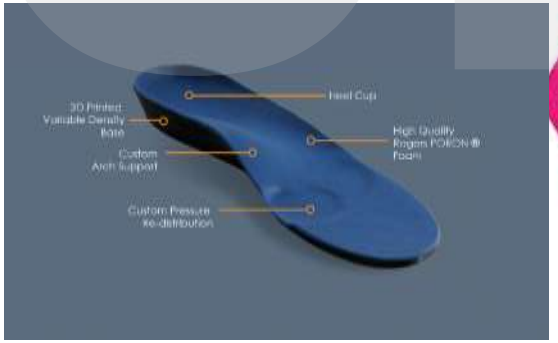

Total Contact Casting

Positioning & Balancing

Walker Boots

What products can we use to Offload?

Insoles & Orthoses

Offloading Footwear

Healing Footwear

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Assistive Devices for Off-Loading

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Real World Challenges

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S=Sensation

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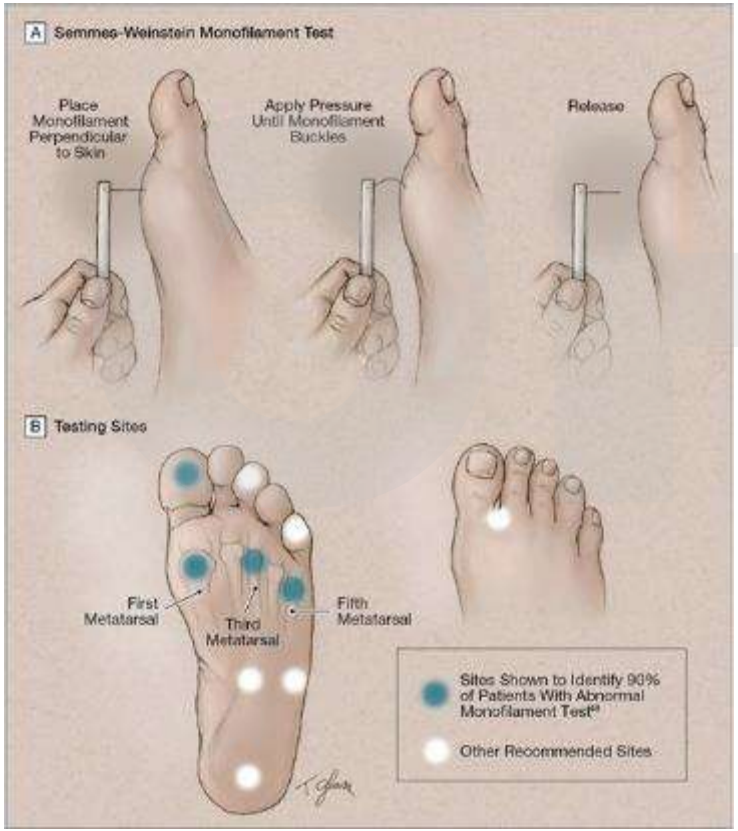

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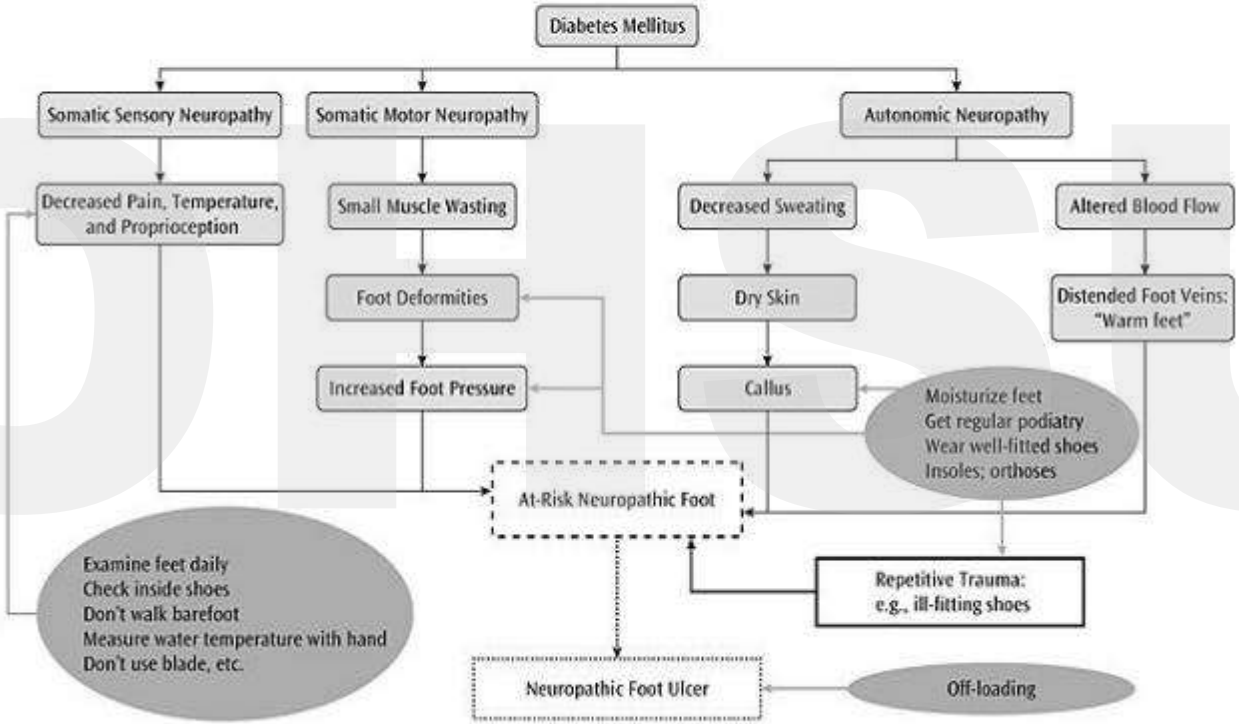
Diabetes Mellitus
Somatic Sensory Neuropathy
Somatic Motor Neuropathy
Autonomic Neuropathy
Decreased Pain, Temperature, and Proprioception
Small Muscle Wasting
Decreased Sweating
Altered Blood Flow
Foot Deformities
Dry Skin
Distended Foot Veins: "Warm feet"
Increased Foot Pressure
Callus
Moisturize feet
Get regular podiatry
Wear well-fitted shoes
Insoles; orthoses
At-Risk Neuropathic Foot
Examine feet daily
Check inside shoes
Don't walk barefoot
Measure water temperature with hand
Don't use blade, etc.
Repetitive Trauma: e.g., ill-fitting shoes
Neuropathic Foot Ulcer
Off-loading

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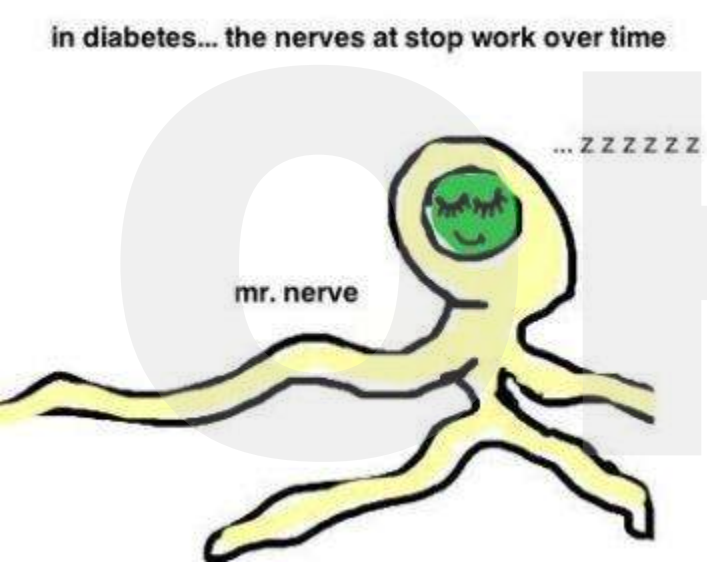

When nerves don't work
...we cannot feel sharp or harmful things

we cannot protect our feet from getting injured

so ulcers will form

the ulcers can get worse if not treated

sometimes bone sticks out

bacteria love that!

they start to party in your foot

http://www.bonetalks.com/footdiabetic

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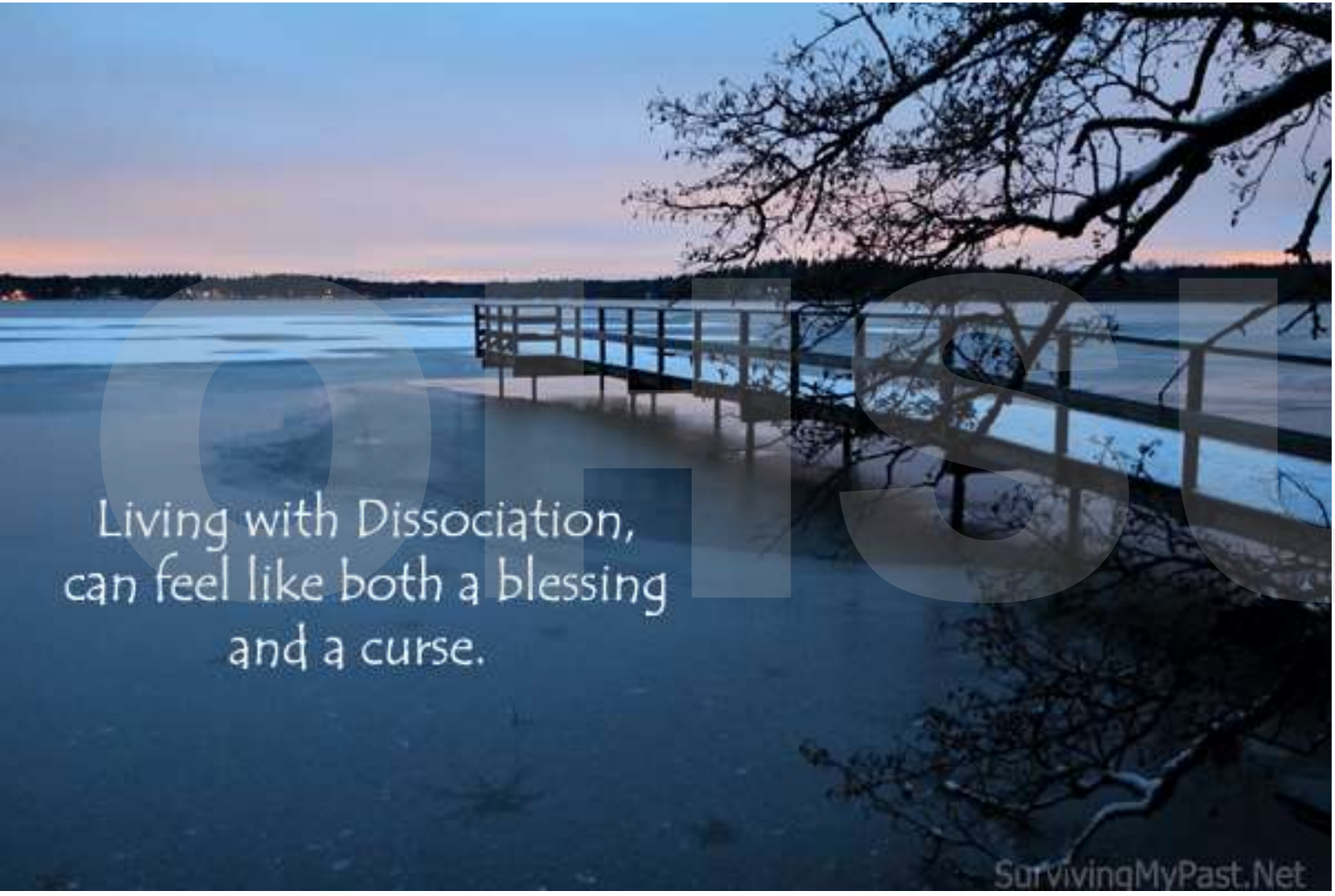

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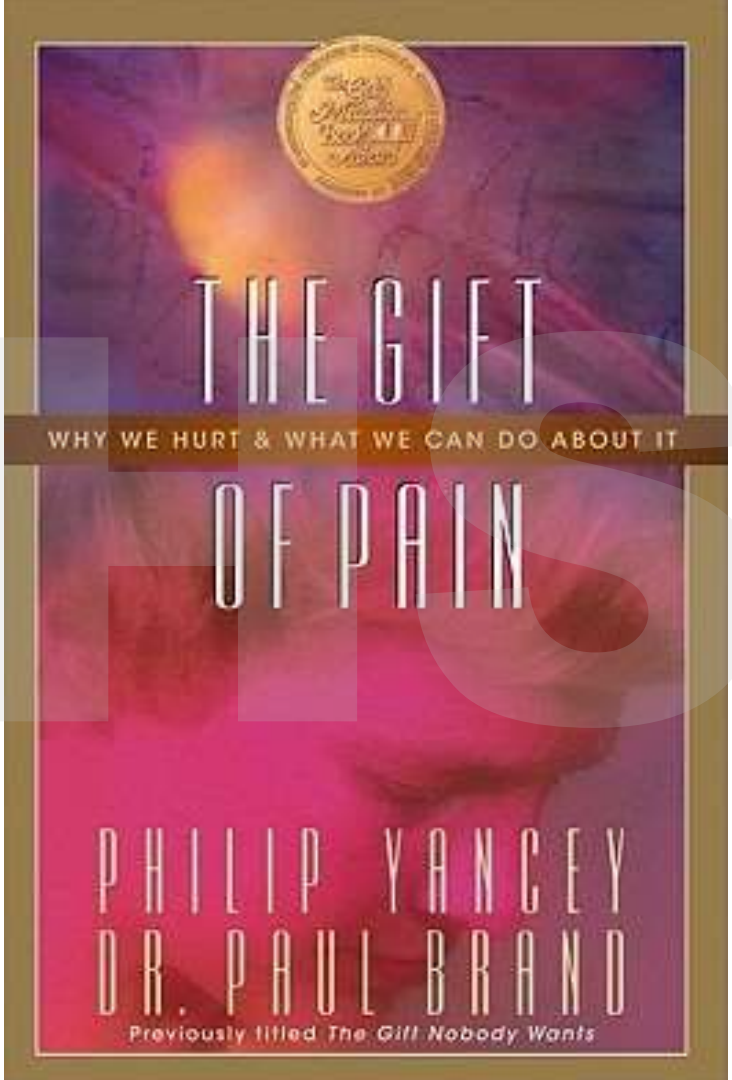
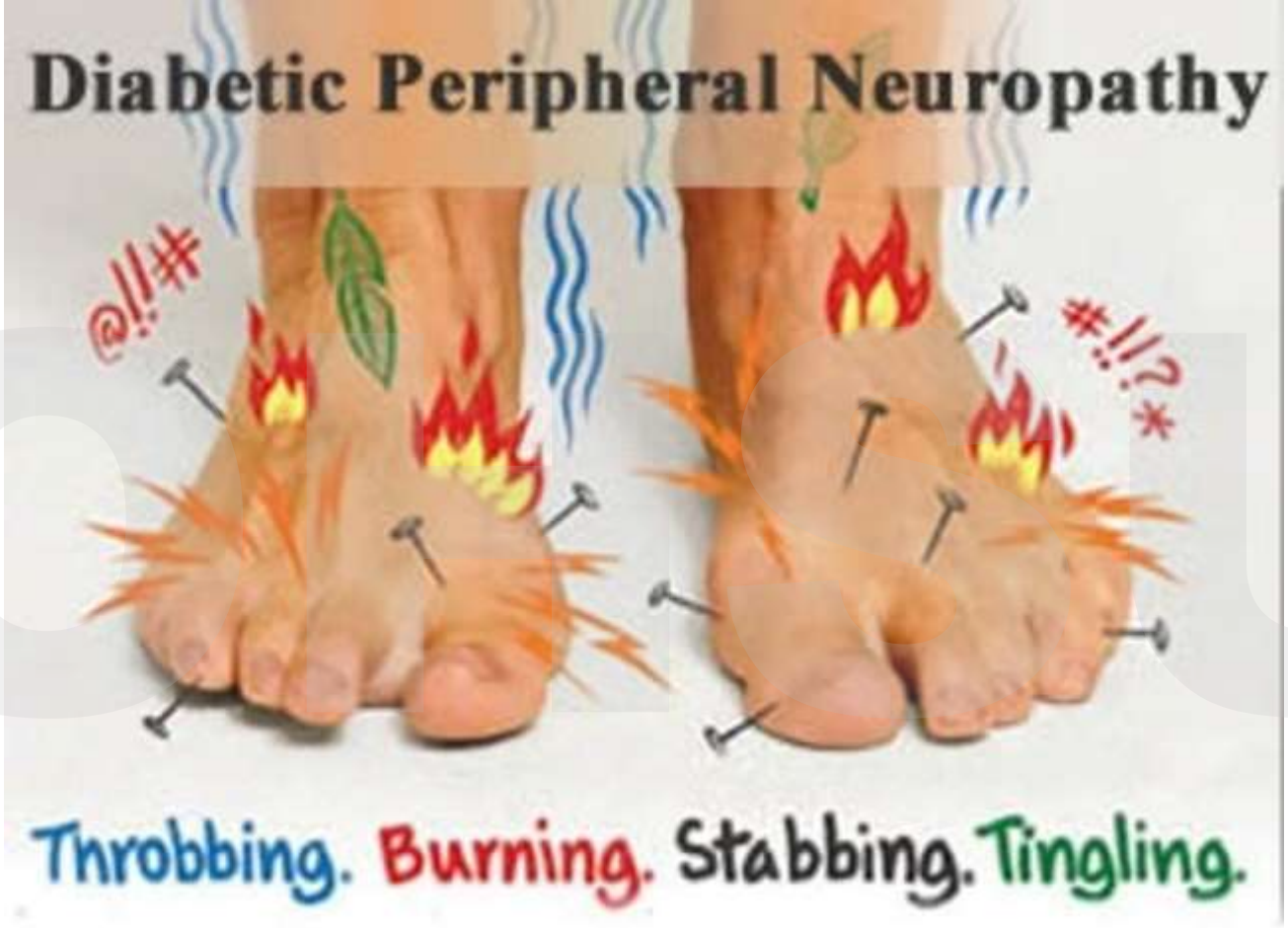


https://lh3.googleusercontent.com/proxy/PI1hR_8kkkrwoeEkAh2_tMnIMoIxfn6-5T-CHRLA2M6nu_jk2A-XCZxJ8gDmIjrZLJ9pNKleSdcl245wvK5vNEWcCWpGVNyrPWw

Diabetic Peripheral Neuropathy



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It is enough to drive you Crazy!

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Imaging

- X-Ray--3 views non wb
- MRI??

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Lab Testing

CBC w/ Diff
CRP
Sed Rate
BMP
Patient appropriate

Wound culture (Bedside vs OR)—timing and anatomy

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Learning Objectives

Residents and Fellows focused (questions encouraged)

- Understand the mortality and morbidity for DFU/DFI
- Recognize cost (QOL and $) associated with DFU and DFI
- Understand how to run a Code Foot—examining an infected foot
- Learn the VIP'S of a DFI
- 3 minute Diabetic Foot Exam
- Understand rationale of Osteomyelitis Abx use and timing
- Understand the team approach (Toe and Flow model)
- Review the surgical art of foot preservation--Toemigo style
- Discuss prevention tools for DFU in 2020

Minute 1: What to Ask

Does the patient have a history of:

- Previous leg/foot ulcer or lower limb amputation/surgery?
- Prior angioplasty, stent, or leg bypass surgery?
- Foot wound?
- Smoking or nicotine use?
- Diabetes? (If yes, what are the patient's current control measures?)

Does the patient have:

- Burning or tingling in legs or feet?
- Leg or foot pain with activity
- Changes in skin color, or skin lesions?
- Loss of lower extremity sensation?

Has the patient established regular podiatric care?

Minute 2: What to Look For

Dermatologic exam:

- Does the patient have discolored, ingrown, or elongated nails?
- Are there signs of fungal infection?
- Does the patient have discolored and/or hypertrophic skin lesions, calluses, or corns?
- Does the patient have open wounds or fissures?
- Does the patient have interdigital maceration?

Neurologic Exam:

- Is the patient responsive to light touch (protective sensation) on the feet?

Musculoskeletal Exam:

- Does the patient have full range of motion of the joints?
- Does the patient have obvious deformities? If so, for how long?
- Is the midfoot hot, red, or inflamed?

Vascular Exam:

- Is the hair growth on the foot dorsum or lower limb decreased?
- Are the dorsalis pedis AND posterior tibial pulses palpable?
- Is there a temperature difference between the calves and feet or between the left and right foot?

Minute 3: What to Teach

Recommendations for daily foot care:

- Visually examine both feet, including the sole and between the toes. If the patient can't do this, have a family member do it.
- Keep feet dry by regularly changing shoes and socks; dry feet after baths or exercise.
- Report any new lesions, discolorations, or swelling to a health care professional.

Education regarding shoes:

- Educate the patient on the risks of walking barefoot, even when indoors.
- Recommend appropriate footwear, and advise against shoes that are too small, tight, or rub against a particular area of the foot.
- Suggest yearly replacement of shoes— more frequently if they exhibit high wear.

Overall health risk management:

- Recommend smoking cessation (if applicable).
- Recommend appropriate glycemic control.

Priority	Indications	Timeline	Suggested follow-up
URGENT (active pathology)	Open wound or ulcerative area, with or without signs of infection New neuropathic pain or pain at rest Signs of active Charcot deformity (red, hot, swollen midfoot or ankle) Vascular compromise (sudden absence of DP/PT pulses or gangrene)	Immediate referral/consult	As determined by specialist
HIGH (ADA risk category 3)	Presence of diabetes with a previous history of ulcer or lower extremity amputation Chronic venous insufficiency (skin color change, or temperature difference)	Immediate or "next available" outpatient referral	Every 1-2 months
MODERATE (ADA risk category 2)	Peripheral artery disease +/- LOPS DP/PT pulse diminished or absent Presence of swelling or edema	Referral within 1-3 weeks (if not already receiving regular care)	Every 2-3 months
LOW (ADA risk category 1)	LOPS +/- longstanding, nonchanging deformity. Patient requires prescriptive or accommodative footwear.	Referral within 1 month	Every 4-6 months
VERY LOW (ADA risk category 0)	No LOPS or peripheral artery disease. Patient seeks education regarding foot care, atgletic training, appropriate footwear, preventing injury, etc.	Referral within 1-3 months	Annually at minimum

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IDSA GUIDELINES

2012 Infectious Diseases Society of America Clinical Practice Guideline for the Diagnosis and Treatment of Diabetic Foot Infections[a]

Benjamin A. Lipsky,[1] Anthony R. Berendt,[2] Paul B. Cornia,[3] James C. Pile,[4] Edgar J. G. Peters,[5] David G. Armstrong,[6] H. Gunner Deery,[7] John M. Embil,[8] Warren S. Joseph,[9] Adolf W. Karchmer,[10] Michael S. Pinzur,[11] and Eric Senneville[12]

[1]Department of Medicine, University of Washington, Veterans Affairs Puget Sound Health Care System, Seattle; [2]Bone Infection Unit, Nuffield Orthopaedic Centre, Oxford University Hospitals NHS Trust, Oxford; [3]Department of Medicine, University of Washington, Veteran Affairs Puget Sound Health Care System, Seattle; [4]Divisions of Hospital Medicine and Infectious Diseases, MetroHealth Medical Center, Cleveland, Ohio; [5]Department of Internal Medicine, VU University Medical Center, Amsterdam, The Netherlands; [6]Southern Arizona Limb Salvage Alliance, Department of Surgery, University of Arizona, Tucson; [7]Northern Michigan Infectious Diseases, Petoskey, [8]Department of Medicine, University of Manitoba, Winnipeg, Canada; [9]Division of Podiatric Surgery, Department of Surgery, Roxborough Memorial Hospital, Philadelphia, Pennsylvania; [10]Department of Medicine, Division of Infectious Diseases, Beth Israel Deaconess Medical Center, Harvard Medical School, Boston, Massachusetts; [11]Department of Orthopaedic Surgery and Rehabilitation, Loyola University Medical Center, Maywood, Illinois; and [12]Department of Infectious Diseases, Dron Hospital, Tourcoing, France

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

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DRAFT ID/PODIATRY OHSU-VA GUIDELINES:

Ideally, hold antibiotics if: clinically stable, no significant cellulitis, no abscesses, no fever, no septic arthritis, no hypotension

When admitted, If pre-operative antibiotics are indicated:

Stable, mild-moderate infection: ampicillin-sulbactam
- Mild PCN allergy: ceftriaxone + metronidazole
- Severe PCN allergy (anaphylaxis): levofloxacin + metronidazole .
- Pharmacist to confirm allergy is real

Stable, but with *Pseudomonas* risk factors: **piperacillin-tazobactam**
- Risk factors include: *Pseudomonas* in past year or patient h/o soaking the foot
- Mild PCN allergy: cefepime + metronidazole
- Severe PCN allergy (anaphylaxis): Levaquin + metronidazole
- Pharmacist to confirm allergy is real

Severe infection (e.g. sepsis): piperacillin-tazobactam
- Mild PCN allergy: cefepime + metronidazole
- Severe PCN allergy [e.g. anaphylaxis]: aztreonam + metronidazole
- Pharmacist to confirm allergy is real

Any severity with MRSA risk factors: add Vancomycin

Add MRSA coverage if:
- MRSA colonization or infection in past year (MRSA flag on chart)
- Severe infection (e.g. possible sepsis)

Daptomycin preferred for vancomycin-allergy OR creatinine >2

Alternative antibiotic choice needed due to allergy, known drug-resistant or otherwise unique microbiology, or renal insufficiency: OHSU: **ID "curbside" consult via operator; VA: Skype or call VA ID group- Forrest, Pfeiffer, Maier, or Murphy (who are typically on-site) before calling on-call ID (who are often at OHSU).**

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Broad Spectrum Coverage

Clin Infect Dis. 2017 Jan 15;64(2):116-123. doi: 10.1093/cid/ciw709. Epub 2016 Oct 20.

Risk of Acute Kidney Injury in Patients on Concomitant Vancomycin and Piperacillin-Tazobactam Compared to Those on Vancomycin and Cefepime.

Navalkele B[1,2], Pogue JM[3,4], Karino S[1,2], Nishan B[2], Salim M[2], Solanki S[2], Pervaiz A[2], Tashtoush N[2], Shaikh H[2], Koppula S[2], Koons J[2], Hussain T[2], Perry W[2], Evans R[5], Martin ET[5], Mynatt RP[6], Murray KP[7], Rybak MJ[2,6,8], Kaye KS[1,2].

Ann Pharmacother. 2018 Jul;52(7):639-644. doi: 10.1177/1060028018757497. Epub 2018 Feb 14.

Comparison of the Nephrotoxicity of Vancomycin in Combination With Cefepime, Meropenem, or Piperacillin/Tazobactam: A Prospective, Multicenter Study.

Mullins BP[1], Kramer CJ[2], Bartel BJ[3], Catlin JS[4], Gilder RE[2].

- Higher rates of acute kidney injury with use of vancomycin/zosyn compared to vancomycin/cefepime

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Osteomyelitis

- Confirmed via baseline x-rays, clinical findings, labs, culture/bone biopsy
- Can manage operatively or non-operatively
- Treatment course with appropriate abx – approximately 6 weeks

Table 3. Features characteristic of diabetic foot osteomyelitis on plain X-rays

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New or evolving radiographic features* on serial radiographs**, including: ▪ Loss of bone cortex, with bony erosion or demineralization ▪ Focal loss of trabecular pattern or marrow radiolucency (demineralization) ▪ Periosteal reaction or elevation ▪ Bone sclerosis, with or without erosion
Abnormal soft tissue density in the subcutaneous fat, or gas density, extending from skin towards underlying bone, suggesting a deep ulcer or sinus tract.
Presence of sequestrum: devitalized bone with radiodense appearance separated from normal bone
Presence of involucrum*: layer of new bone growth outside previously existing bone resulting and originating from stripping off the periosteum.
Presence of cloacae*: opening in the involucrum or cortex through which sequestrum or granulation tissue may discharge.

Note: *Some features (e.g. sequestrum, involucrum and cloacae) are seen less frequently in diabetic foot osteomyelitis than in younger patients with osteomyelitis of larger bones. **Usually spaced several weeks apart.

IWGDF Guidelines

Imaging

- X-Ray--3 views non wb
- MRI??

Recommendation 5: In a person with diabetes and suspected osteomyelitis of the foot, we recommend using a combination of the probe-to-bone test, the erythrocyte sedimentation rate (or C-reactive protein and/or procalcitonin), and plain X-rays as the initial studies to diagnose osteomyelitis. (Strong; Moderate)

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Recommendation 6:

a) In a person with diabetes and suspected osteomyelitis of the foot, if a plain X-ray and clinical and laboratory findings are most compatible with osteomyelitis, we recommend no further imaging of the foot to establish the diagnosis. (Strong; Low).

b) If the diagnosis of osteomyelitis remains in doubt, consider ordering an advanced imaging study, such as magnetic resonance imaging scan, 18F-FDG- positron emission tomography/computed tomography (CT) or leukocyte scintigraphy (with or without CT). (Strong; Moderate)

IWGDF Guidelines

OHSU

OHSU Numbers

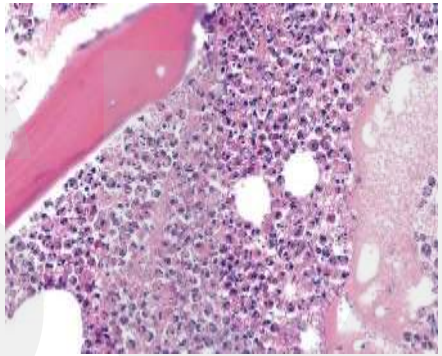
Xrays 3 views NWB vs MRI wwo contrast

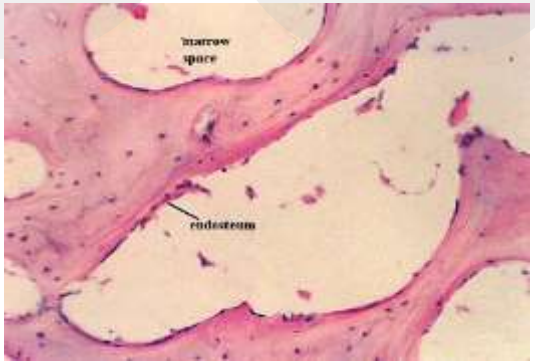
$395 $3,350

https://www.google.com/search?q=costs+of+medical+care&tbm=isch&ved=2ahUKEwibtrSx3KfpAhXLh54KHbCwDZQQ2-cCegQIABAA&oq=costs+of+medical+care&gs_lcp=CgNpbWcQAzIECAAQGDoECCMQJzoCCAA6BggAEAUQHjoGCAAQCBAeUN58WIOkAWDopgFoAHAAeACAATmIAfMEkgECMTOYAQCgAQGqAQtnd3Mtd2l6LWltZw&sclient=img&ei=IyC3XtuYPMuP-gSw4bagCQ&bih=932&biw=1920&hl=en#imgrc=1q8Hf0-jNBGrYM&imgdii=gRv9kvYsskE55M

Histopathology

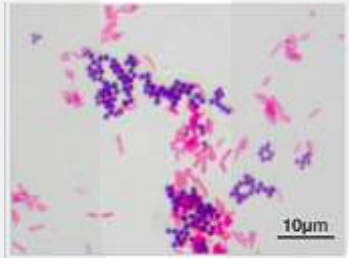
- Osseous fragments
- Osseous necrosis
- Inflammatory Cells/Leukocytes
- **Acute Osteomyelitis**
  - Polymorphonucleocytes (PMNs)
  - Thrombosed blood vessels
  - Vascular congestion
- **Chronic Osteomyelitis**
  - Osteonecrosis
  - Absence of living myocytes
  - Granulation and fibrous tissue





Microbiology

- Wound Culture and Sensitivity
  - False positive if harvested through infected/contaminated wound
  - Ideally prior to the initiation of antibiotics
- Bone/Soft tissue Gram stain + Culture
- Gram stain, aerobic and anaerobic
  - Ancillary organisms:
    - Acid-fast stain
      - Tuberculosis osteomyelitis generally hematogenous spread from pulmonary TB
      - OM present in 1-3% of pulmonary TB patients
    - Fungal culture
      - Uncommon…



A Gram stain of mixed *Staphylococcus aureus* (*S. aureus* ATCC 25923, Gram-positive cocci, in purple) and *Escherichia coli* (*E. coli* ATCC 11775, Gram-negative bacilli, in red), the most common Gram stain reference bacteria

Why is this important?

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IDSA clinical practice guidelines

Most definitive diagnosis of DFO: 2 tissue based methods

Bone culture

Contamination?

How to maintain sterility when obtaining samples?

Histopathology

Reference standard?

What constitutes a positive bone biospy? **Is there a consensus?**

Misdiagnosis?

Unnecessary antibiotics, surgery, amputation

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	Culture (+)	Culture (-)
Pathology (+)	Osteomyelitis is present with coordinating positive culture results to identify causative organism.	This scenario may indicate chronic osteomyelitis without heavy bacterial load or may occur when antibiotics are not held prior to biopsy.
Pathology (-)	Contamination may have occurred from an adjacent open wound or when handling the specimen. If strong suspicions of osteomyelitis based on clinical and radiographic picture, consider repeat biopsy of adjacent bone or discuss diagnostic criteria with pathologist	Reconsider clinical picture as non-infectious conditions mimics osteomyelitis including charcot arthropathy, gout, fracture, etc.

Duration of Therapy

Bone or joint

- No residual infection post amputation:
  2-5 days PO or IV
- Residual infected soft tissue:
  1-3 weeks PO or IV
- Residual infected (but viable) bone:
  4-6 weeks IV
- No surgery, or residual dead bone postoperatively:
  >3 months IV

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Oral versus Intravenous Antibiotics for Bone and Joint Infection

Oral versus Intravenous Antibiotics for Bone and Joint Infection

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Ho-Kwong Li, M.R.C.P., Ines Rombach, D.Phil., Rhea Zambellas, M.Sc., A. Sarah Walker, Ph.D., Martin A. McNally, F.R.C.S.(Orth.), Bridget L. Atkins, F.R.C.P., Benjamin A. Lipsky, M.D., Harriet C. Hughes, M.A.(Cantab.), Deepa Bose, F.R.C.S., Michelle Kümin, Ph.D., Claire Scarborough, M.R.C.P., Philippa C. Matthews, D.Phil., et al., for the OVIVA Trial Collaborators*

- 527 IV, 527 oral
- Duration of therapy beyond 6 weeks in 76.7% of population
  - 78 days IV
  - 71 days oral

The NEW ENGLAND JOURNAL of MEDICINE

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Oral versus Intravenous Antibiotics for Bone and Joint Infection

Ho-Kwong Li, M.R.C.P., Ines Rombach, D.Phil., Rhea Zambellas, M.Sc., A. Sarah Walker, Ph.D., Martin A. McNally, F.R.C.S.(Orth.), Bridget L. Atkins, F.R.C.P., Benjamin A. Lipsky, M.D., Harriet C. Hughes, M.A.(Cantab.), Deepa Bose, F.R.C.S., Michelle Kümin, Ph.D., Claire Scarborough, M.R.C.P., Philippa C. Matthews, D.Phil., et al., for the OVIVA Trial Collaborators*

The NEW ENGLAND JOURNAL of MEDICINE

Organisms identified — no./total no. (%)§			
Staphylococcus aureus	196/500 (39.2)	182/503 (36.2)	378/1003 (37.7)
Coagulase-negative staphylococcus	137/500 (27.4)	135/503 (26.8)	272/1003 (27.1)
Streptococcus species	72/500 (14.4)	73/503 (14.5)	145/1003 (14.5)
Pseudomonas species	28/500 (5.6)	23/503 (4.6)	51/1003 (5.1)
Other gram-negative organisms	84/500 (16.8)	84/503 (16.7)	168/1003 (16.7)
Culture negative	77/500 (15.4)	78/503 (15.5)	155/1003 (15.5)

- IV: Glycopeptides 41.4%, cephalosporins 37.6%
- Oral: quinolones 43.8%, combination therapy

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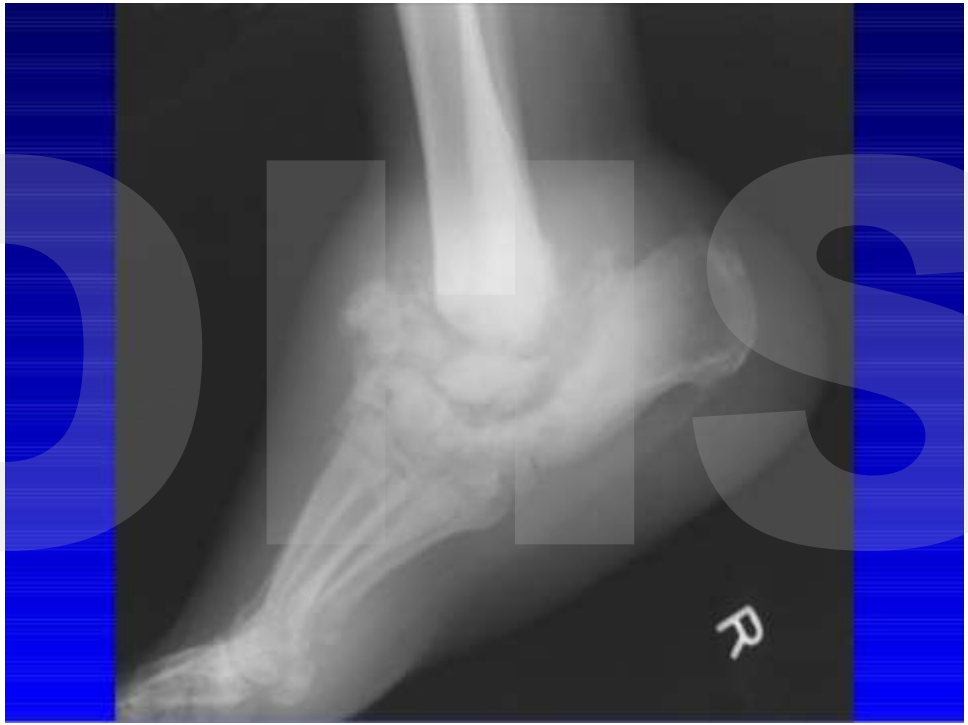
Diagnosis not to miss!

- Retained purulence
- Necrotizing fasciitis
- Septic joint
- PVD
- Charcot

Charcot

Charcot Foot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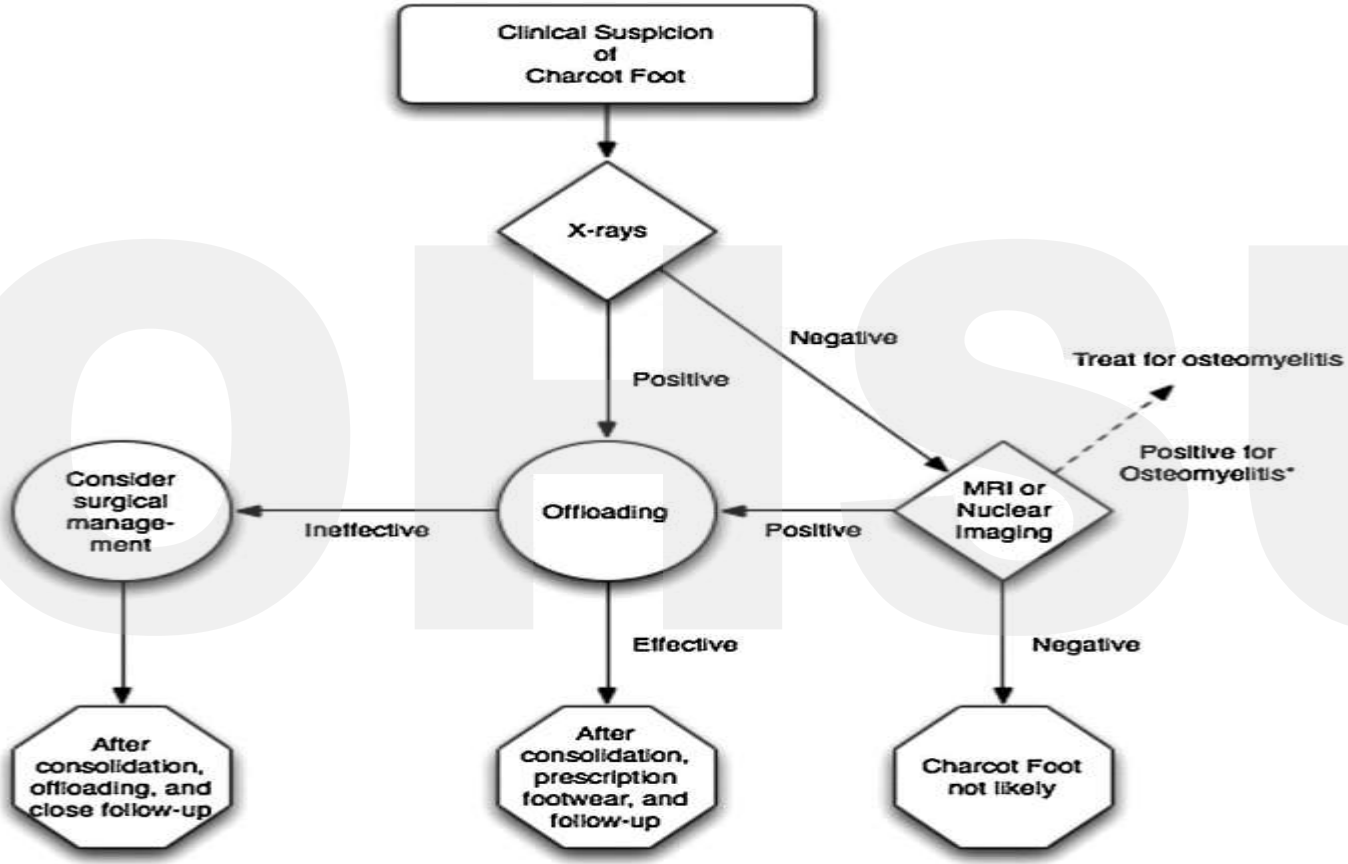
Clinical Suspicion of Charcot Foot
X-rays
Negative
Positive
Treat for osteomyelitis
Positive for Osteomyelitis*
Consider surgical manage-ment
Ineffective
Offloading
Positive
MRI or Nuclear Imaging
Effective
Negative
After consolidation, offloading, and close follow-up
After consolidation, prescription footwear, and follow-up
Charcot Foot not likely

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- Podiatric Covid Update

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The CODE FOOT-line

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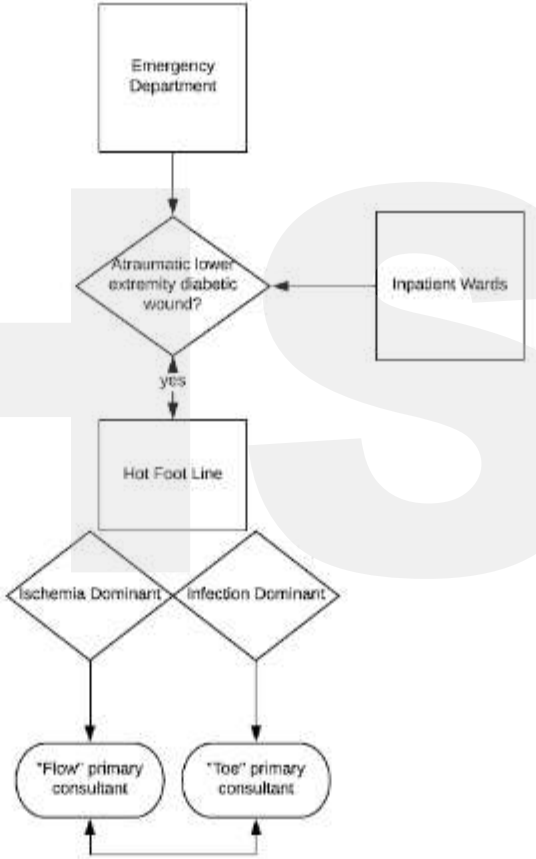

Miller et al (Rowe, Ochoa, Weaver Armstrong), JAPMA, 2019

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Teams Reduce Amputations

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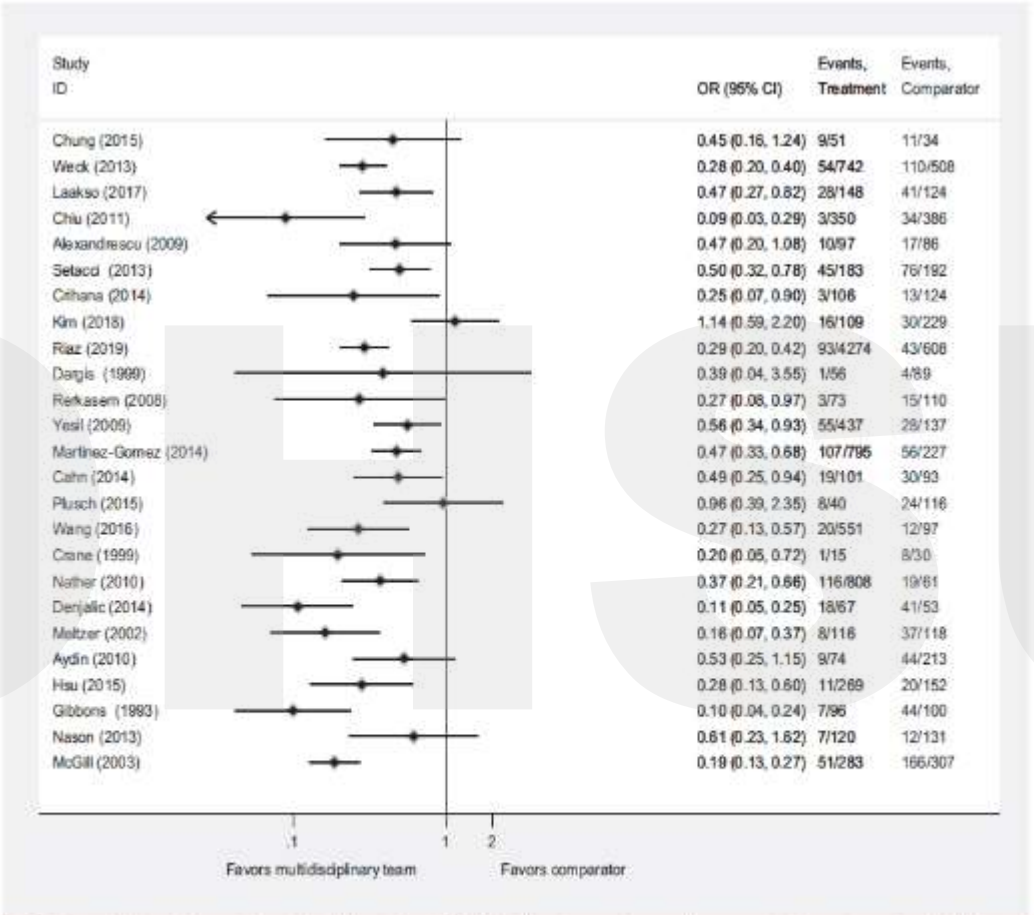

Fig 3. Forest plot of the estimated odds ratios (*ORs*) for the change in major amputation rates after initiation of multidisciplinary care compared with standard care for 25 of the 33 included studies for which odds ratios could be calculated. *CI*, Confidence interval; *ID*, identifier.

Musuuza, et al, J Vasc Surg, 2019

CODEFOOT

So how do we build a team?

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Footcare prolongs the life of legs

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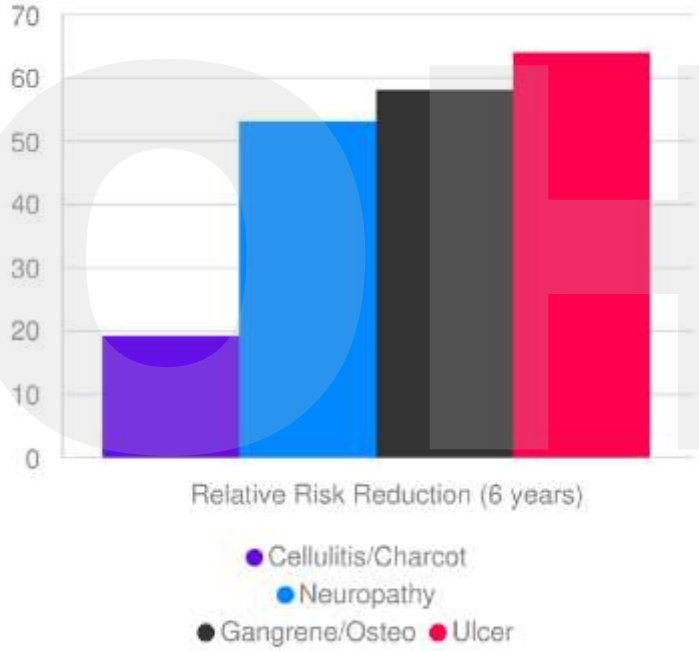
Podiatry's Pivotal Place in Prevention



- Patients visiting a podiatrist and another specialist the year before had a sustained reduction in amputation
- Initial sample: n = 1,054,283

Sloan, et al Health Services Res, 2010

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Revascularization prolongs life

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The Toe and Flow Model

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Toe and Flow: Two Surgical Specialties, One Service

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https://www.pinterest.com/pin/411797959648872581/

Infectious Disease

Plastic Surgeon

Pedorthotist
Orthotist
Prosthetics

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Sew

Podiatrist

Toe and Flow

Vascular Surgeon

Go

Interventional Radiologist

Physical Therapist

Wound Clinic

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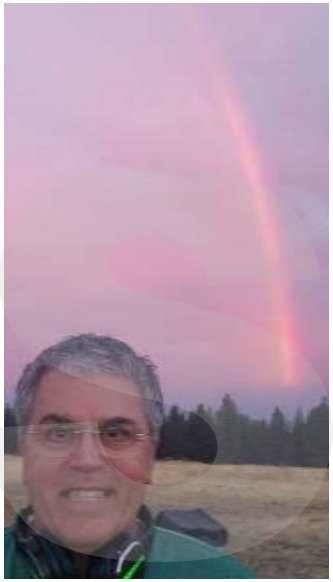
Flowmigos

Toemigo



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Sew-Migos

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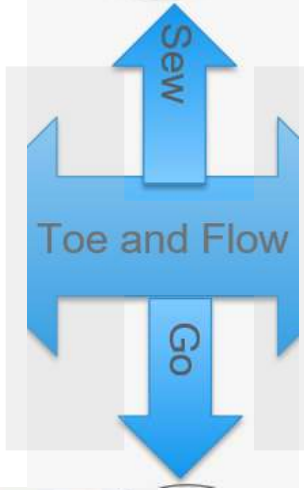

Go-Migas

Erin E. Jobst, PT, PhD

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= Money-Migos

Christopher Hawley

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Pathology
Dr. Jessica Davis et al

Foot Remission Pod's
(State Resources)

In-Patient Wound Care
Sarah, Meredith, et al

Radiology
Dr. Brooke Beckett

Nephrology
Dr. Raghav Wusirika

Physiatry
Dr. Nels Carlson

Orthopedic Surgery
Dr. James Meeker

Surgical Nutrition
Dr. Bob Martindale

Dermatology
Dr. Alex Ortega

Diabetes Educators
Lolis, Jesse et al

Hematology
Dr. Tom Delaughney

Rheumatology
Dr. Atul Deodhar

Hospitalists
IM and FM

Case Managers
& Social Workers

NP's and PA
Callie, Roy and Heidi

Admin Coordinator
Nora Cozaad

Learners--Fellows, Residents, Interns and Med Students

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Measure What You Manage

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Measurable Goals:

- Ulcer-free days
- Hospital-free days
- Activity-rich days
- Hi-Low Amputation Ratio

Research Coordination--David Louie (Doctor to be)

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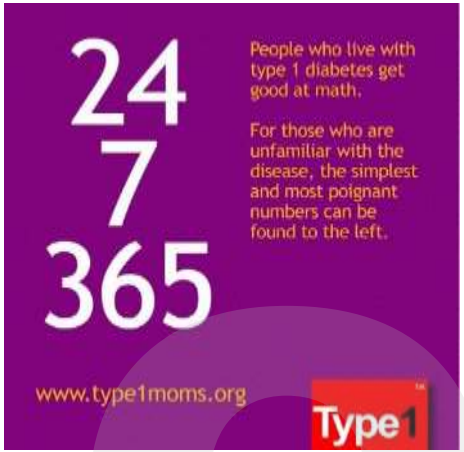

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DIABETES IS A FULL-TIME JOB. A JOB THAT IS NEVER FULLY TAUGHT. IT'S ONE THAT YOU LEARN AS YOU GO AND EVERYDAY HAS NEW OBSTACLES AND VARIABLES. THERE'S NO 30 MINUTE BREAKS OR VACATIONS. IT'S CONSTANT, AROUND THE CLOCK. IT COMES WITH A LOT OF RESPONSIBILITY AND YOU CAN'T QUIT BECAUSE IT'S LITERALLY LIFE OR DEATH.

–The Diabetic Journey

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Does the Host(ess) Want to Actively Engage with the Rest of the Team?

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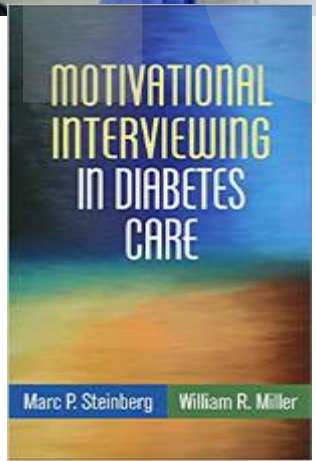
Motivational Interviewing Empowers Patients

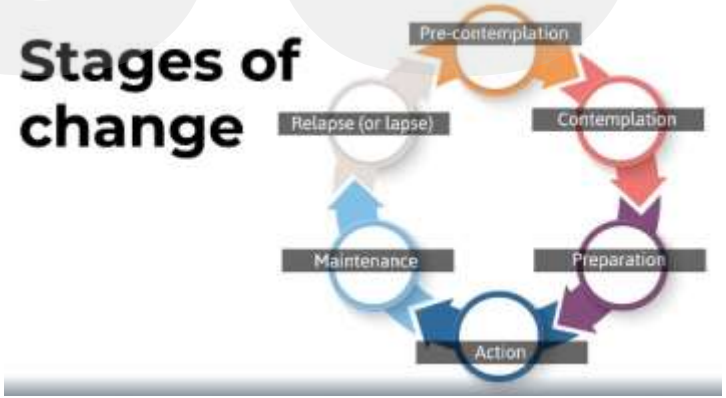
Care managers can use motivational interviewing to empower patients in their own care, rather than projecting outside goals to an individual's situation.

The motivational interviewing method of engaging patients was developed by clinical psychologist William Miller in 1983 to address substance abuse.

Over the years, however, research has shown that the technique is effective at reducing many potentially risky behaviors and promoting healthy behaviors.

Health Catalyst





Team Components of the Center for Functional Limb Preservation at OHSU

- Inpatient Management/ Code foot line
  - Inpatient Wards
  - ED

Outpatient Management

1.Toe, Flow and Go (Vascular/Podiatry/PT) Clinic

- Eval & Treat active tissue loss for intervention needs
- Determine etiology/modalities to help closure
- Neuro/ischemic/Neuro-ischemic wounds
- Physical Therapy embedded in clinic
- Complex Non-surgical wounds—>OHSU Wound & Hyperbaric Medicine Clinic

2. Foot Remission Podiatry Directory

- Ulcer-free, hospital-free, activity rich days
- Flow to Regional Podiatrist once healed
- Return to OHSU as needed per Regional Podiatrist
- Qualified routine foot care
- Reinforce patient daily self foot exam/care, education, home based monitoring program
- Pedorthotist/prosthetics and PT prn

3. Screening Clinics—Primary Care

- 3 min foot exam
- Development and Dissemination

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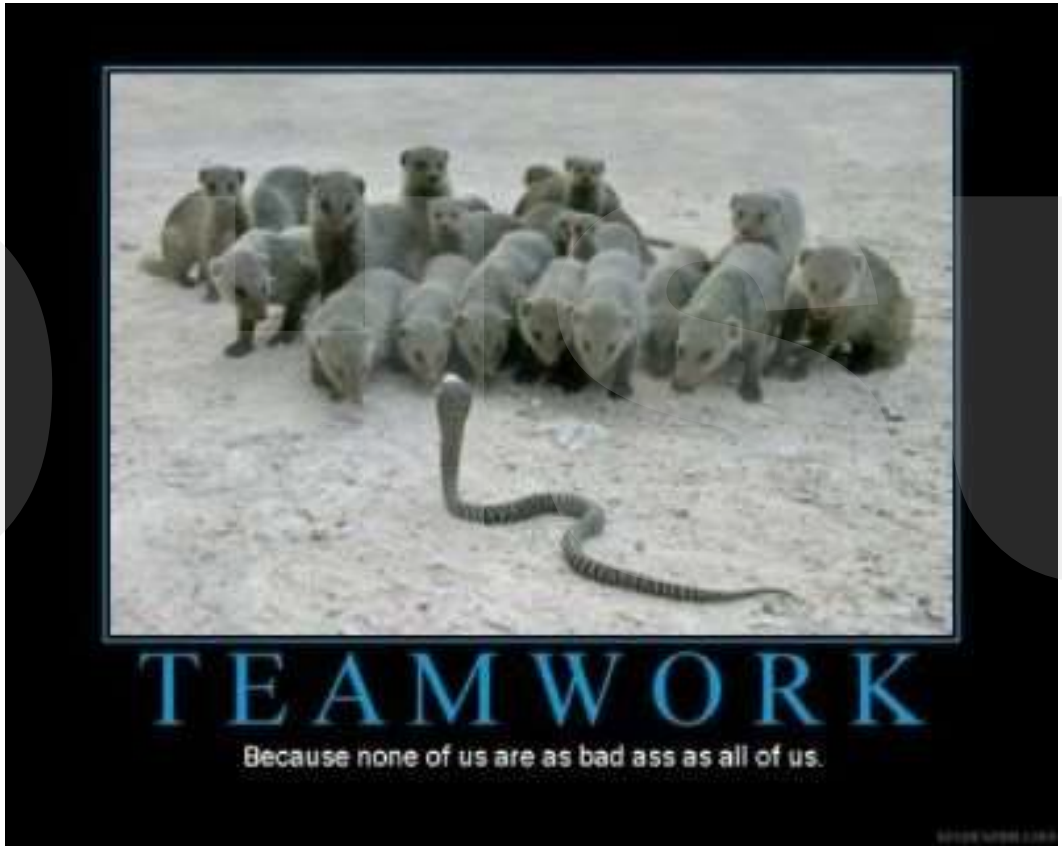

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Learning Objectives

- Understand the mortality and morbidity for DFU/DFI
- Recognize cost (QOL and $) associated with DFU and DFI
- Understand how to run a Code Foot—examining an infected foot
- Learn the VIP'S of a DFI
- Understand rationale of Osteomyelitis Abx use and timing
- Understand the team approach (Toe and Flow model)
- Review the surgical art of foot preservation--Toemigo style
- Discuss prevention tools for DFU in 2020

The Art of Foot Preservation

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Considerations

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- Anatomy
- Age
- Ambulatory status
- Body mass index
- Vascular supply
- Glycemic control
- Cardiac function
- Nutritional status

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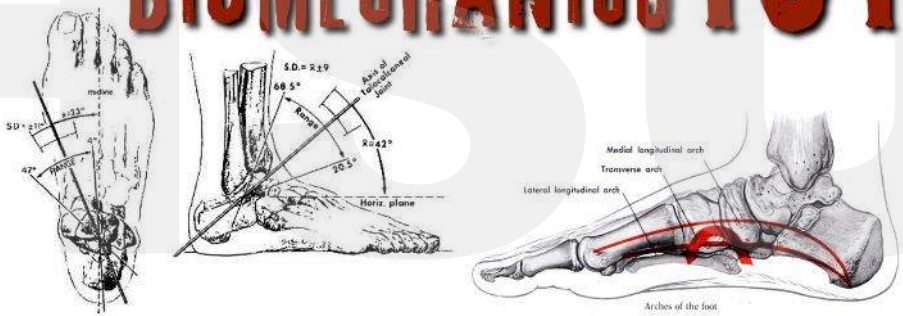
http://TheFunnyPlace.net

FOOT/ANKLE BIOMECHANICS 101



Arches of the foot

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Tendon Balancing

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Flexor tendon release for healing toe ulcers in flexible hammertoes

https://youtu.be/Y9MS6NO97bI

Tendons & Joint Axis

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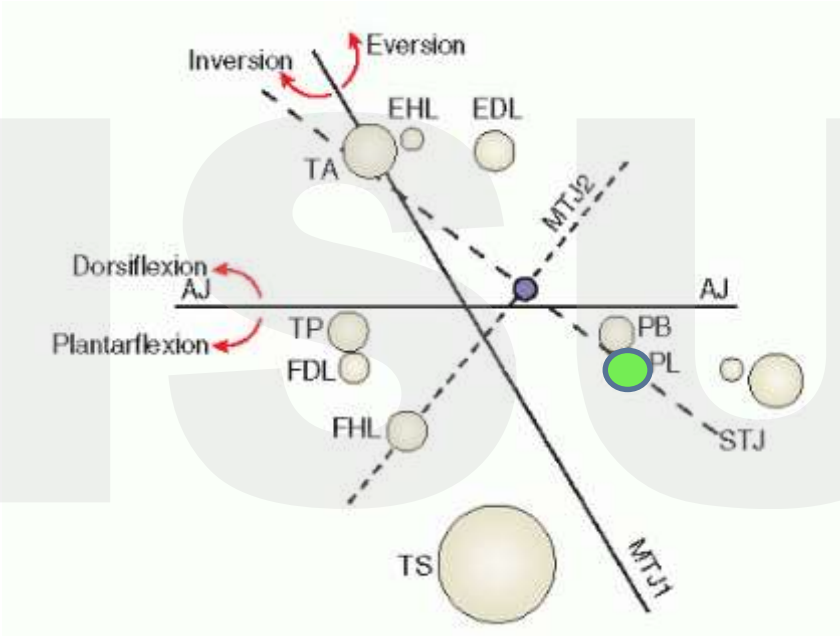

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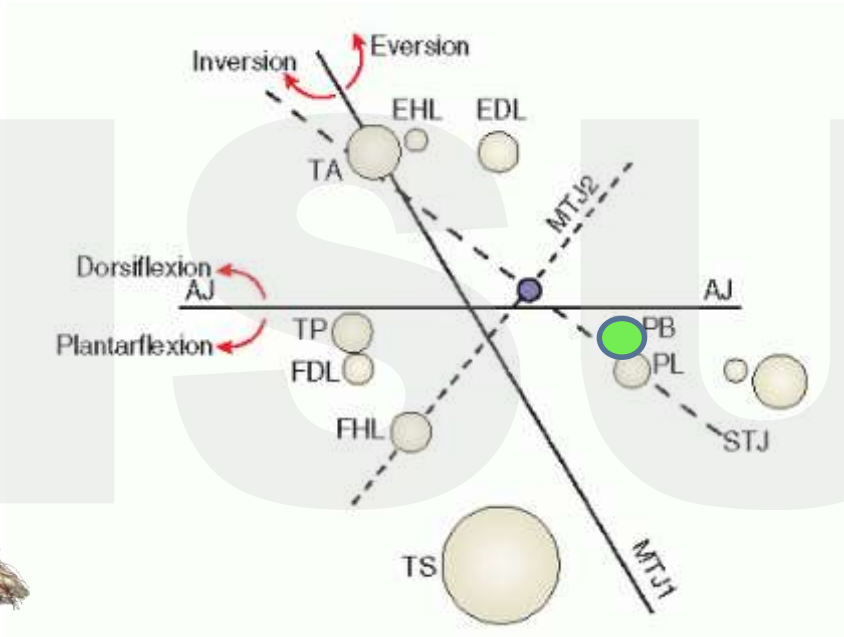

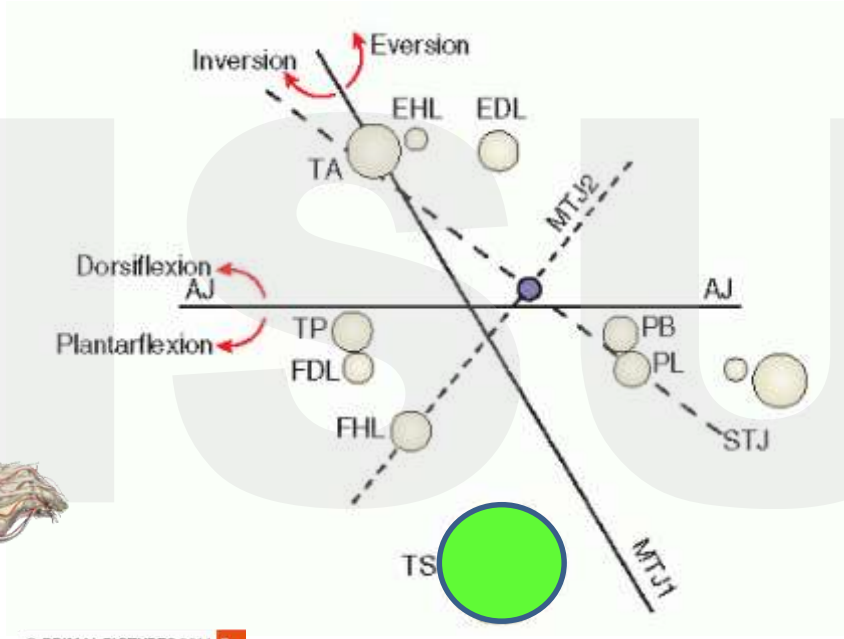

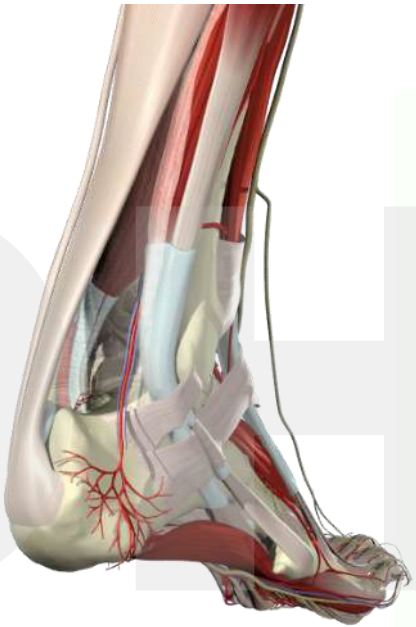

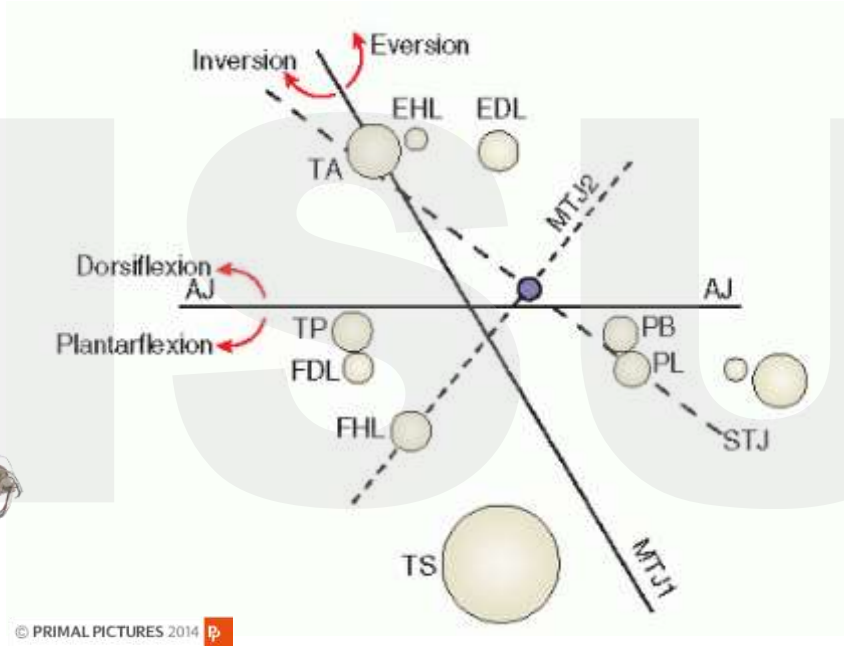

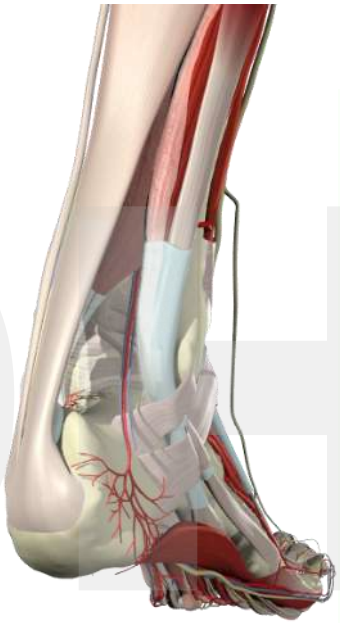

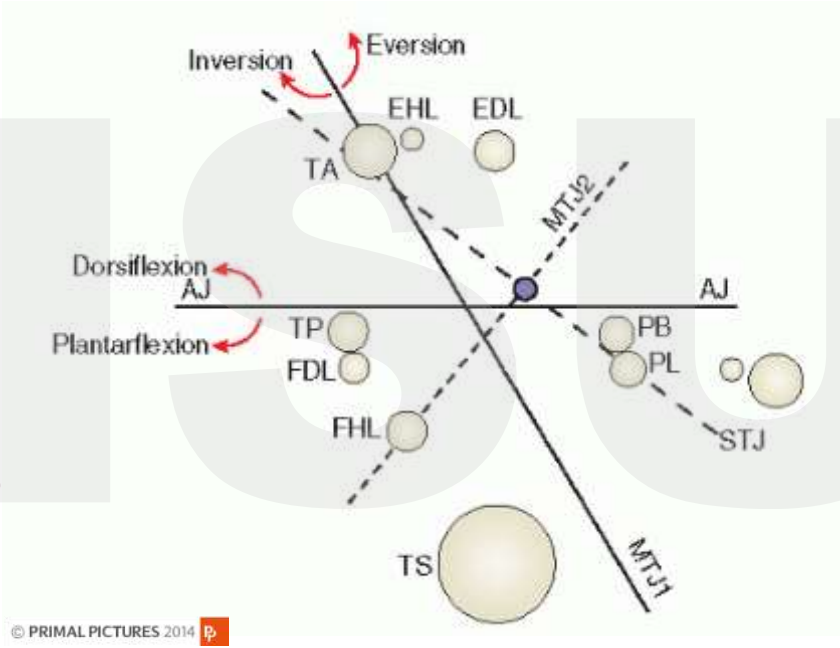
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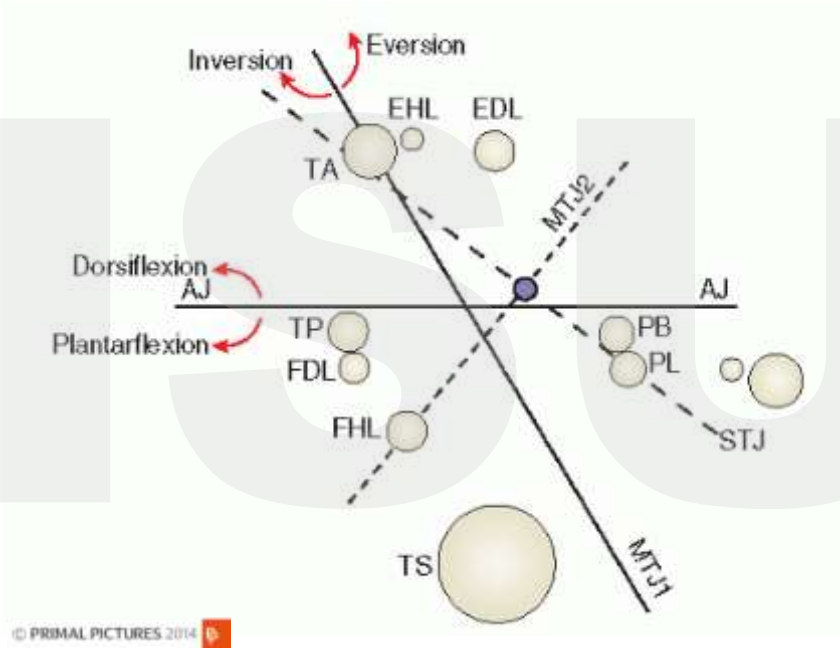
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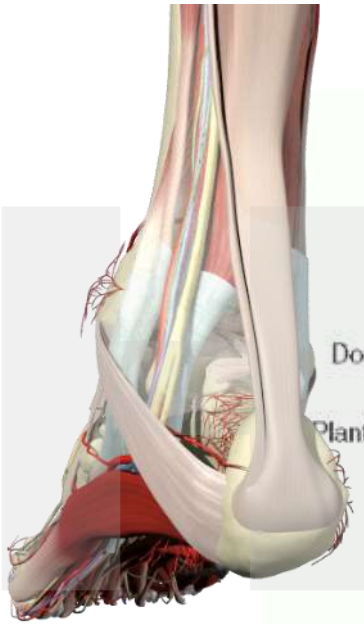

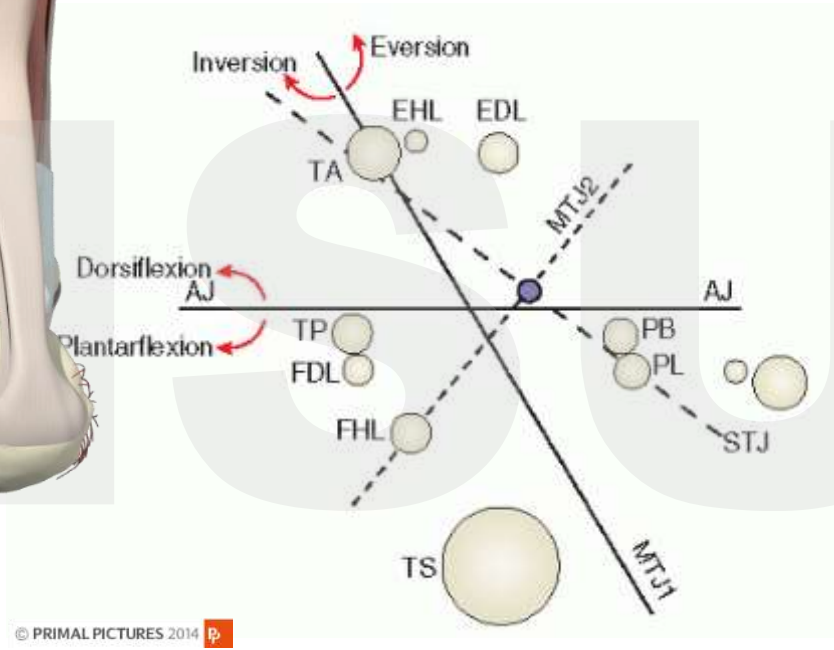

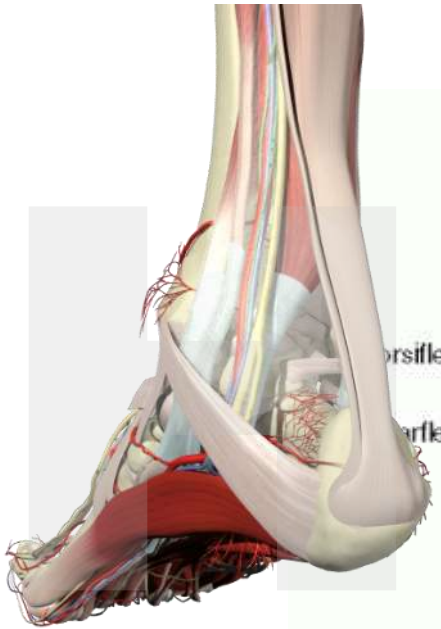

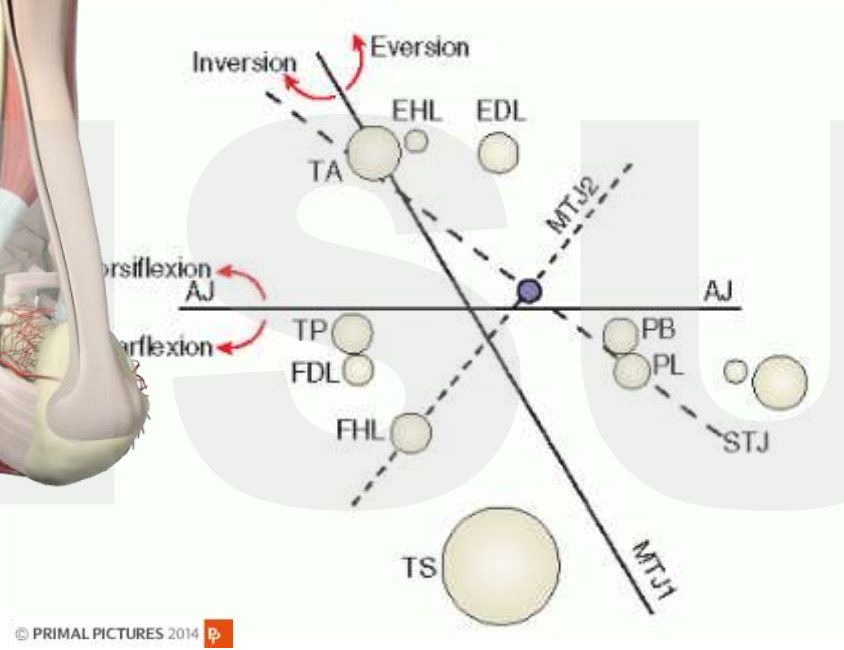

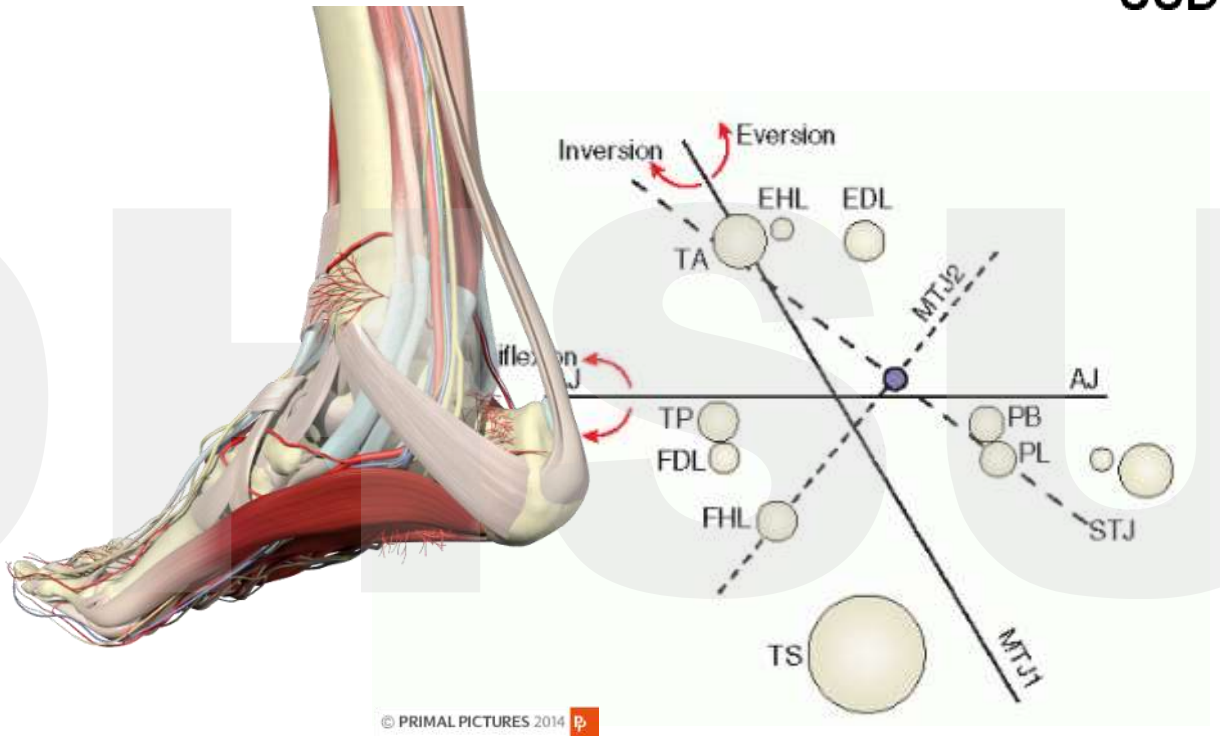
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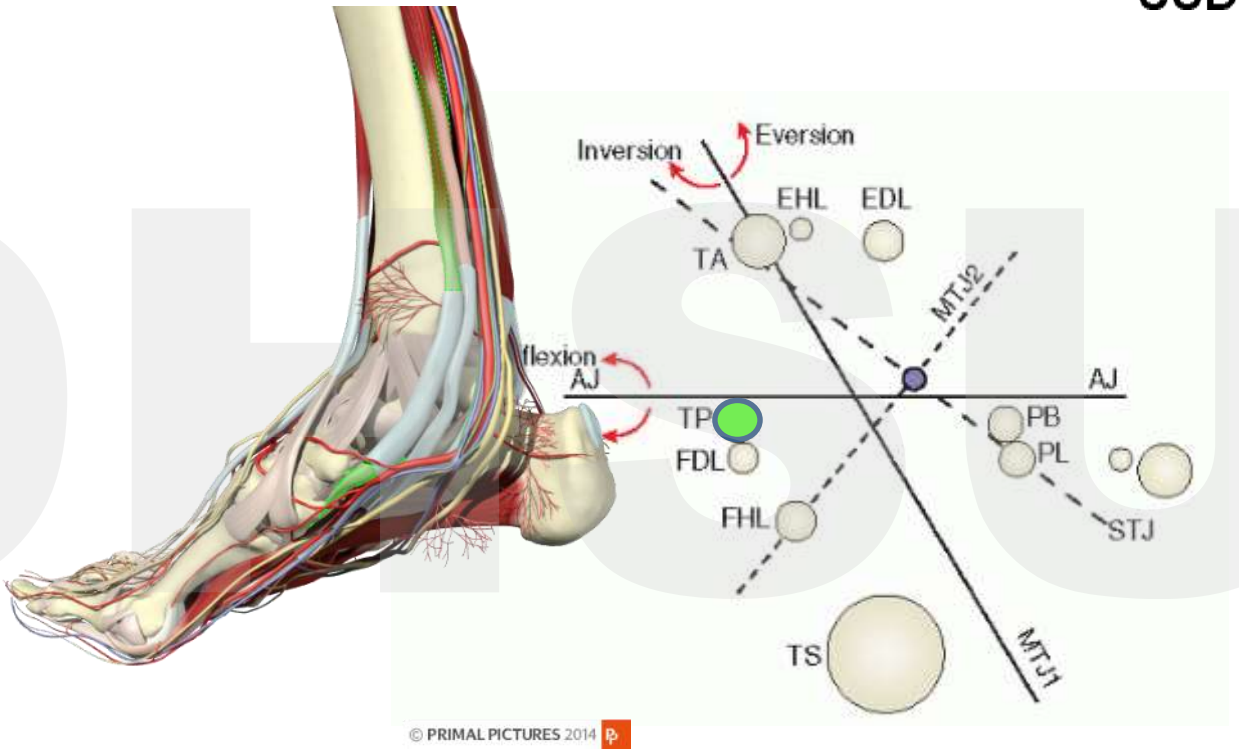
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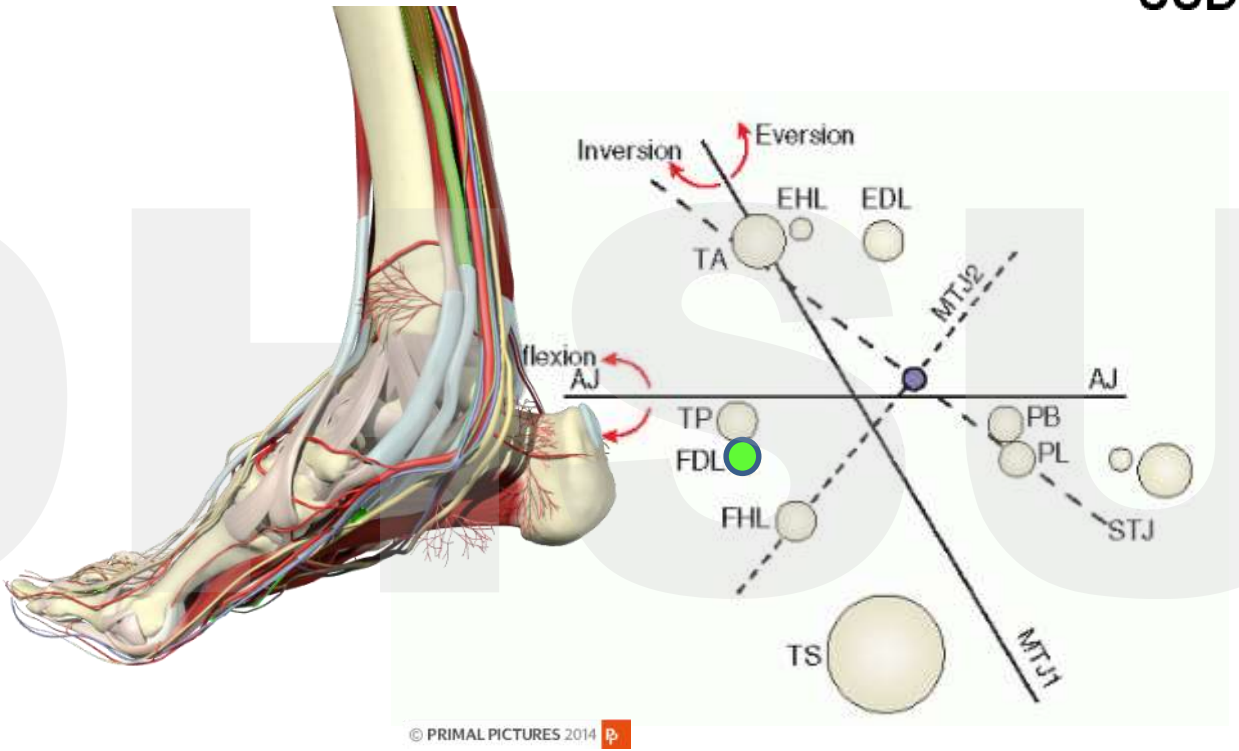
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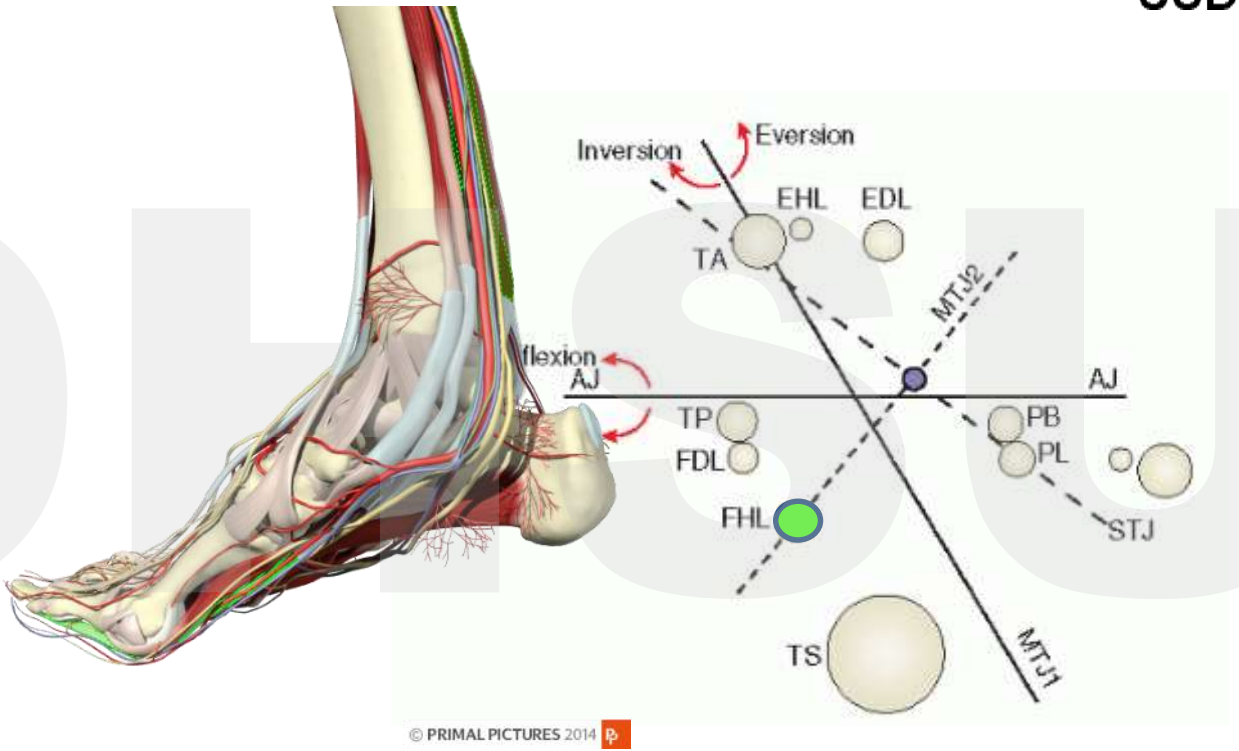
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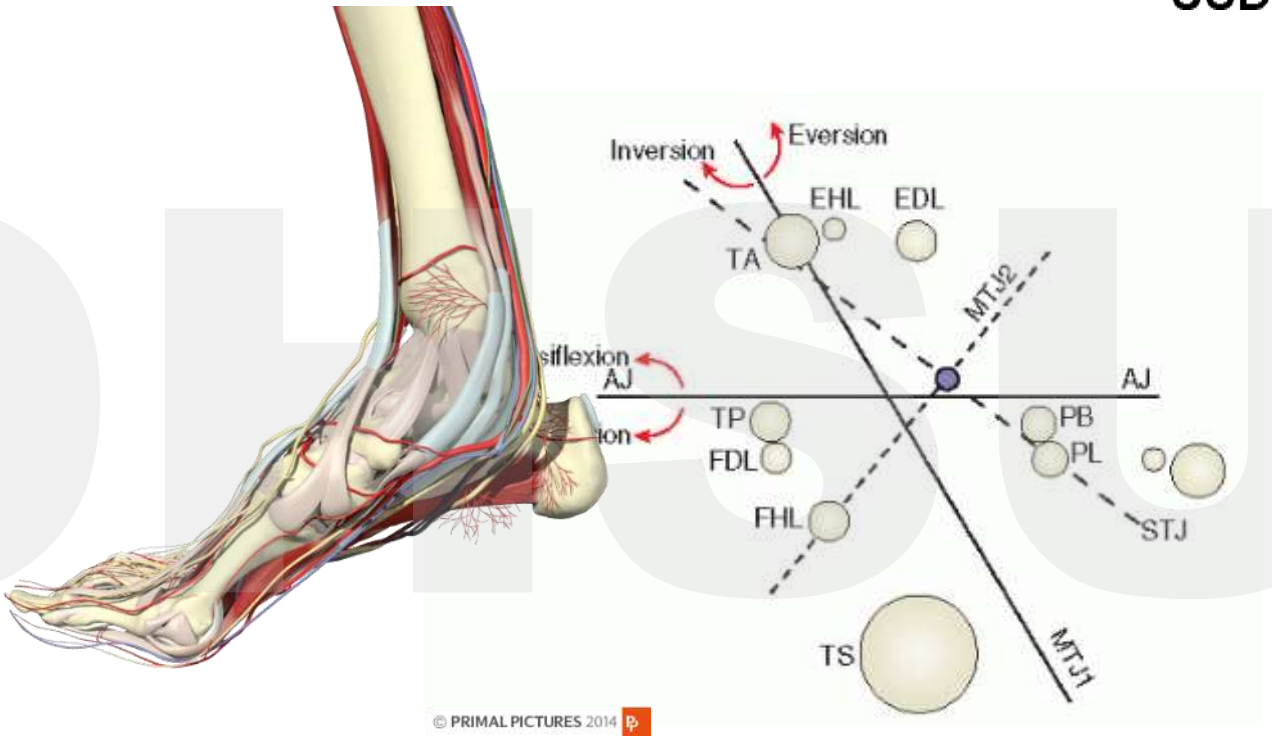
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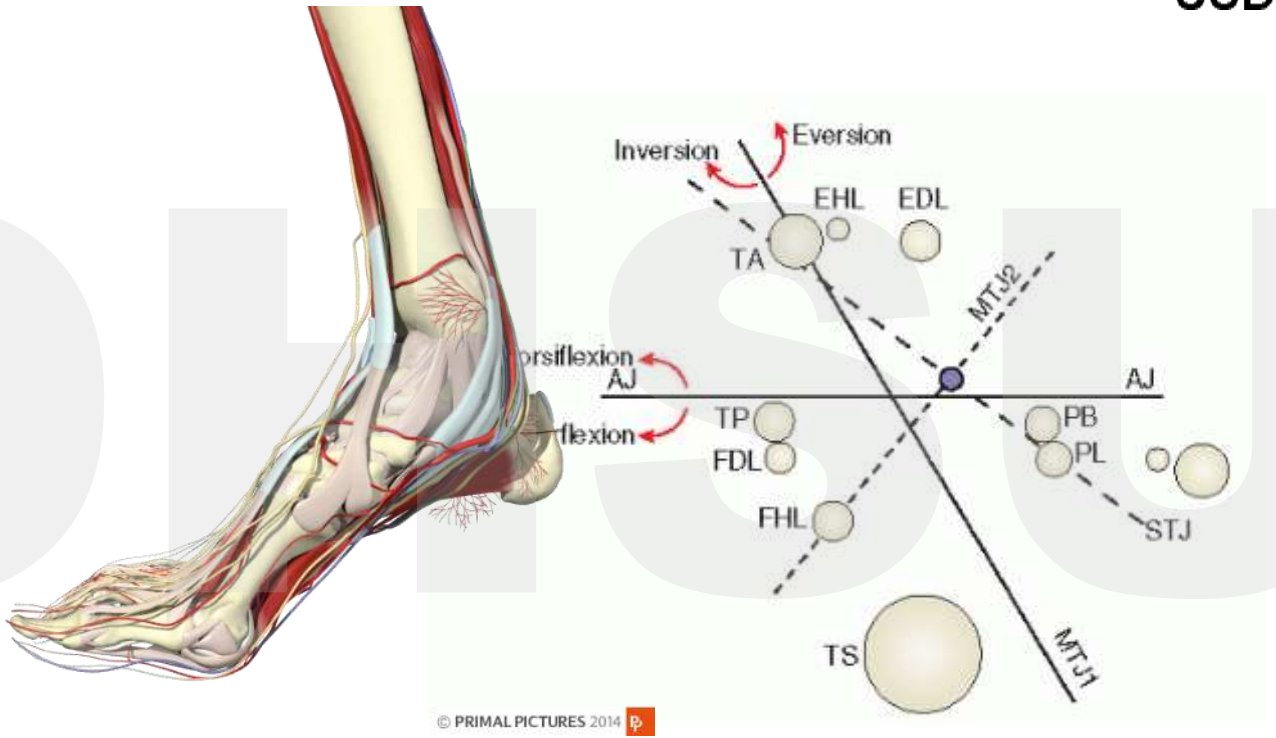
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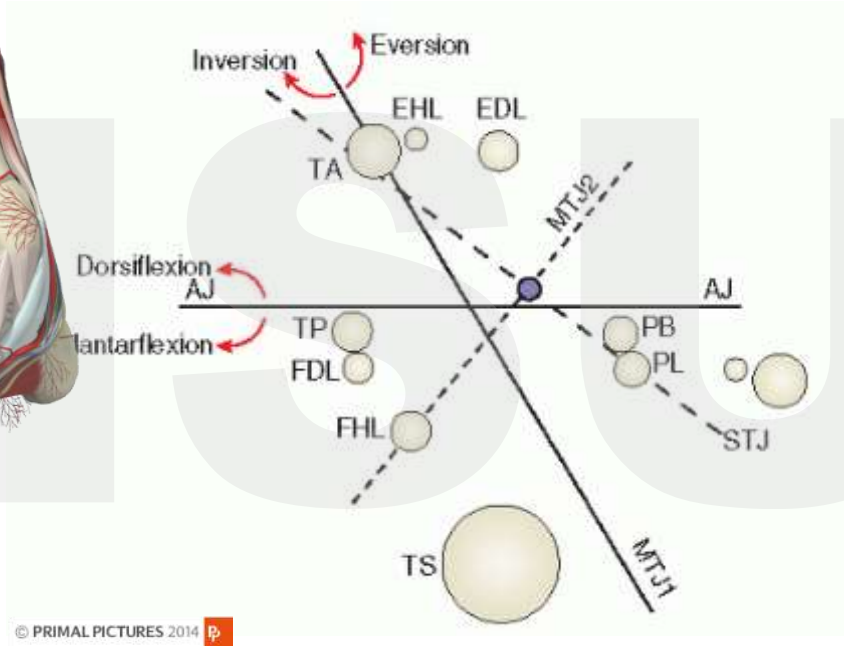

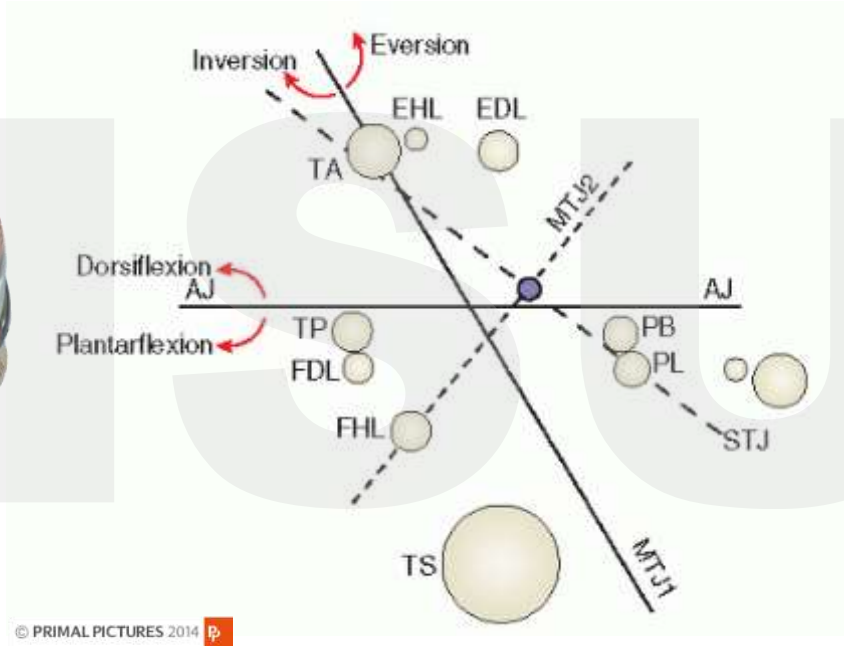

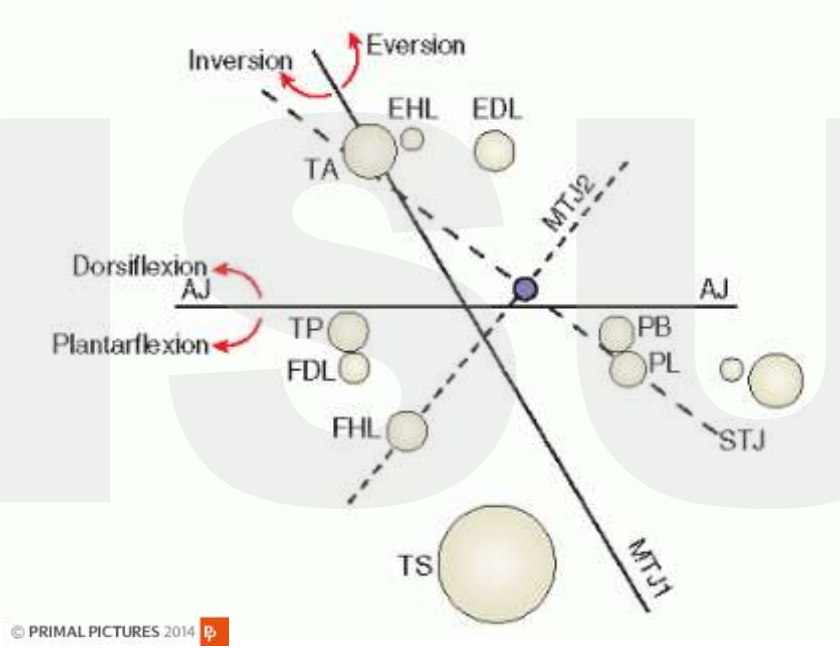
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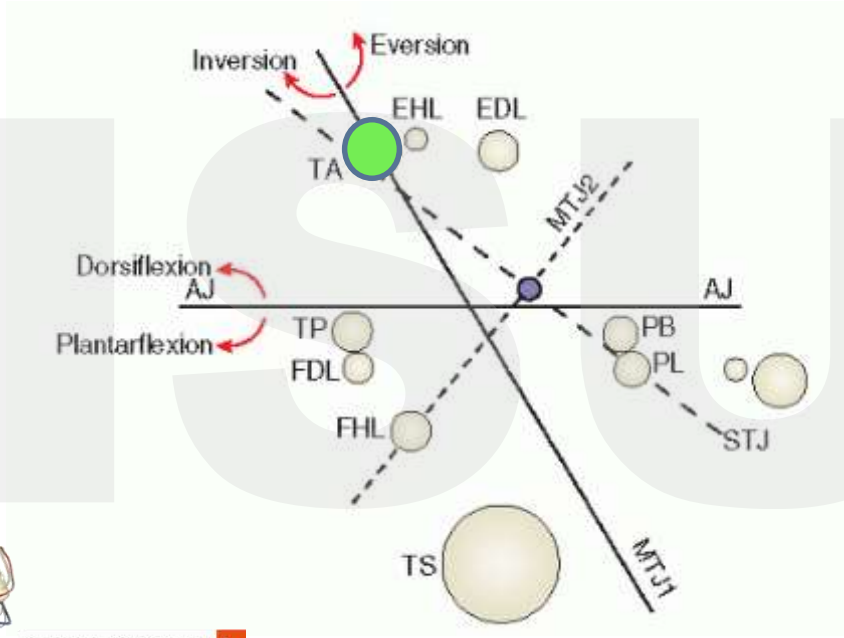

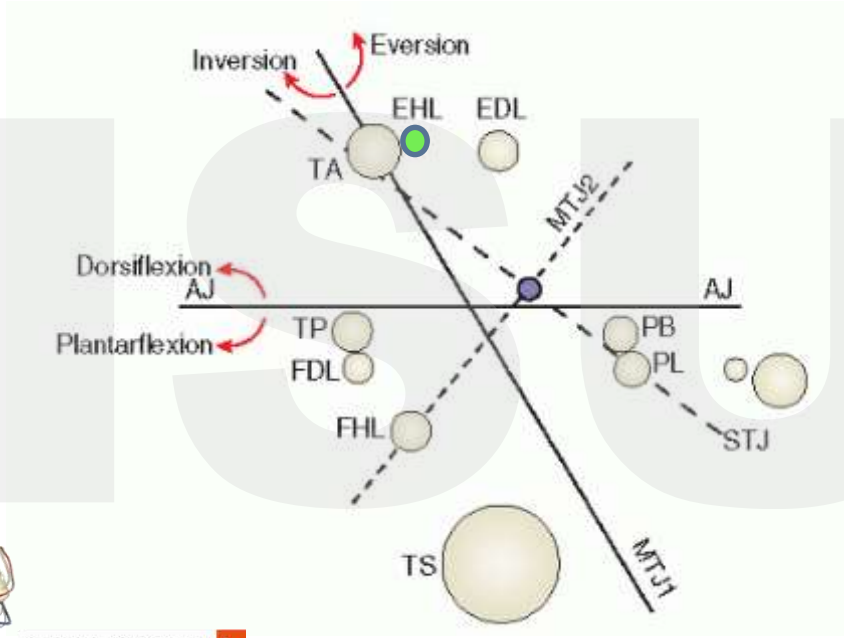

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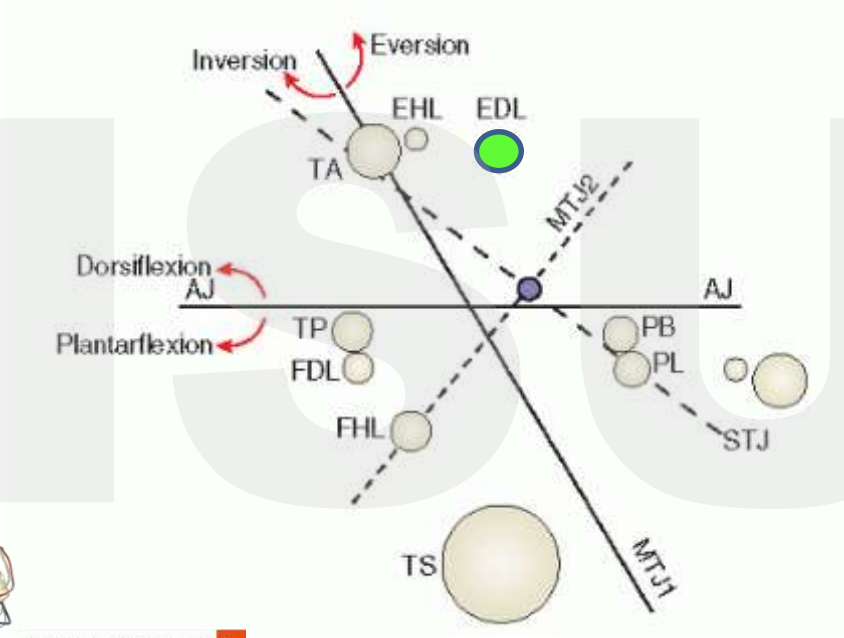

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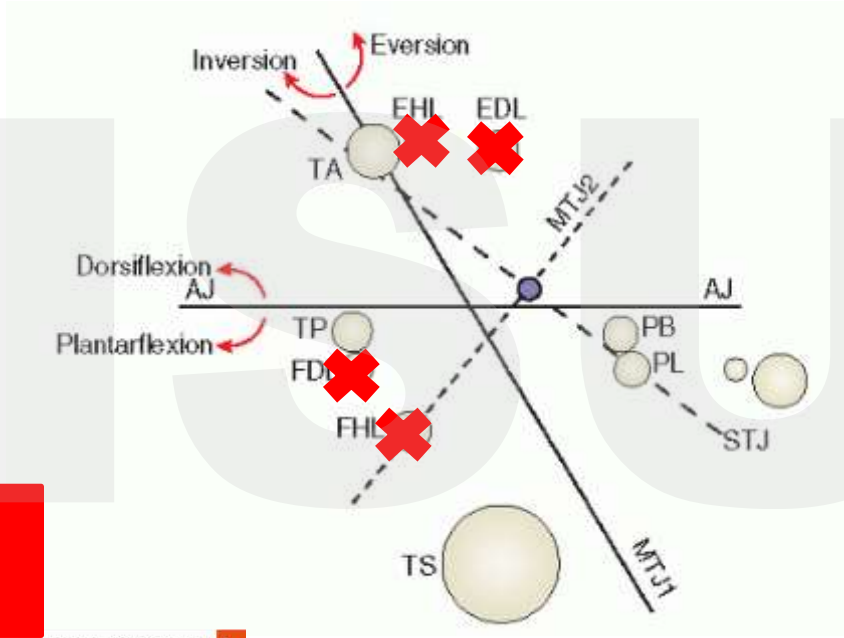

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Triple Hemi-Section

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Table 1
Comparison of gastrocnemius recession, tendo-Achilles lengthening, and tenectomy/tenotomy for lengthening of the gastrocnemius-soleus complex for equinus deformity associated with partial foot amputation

Procedure	Indications	Advantage	Disadvantage
Gastrocnemius recession	• Mild or moderate equinus	• Decreased risk of over-lengthening or calcaneal gait • Decreased risk of Achilles rupture • Can weight bear	• Inadequate lengthening • Larger incision
TAL	• Moderate to severe equinus	• Percutaneous • Can be done in peripheral vascular disease patients	• Postoperative NWB • Calcaneal gait • Over-lengthening • Achilles rupture
Tenectomy or tenotomy	• Severe equinus	• Large correction • Low risk of recurrence	• Postoperative NWB • Calcaneal gait • Over-lengthening

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PT Recession

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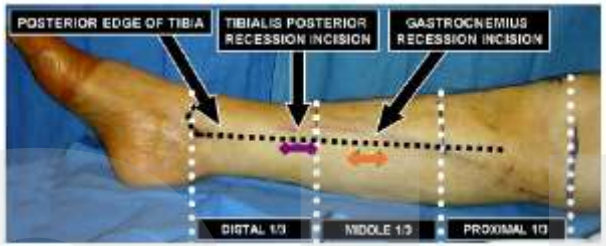
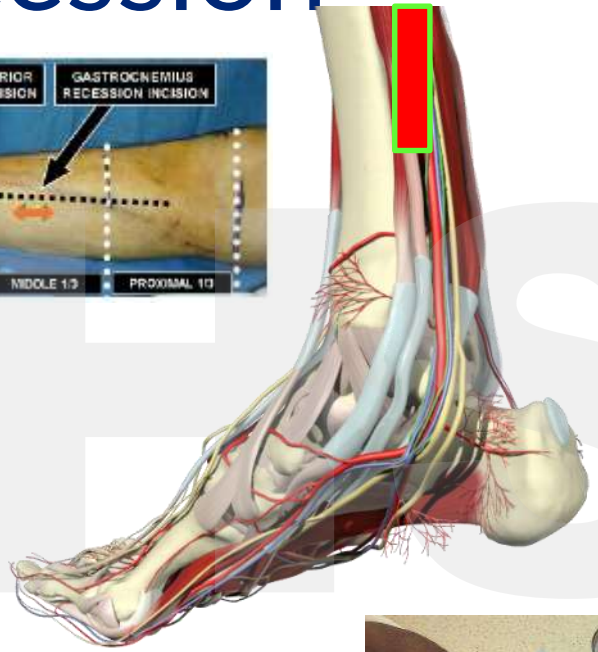
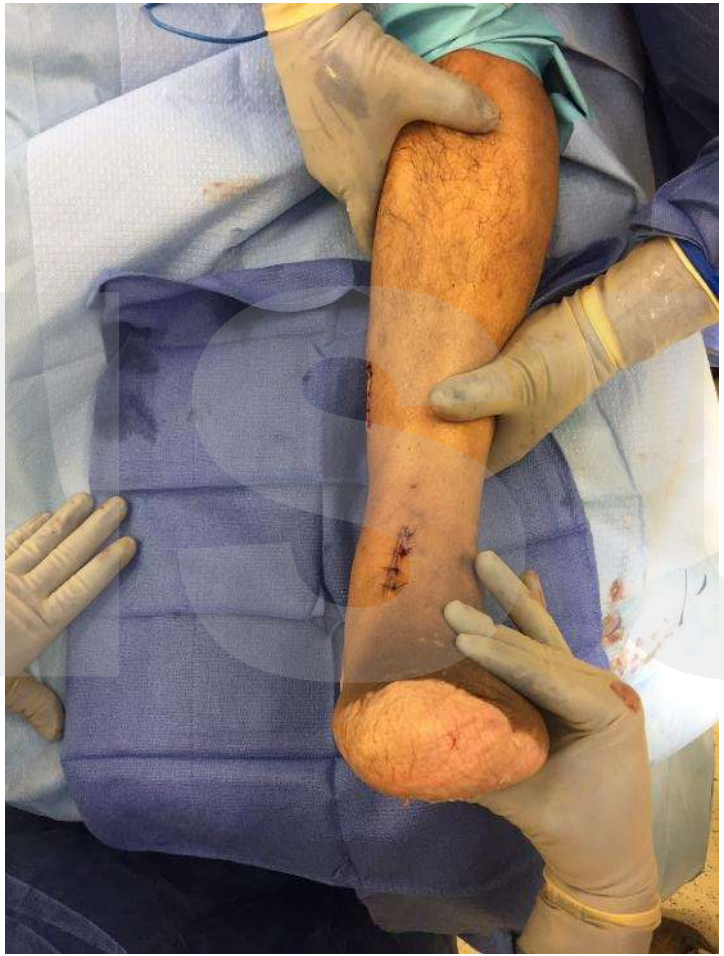




AT Lengthening



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Clinical Photos

Ulcer Size:
R – 11 x 9 x 3 mm
L – Healed!

PLAN:
-referral for brace

Overall

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- Goal is a balanced plantigrade foot able to fit into a shoe with least potential for further breakdown

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Levels of amputation

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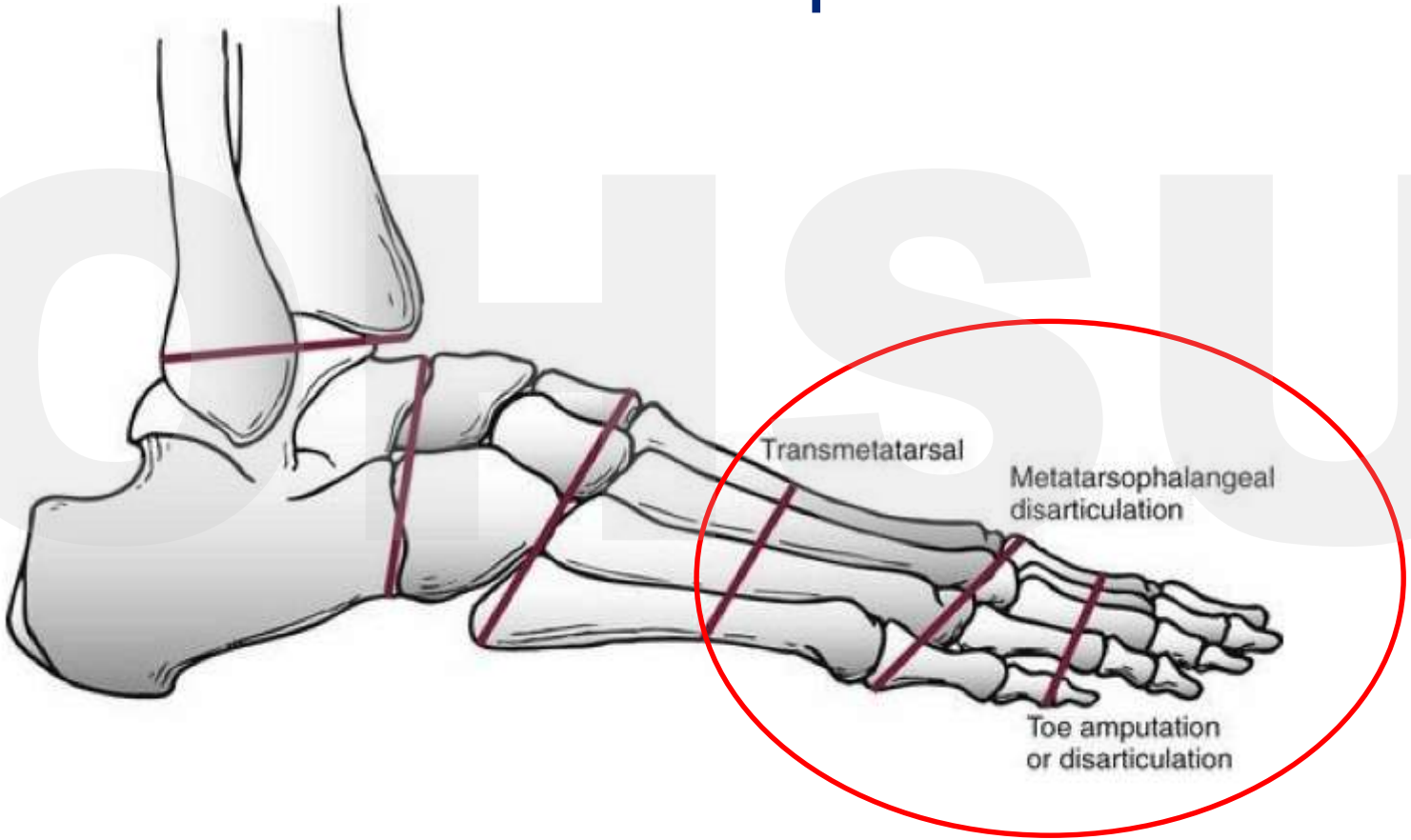


Indications

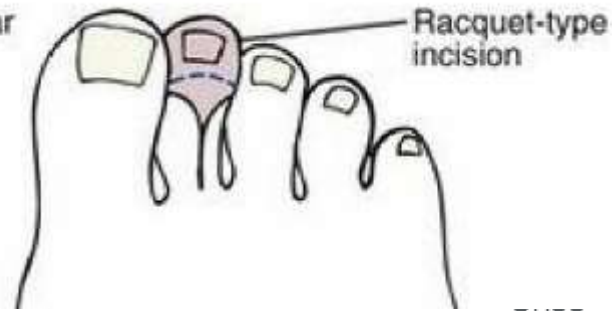
- **Infection**
- **Gangrene**
- Congenital abnormalities/deformity
- Trauma
- Tumor

Goals of surgery

- Removal of infection/necrosis
- Salvage as much foot as possible while preserving function
  - More proximal amputation→ higher O2 demand
- Plantigrade foot
  - Less likelihood for ulceration

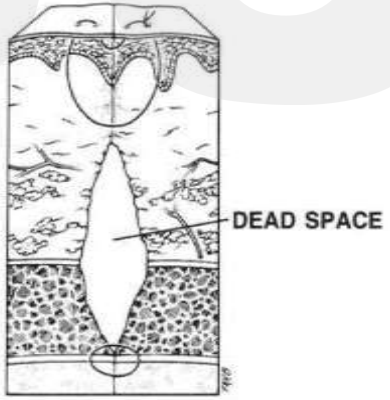
Digital amputations

- Up to 55% patients who undergo toe amputation need another amputation[1]
- Common sequelae: loss of toe buttress with complete amps→ drifting toes



Surgical considerations

- Soft tissue preservation
  - Aggressively debride infected/necrotic bone & soft tissue
  - Preserve as much viable skin and soft tissue
  - Delicate tissue handling
- Wound closure
  - Balance between length of bone vs soft tissue coverage
  - Hemostasis
  - Prevention of dead space



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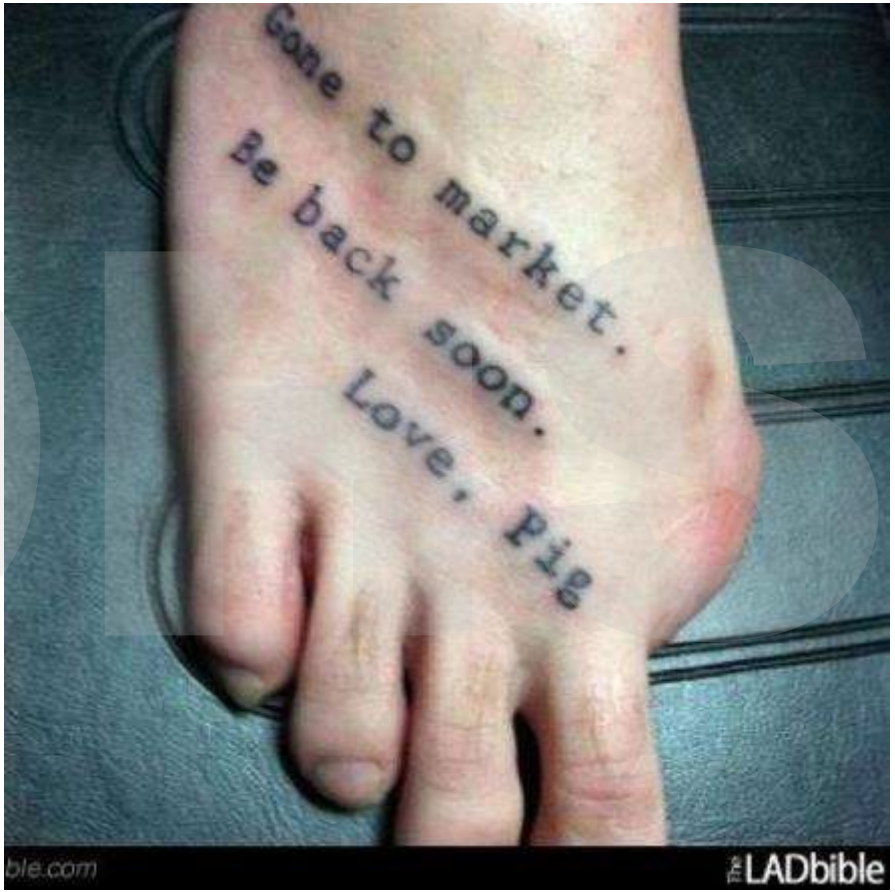

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Levels of amputation

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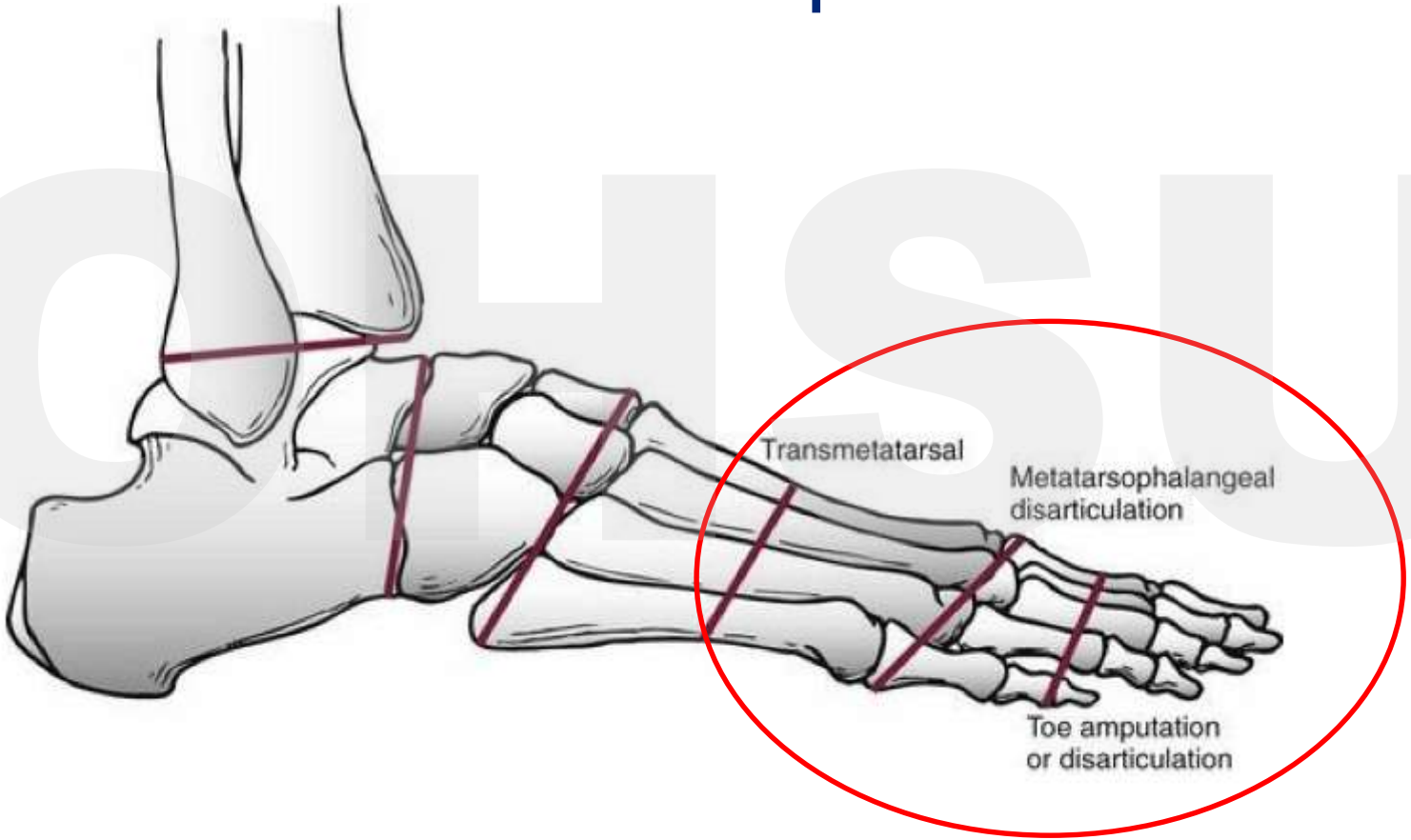
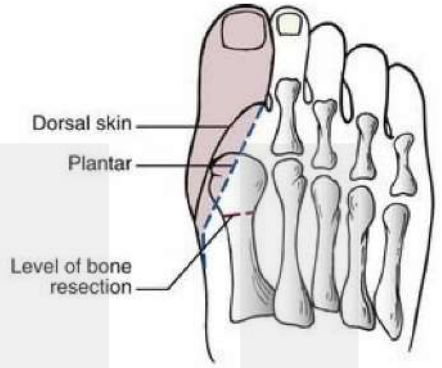


Ray amputations

- *Indications*
  - Septic MPJ
  - Metatarsal head osteomyelitis
  - Inadequate soft tissue coverage
- Partial vs. complete
  - Generally, complete ray amps should be avoided due to subsequent midfoot instability and/or loss of critical tendon insertions



- Transfer lesions are the most common complication
- Caution with removal of 3 or more

Partial Ray Amputations

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Partial 1st ray amputation outcomes

- Borkosky & Roukis, 2011
  - Systematic review, n=435, 5 studies
  - all levels of 1st ray amputation, mean 26 month follow up
  - Incidence of re-amputation→19.8%

- Borkosky & Roukis, 2013
  - Retrospective review, n=59
  - All patients initially healed
  - At mean 10.5 months, 69% developed a mean 3.1 re-ulcerations
  - 42% proximal re-amputation rate at 25 months

Partial 1st ray amputation outcomes

- Dalla Paola *et al*, 2003
  - Prospective cohort study, n=89 partial 1st ray resections, mean follow up 16 months
  - Post-op intensive secondary prevention plan
    - Custom-molded insole
    - Rock-bottom soles and thermo-moldable leather uppers
    - House slipper with custom inserts
  - 17% ulcer recurrence, 9% reoperation
  - Better results attributed to their post-op care plan

Levels of amputation

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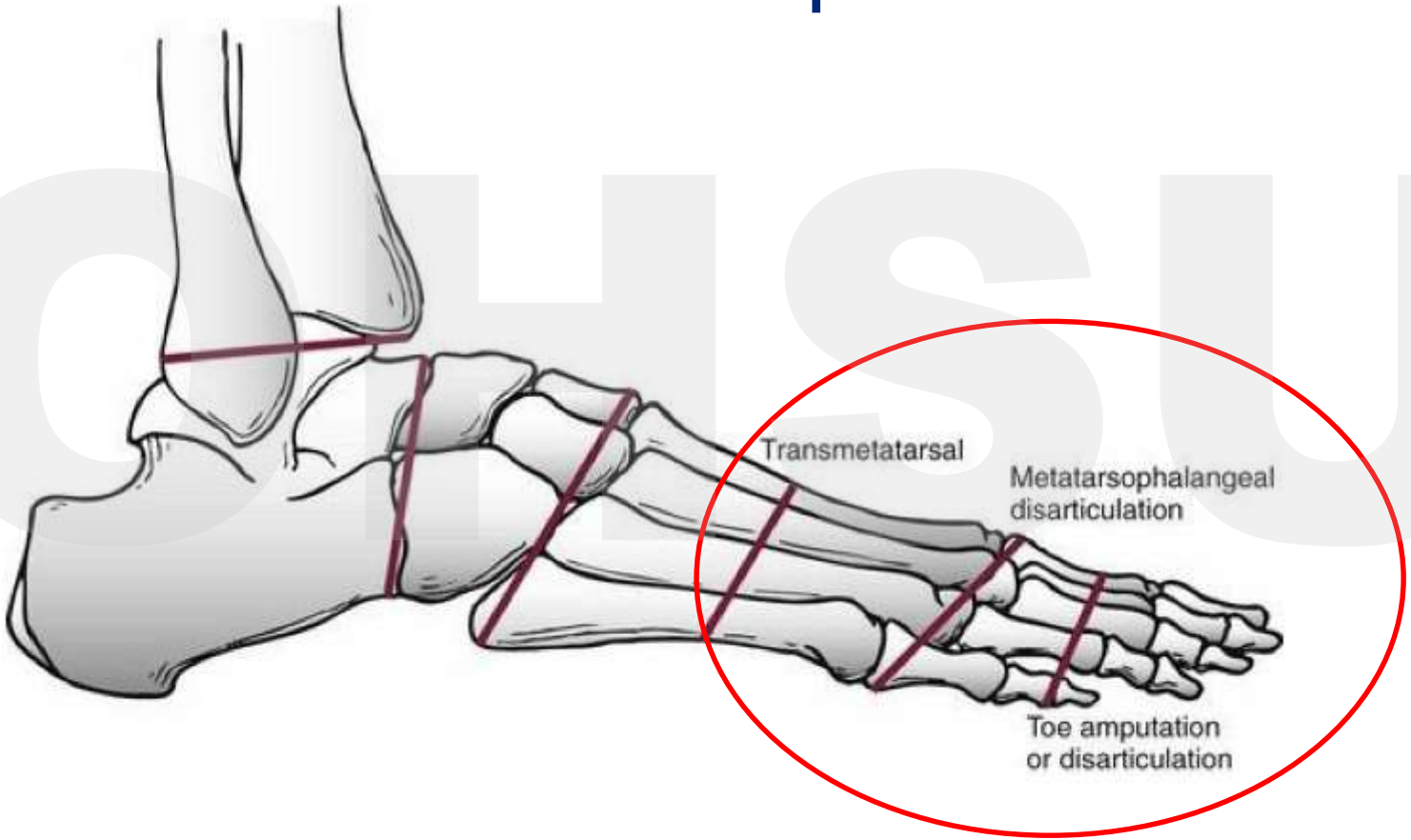

Transmetatarsal Amputations

Transmetatarsal amputation

- Preservation of metatarsal parabola
- Preserves TA and PB insertions, more functional amputation compared to more proximal amputations
- Well tolerated with custom shoes/filler

- <u>Common complications</u>
  - Recurrent ulceration/infection
  - Equinovarus deformity

Predictors of Healing and Functional Outcome Following Transmetatarsal Amputations

Gregory J. Landry, MD; Daniel A. Silverman, BS; Timothy K. Liem, MD; Erica L. Mitchell, MD; Gregory L. Moneta, MD

Arch Surg. 2011;146(9):1005-1009

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- Landry *et al* 2011
  - Retrospective review, n=62 TMA's
  - 53% healed, 35% BKA, 11% died
  - Healing associated with going on to independent ambulation
  - No significant difference in mortality in those who healed vs did not heal
  - Mortality associated with ESRD, non-independent living, need for pre-op revascularization

Mortality/morbidity of TMA

- Pollard *et al* 2006
  - Retrospective review 101 cases TMA, 2 year follow up
  - Results
    - Stump healing rate of 57%, but 87% had post-op complications
      - Palpable pedal pulses predictive of healing and not requiring proximal amputation
      - ESRD predictive of non-healing

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Reoperation and Reamputation After Transmetatarsal Amputation: A Systematic Review and Meta-Analysis

Jakob C. Thorud, DPM, MS, AACFAS [1], Daniel C. Jupiter, PhD [2], Jonathan Lorenzana, DPM [3], Tea Tu Nguyen, DPM, AACFAS [4], Naohiro Shibuya, DPM, MS, FACFAS [5]

- n=1453, 24 studies
- **Re-operation: 24%**
- **Re-amputation: 28%**
- **Major amputation: 30%**

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Levels of amputation

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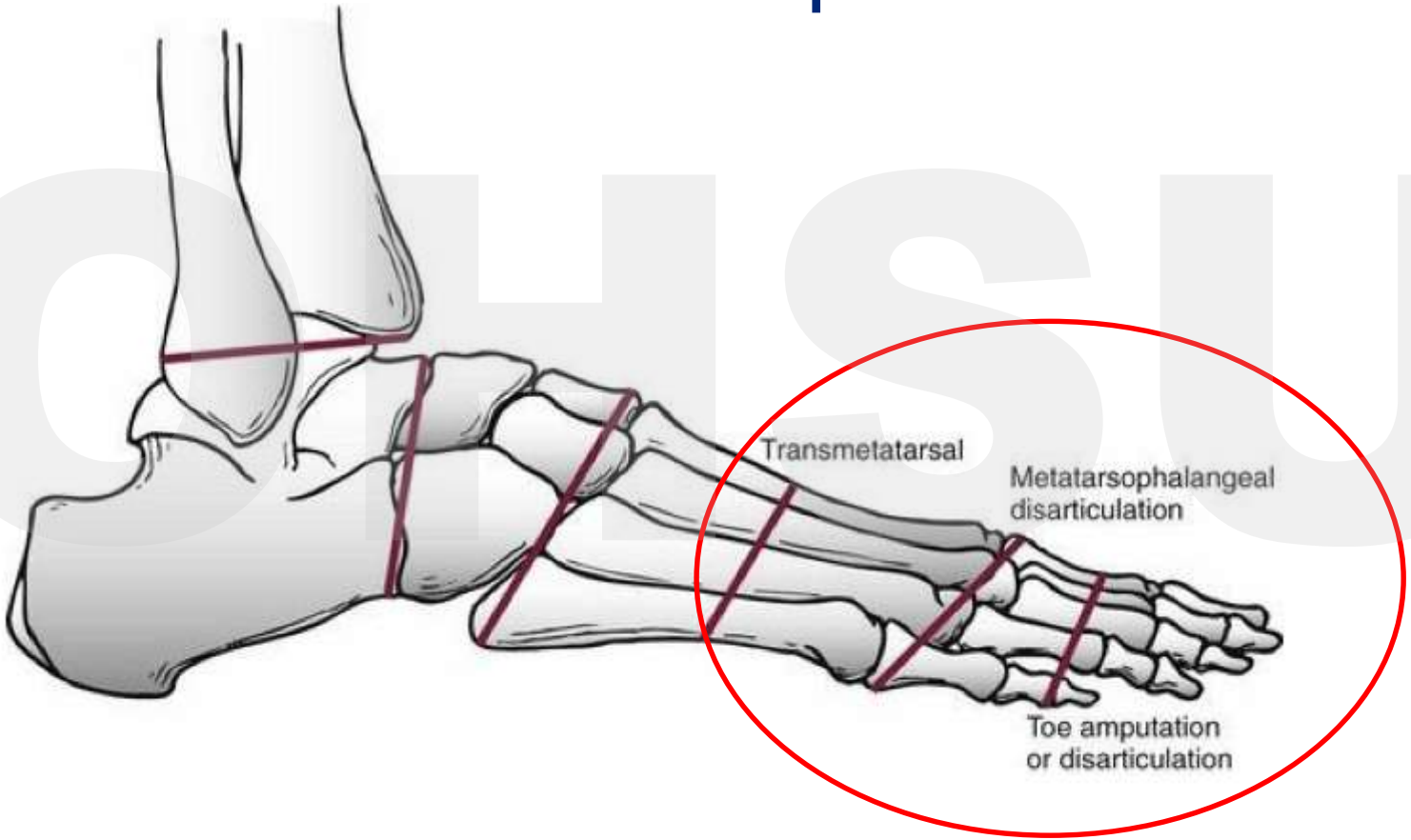
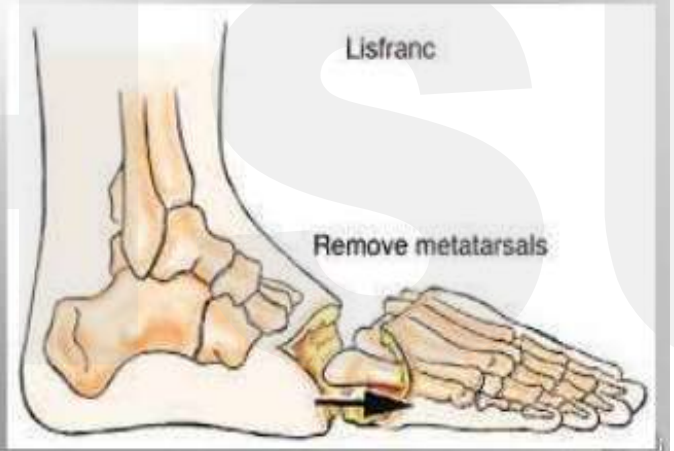


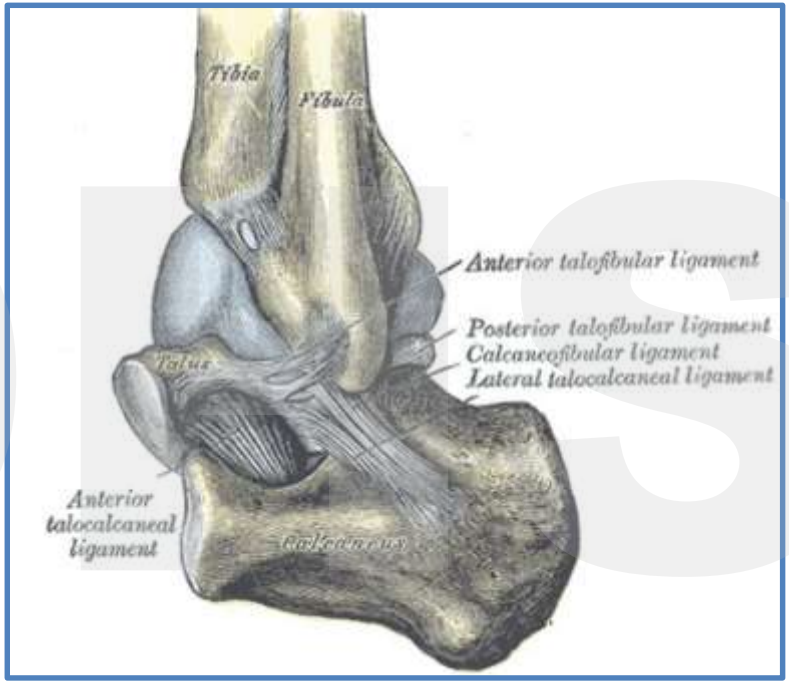
LISFRANC AMPUTATION

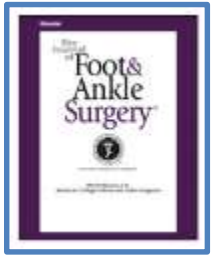
- TARSOMETATARSAL DISARTICULATION.
- LEAD TO SEVERE EQUINOVARUS DEFORMITY. TO PREVENT EQUINOVARUS DEFORMITY-
  - PRESERVE INSERTION OF TIBIALIS ANTERIOR AND PERONEUS LONGUS AT MEDIAL CUNEIFORM AND PERONEUS BREVIS AT THE BASE OF 5TH METATARSAL.
  - BASE OF 2ND METATARSAL SHOULD



https://www.google.com/search?q=lis+franc+level+foot+amputation&tbm=isch&ved=2ahUKEwj-4bfEzqfpAhWTiZ4KHeTwA8AQ2-cCegQIABAA&oq=lis+franc+level+foot+amputation&gs_lcp=CgNpbWcQAzoFCAAQgwE6AggAOgQIIxAnOgQIABBDOgQIABAeOgYIABAFEB46BggAEAoQHjoGCAAQChAYUMjQdlj8mHdg55t3aAJwAHgAgAFMiAGTDJIBAjMzmAEAoAEBqgELZ3dzLXdpei1pbWc&sclient=img&ei=nRG3Xr6fMJOT-gTk4Y-ADA&bih=932&biw=1920&hl=en#imgrc=yyC2-LGDfaKw-M

Chopart Amputation





Outcomes of Chopart Amputation in a Tertiary Referral Diabetic Foot Clinic: Data From a Consecutive Series of 83 Hospitalized Patients

Ezio Faglia, MD[1], Giacomo Clerici, MD[2], Robert Frykberg, DPM, MPH[3], Maurizio Caminiti, MD[4], Vincenzo Curci, MD[4], Francesco Cetta, MD[5], Vincenzo Prisco, MD[6], Rosaria Greco, MD[6], Marco Prisco, MD[6], Alberto Morabito, PhD[7]

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- Level of Evidence: 3
- Methods: Over 2 year span, 83 patients underwent chopart amputation.
  - Follow-up: Weekly until incision healed and monthly thereafter and in absence of recurrence.
- Results:
  - Mean follow-up of 2.8 years
  - 47 patients (56.6%) had completely healed after a mean interval of 164.7 days
  - 23 patients (27.7%) underwent major amputation
  - 38 patients (45.8%) died at a mean of 257.9 +/- 252.1 days
    - Incidence of 25.8% per year

- **Conclusion: Chopart amputation resulted in approximately 60% limb salvage rate which is an acceptable alternative in lesions so significant that often times only an above-the-ankle amputation is offered.**

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Levels of amputation

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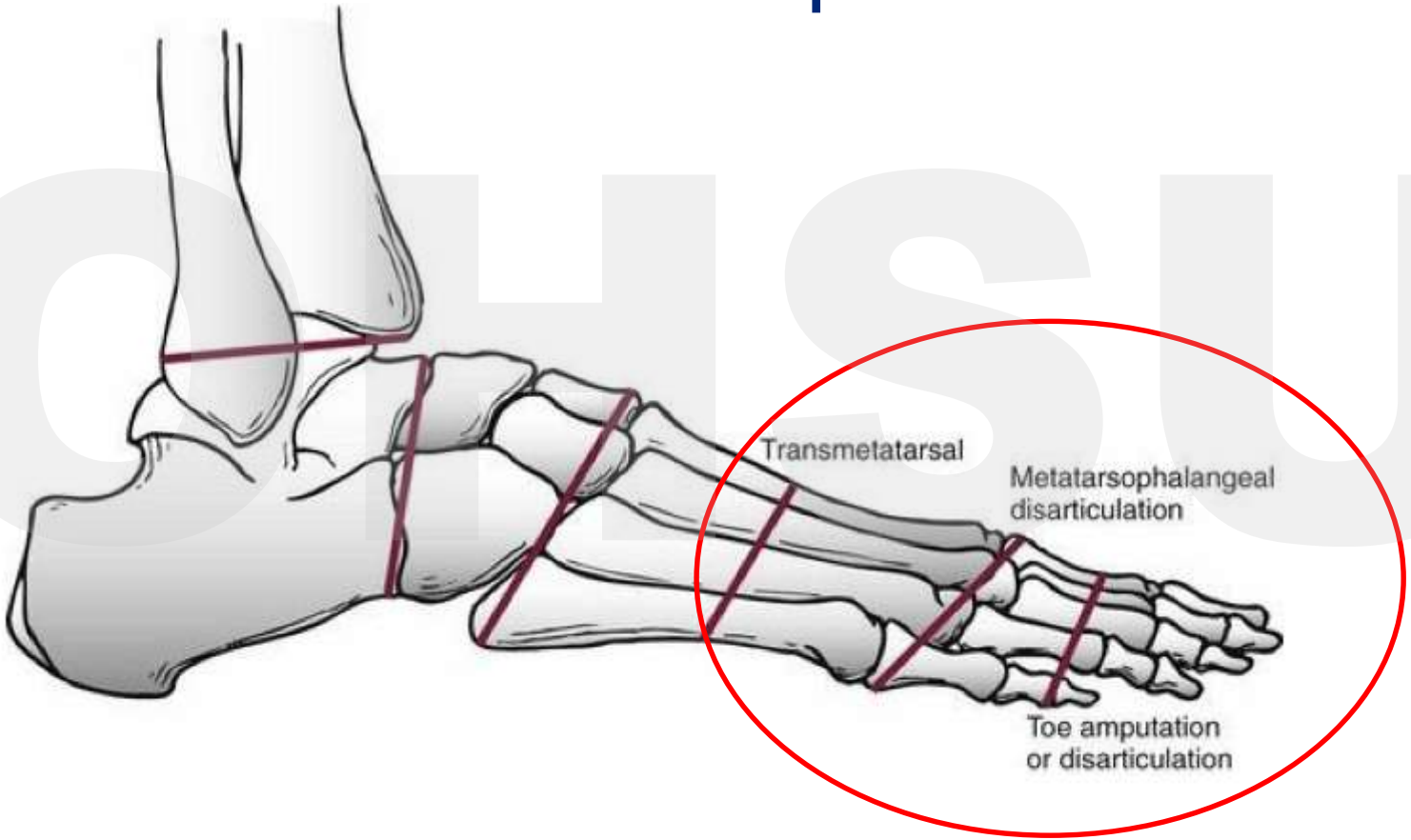

Syme Amputation

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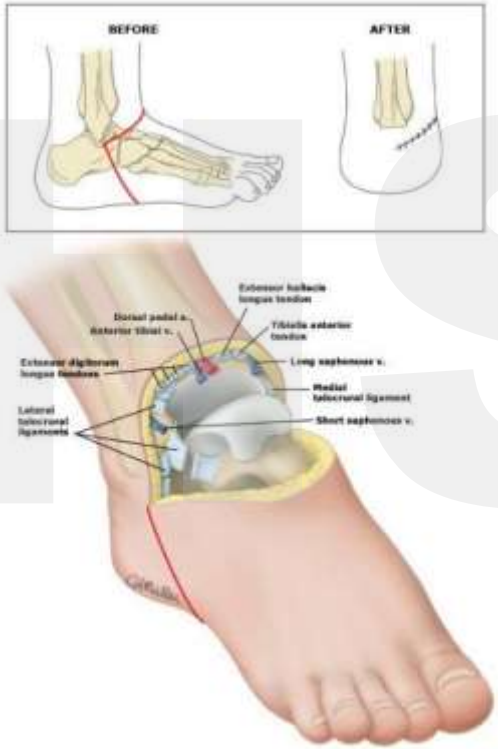
Syme Amputation



https://www.google.com/search?q=syme+amputation&rlz=1C1GCEA_enUS893US893&source=lnms&tbm=isch&sa=X&ved=2ahUKEwjBlc311_LoAhVLsZ4KHXivD0sQ_AUoAXoECA0QAw&biw=1920&bih=888#imgrc=K55gi97kRszSPM

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Take home points

- Consider patient-specific factors when deciding on index amputation levels
- Patient education and setting long term expectations
- More investigation is needed on secondary prevention measures

Learning Objectives

- Understand the mortality and morbidity for DFU/DFI
- Recognize cost (QOL and $) associated with DFU and DFI
- Understand how to run a Code Foot—examining an infected foot
- Learn the VIP'S of a DFI
- Understand rationale of Osteomyelitis Abx use and timing
- Understand the team approach (Toe and Flow model)
- Review the surgical art of foot preservation--Toemigo style
- Discuss prevention tools for DFU in 2020

The NEW ENGLAND JOURNAL of MEDICINE

REVIEW ARTICLE

Julie R. Ingelfinger, M.D., *Editor*

Diabetic Foot Ulcers and Their Recurrence

David G. Armstrong, D.P.M., M.D., Ph.D., Andrew J.M. Boulton, M.D., and Sicco A. Bus, Ph.D.

COMPLICATIONS OF DIABETES THAT AFFECT THE LOWER EXTREMITIES ARE common, complex, and costly. Foot ulceration is the most frequently recognized complication. In a community-based study in the northwestern United Kingdom, the prevalence of active foot ulcers identified at screening among persons with diabetes was 1.7%, and the annual incidence was 2.2%.[1] Higher annual incidence rates have been reported in specific populations: 6.0% among Medicare beneficiaries with diabetes, 5.0% among U.S. veterans with diabetes, and 6.3% in the global population of persons with diabetes.[2-4] On the basis of 2015

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Recurrence is Likely

1 year 34%

3 year 61%

5 year 70%

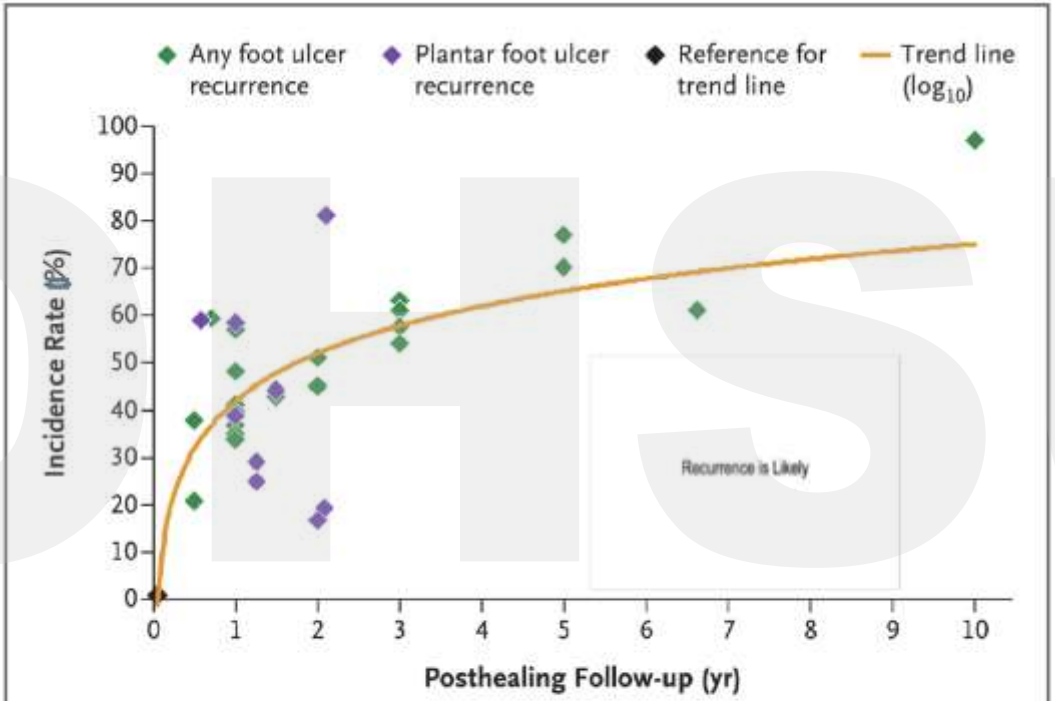

Figure 2. Incidence of Ulcer Recurrence.

Data are from nine prospective follow-up studies, one retrospective study, and the control groups (i.e., patients who received usual care) in nine ran-

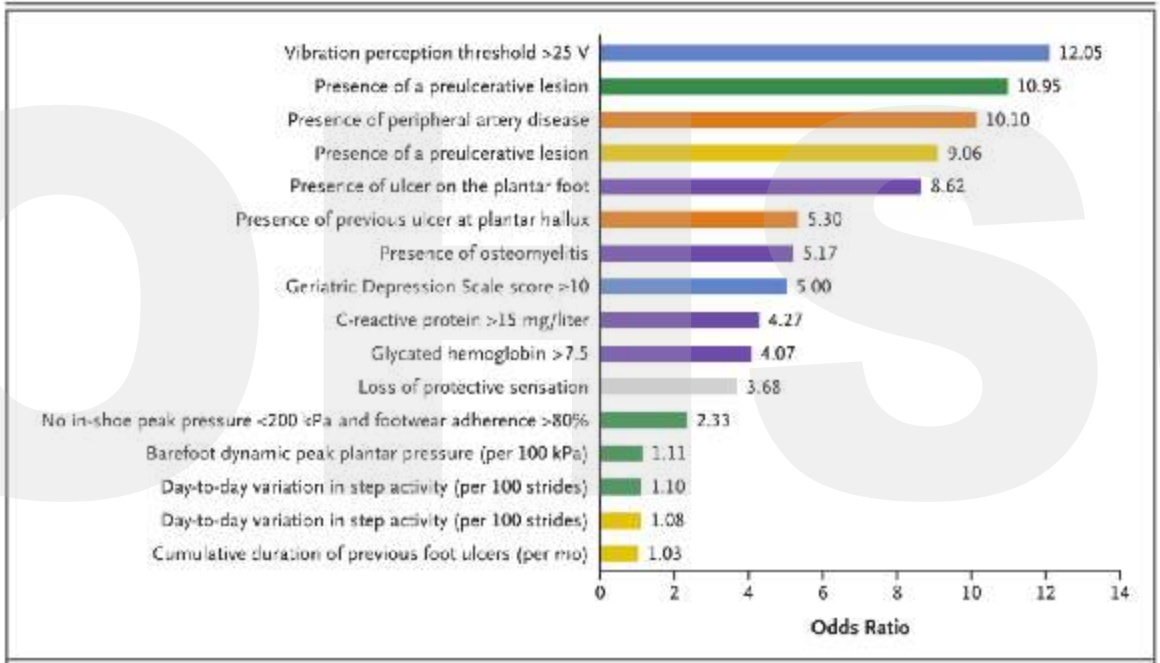

Figure 3. Risk Factors Independently Associated with Ulcer Recurrence.

Data are from five studies that reported an odds or risk ratio.[28,33,42,52,58] According to Monami et al.[42] (blue), risk factors for ulcer recurrence are a vibration perception threshold greater than 25 V and a Geriatric Depression Scale score of

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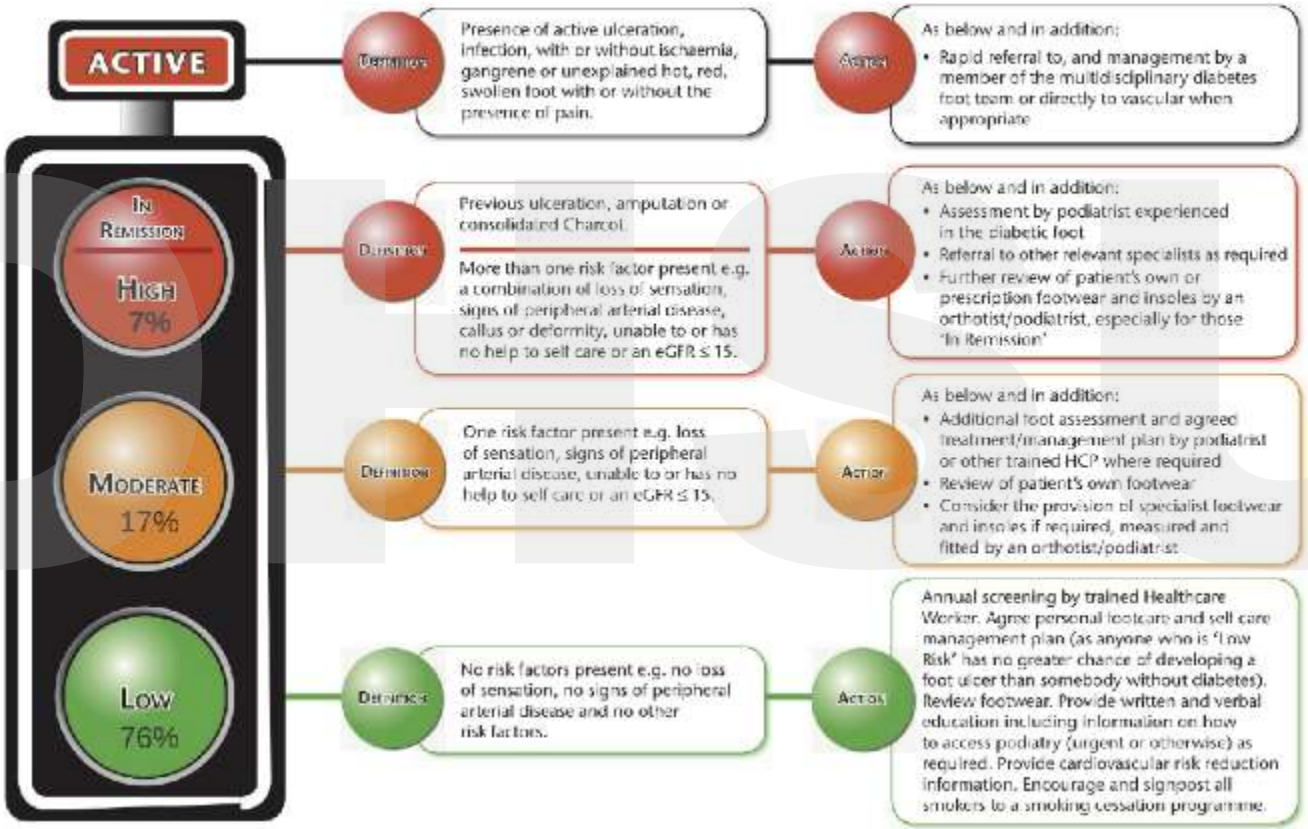
Wound Healing = Remission

Armstrong and Mills, JAPMA 2013
Armstrong, Boulton and Bus, NEJM, 2019

Diabetic Foot Risk Stratification and Triage



These risk categories relate to the use of the SCI-Diabetes foot risk stratification tool

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If wound recurs should leg be cut off (Major Amputation) ?

- A well performed amputation to get on with their life

- Die Sooner
- Use Less Resources

- Others cost a bit more if they lived longer with new prosthetics every couple of years

- Some (a small minority) would have a better quality of life if they were super motivated and had the reserve for rehab

WIFi Classification

Developed with Dr. Joe Mills
OHSU Vascular Resident
1986-87

a, Estimate risk of amputation at 1 year for each combination

	Ischemia – 0				Ischemia – 1				Ischemia – 2				Ischemia – 3			
W-0	VL	VL	L	M	VL	L	M	H	L	L	M	H	L	M	M	H
W-1	VL	VL	L	M	VL	L	M	H	L	M	H	H	M	M	H	H
W-2	L	L	M	H	M	M	H	H	M	H	H	H	H	H	H	H
W-3	M	M	H	H	H	H	H	H	H	H	H	H	H	H	H	H
	fI-0	fI-1	fI-2	fI-3	fI-0	fI-1	fI-2	fI-3	fI-0	fI-1	fI-2	fI-3	fI-0	fI-1	fI-2	fI-3

b, Estimate likelihood of benefit of/requirement for revascularization (assuming infection can be controlled first)

	Ischemia – 0				Ischemia – 1				Ischemia – 2				Ischemia – 3			
W-0	VL	VL	VL	VL	VL	L	L	M	L	L	M	M	M	H	H	H
W-1	VL	VL	VL	VL	L	M	M	M	M	H	H	H	H	H	H	H
W-2	VL	VL	VL	VL	M	M	H	H	H	H	H	H	H	H	H	H
W-3	VL	VL	VL	VL	M	M	M	H	H	H	H	H	H	H	H	H
	f-0	fI-1	fI-2	fI-3	fI-0	fI-1	fI-2	fI-3	fI-0	fI-1	fI-2	fI-3	fI-0	fI-1	fI-2	fI-3

fI, foot Infection; I, Ischemia; W, Wound.

Premises:

1. Increase in wound class increases risk of amputation (based on PEDIS, UT, and other wound classification systems)
2. PAD and infection are synergistic (Eurodiale); infected wound + PAD increases likelihood revascularization will be needed to heal wound
3. Infection 3 category (systemic/metabolic instability): moderate to high-risk of amputation regardless of other factors (validated IDSA guidelines)

Four classes: for each box, group combination into one of these four classes

Very low = VL = clinical stage 1
Low = L = clinical stage 2
Moderate = M = clinical stage 3
High = H = clinical stage 4
Clinical stage 5 would signify an unsalvageable foot

Society For Vascular Surgery® document
The Society for Vascular Surgery Lower Extremity Threatened Limb Classification System: Risk stratification based on Wound, Ischemia, and foot Infection (WIfI)☆
Author links open overlay panelJoseph L.MillsSr.MDaMichael S.ConteMDbDavid G.ArmstrongDPM, MD, PhDaFrank B.PomposelliMDcAndresSchanzerMDdAnton N.SidawyMD, MPHeGeorgeAndrosMDfSociety for Vascular Surgery Lower Extremity Guidelines Committee

New Technologies to Prevent Foot Ulcers

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https://www.google.com/search?q=new+technology&tbm=isch&ved=2ahUKEwjlg4nmyKfpAhWGhZ4KHT6BBiYQ2-cCegQIABAA&oq=new+technology&gs_lcp=CgNpbWcQAzIECAAQQzICCAAyBAgAEEMyBAgAEEMyBAgAEEMyAggAMgIIADICCAAyAggAMgQIABBDUNX5AVjV-QFggv0BaABwAHgAgAExiAExkgEBMZgBAKABAaoBC2d3cy13aXotaW1n&sclient=img&ei=mQu3XqXTK4aL-gS-gpqwAg&bih=932&biw=1920&hl=en#imgrc=Dg6GUCDs43JKwM

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Internet of Medical Technology (IoMT) for DFU

- Wearable Technology to monitor wound healing process & Personalized Wound care—Smart Dressings, (bacteria. Temperature, moisture, wound pH)
- Wearable and smart platforms to monitor biomarkers for chronic health conditions –diagnostic biosensor watch (cortisol, glucose and Interleukin-6—perspired sweat)
- CV Heath Monitoring—?Early ID of PAD (pulse wave velocity)
- Vital Sign monitoring with mobile health or wearables (HR variability reln to delayed wound healing, skin temp and RR for infxn)
- Skin Health monitoring

- Early signs of DFU
  - Smart Bathmat (Podimetrics)
  - Smart Socks (Siren)
  - Smart Insoles/Smartwatch (SurroSense Rx)

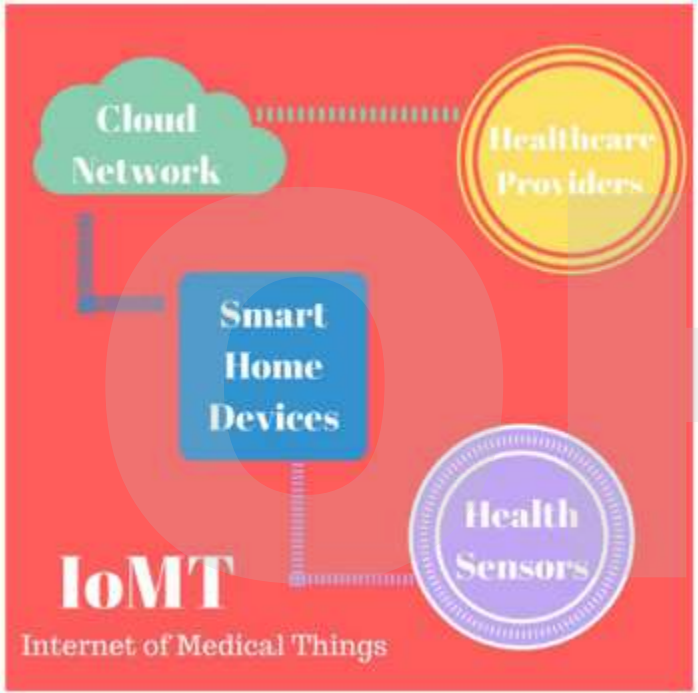

Figure 1. The Internet of medical things lies at the intersection of sensors, cloud computing, and medical monitoring.

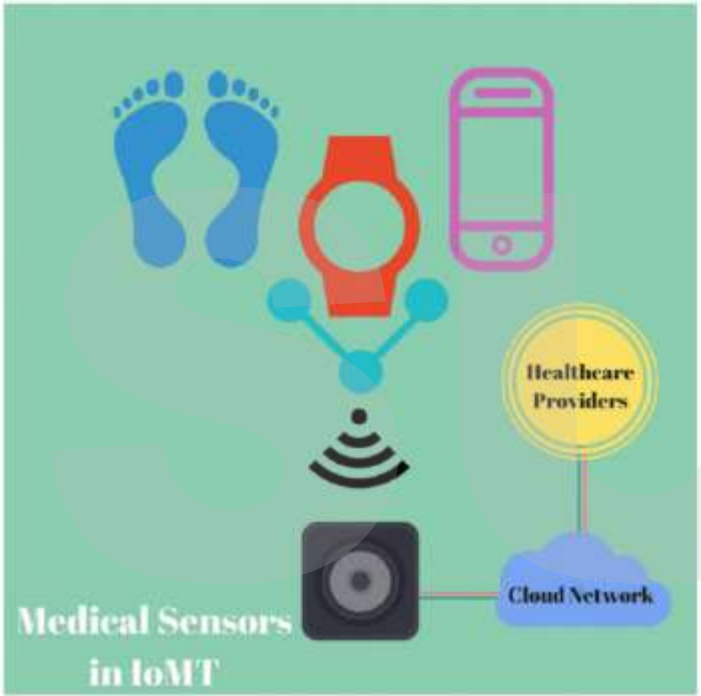

Figure 3. Future direction for IoMT in the care of the diabetic foot.

Health Sensors, Smart Home Devices, and the Internet of Medical Things: An Opportunity for Dramatic Improvement in Care for the Lower Extremity Complications of Diabetes
Rami Basatneh, BSc, MA, Bijan Najafi, PhD, MSc, David G. Armstrong, DPM, MD, PhD
Journal of Diabets Science and Technology, https://doi.org/10.1177/1932296818768618

Contents available at ScienceDirect
Diabetes Research and Clinical Practice
journal homepage: www.elsevier.com/locate/diabres
ELSEVIER
International Diabetes Federation

Accuracy of a foot temperature monitoring mat for predicting diabetic foot ulcers in patients with recent wounds or partial foot amputation

Ian L. Gordon [a], Gary M. Rothenberg [b], Brian D. Lepow [c], Brian J. Petersen [d,*], David R. Linders [d], Jonathan D. Bloom [d], David G. Armstrong [e]

[a] University of California Irvine School of Medicine, Irvine, CA, USA
[b] University of Michigan Medical School, Ann Arbor, MI, USA
[c] Baylor College of Medicine, Houston, TX, USA
[d] Podmetrics Inc., Somerville, MA, USA
[e] Keck School of Medicine, University of Southern California, Los Angeles, CA, USA

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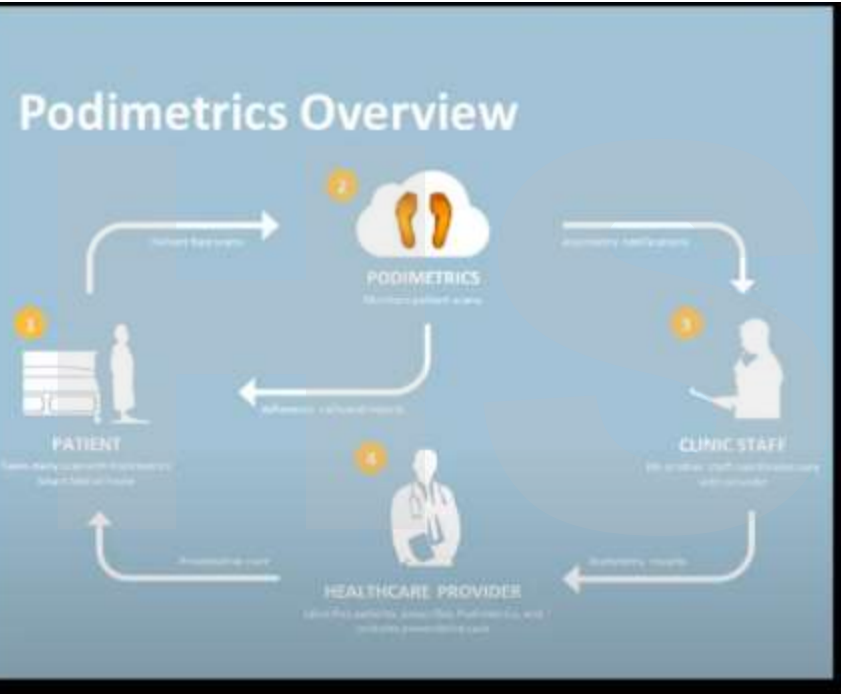
Podimetrics Smart Mat

- Easy-to-use, in-home floor mat for remote monitoring of plantar foot temperature for signs of inflammation
- Cellular modem + service included
- End-to-end data encryption protect patient data
- Manufactured in the United States



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Tech Startup Brings Diabetic Ulcer Solution to Veterans Affairs Clinics

“But the spark that made the innovation possible was the first **Massachusetts Institute of Technology’s first Hacking Medicine Grand Hack**, which joined together academic, industry and federal innovators to accelerate medical innovation.”

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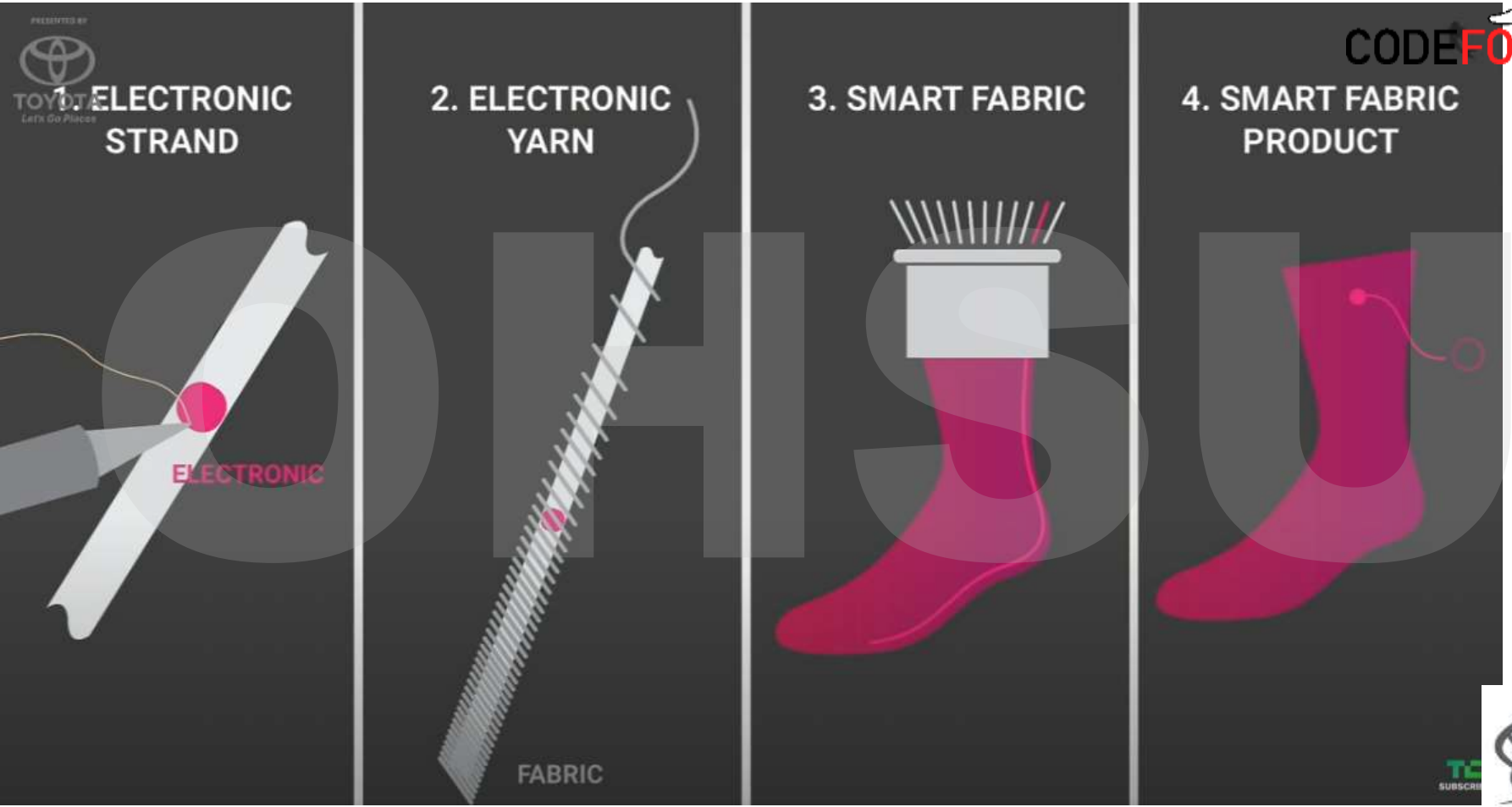

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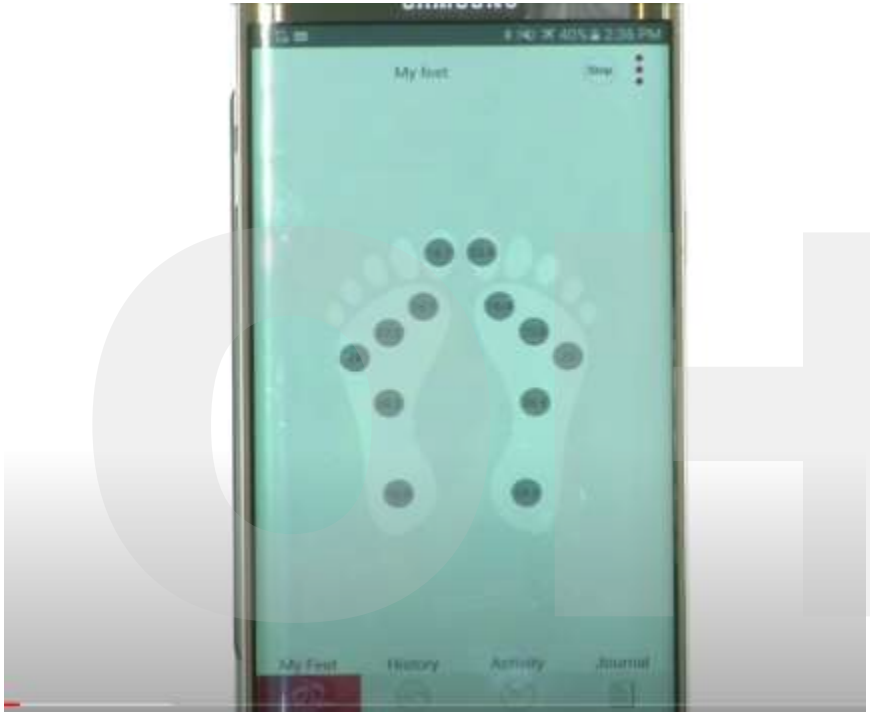

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How Orpyx SI Works

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Custom insoles with embedded sensors monitor plantar pressure, temperature and movement.

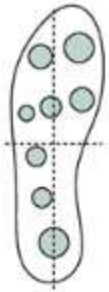
Provides the health care provider with real-world, plantar feedback while the user goes about their daily activities.

Real-time alerts allows the user to immediately relieve sustained, high-pressure areas.

The health care provider monitors the sensory data and adjusts the patient's foot care plan.

A

B



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Bariatric Surgery and Type 2 Diabetes

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Surgery improves type 2 diabetes in nearly 90 percent of patients by:

- lowering blood sugar
- reducing the dosage and type of medication required
- improving diabetes-related health problems

Surgery causes type 2 diabetes to go into remission in 78 percent of individuals by:

- reducing blood sugar levels to normal levels
- eliminating the need for diabetes medication

ASMBS American Society for Metabolic and Bariatric Surgery

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Type 2 Diabetes Remission Rates

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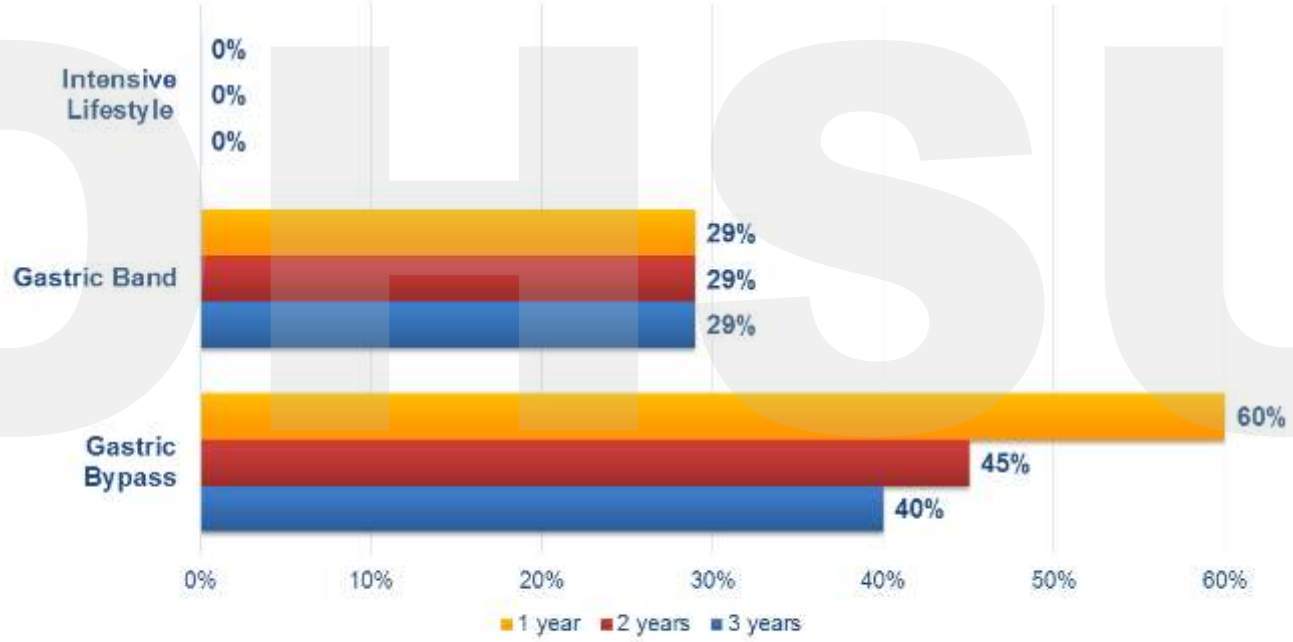

Source: Courcoulas et al, 2015.07.01, JAMA Surg.

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Bariatric Surgery and Type 2 Diabetes

Who is a Candidate?

The following are recommendations from the American Diabetes Association:

- Surgery for Diabetes is recommended to treat people with T2DM and BMI > 40 kg/m2, even if your diabetes is well controlled on medications.
- Surgery for Diabetes should be considered to treat people with T2DM and BMI 35-39.9 if your diabetes is not well controlled on medications.
- Surgery for Diabetes should be considered to treat people with T2DM and a BMI between 30 and 35 when your T2DM is not controlled by medications, especially in the presence of other major cardiovascular disease risk factors.

Feels Like the Office has gone to the dogs?


Mihnonah Pavilion


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Help our patients keep moving thru this world a little easier

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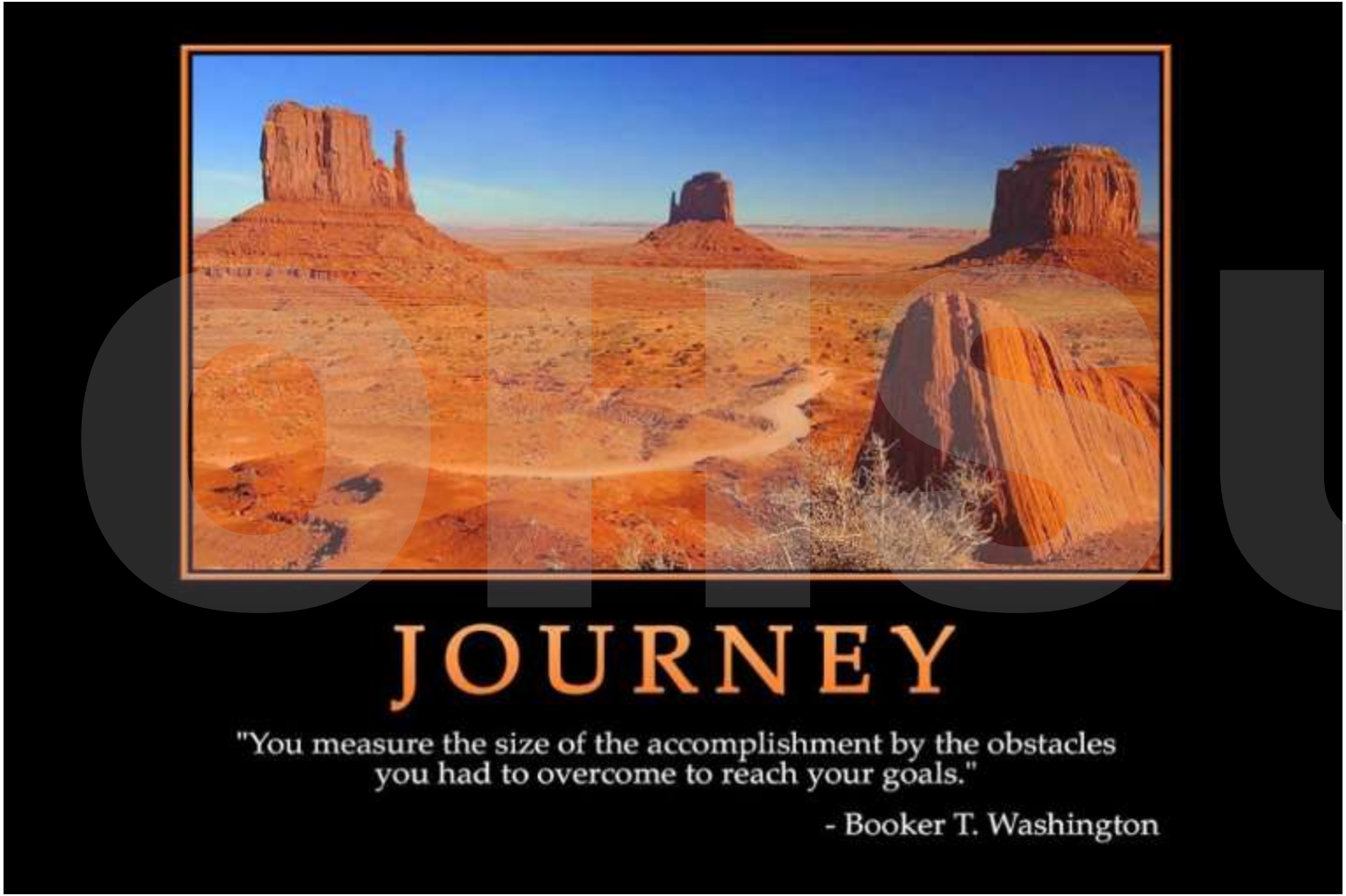

2020 Toe and Flow NW Conference

Please join us for a half day of multidisciplinary continuing medical education for vascular surgeons, podiatrists, physicians, advanced practice providers, nurses, and allied health professionals who are interested in the latest national guidelines on the management of chronic disease, limb preservation, interventions, and wound care strategies

Saturday, October 10, 2020

8:00am-1:00pm

For more information, and to register, please contact Nora Cozadd at Cozadd@ohsu.edu.

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Dave Griffin, DPM—OHSU Functional Limb Preservation Program
griffdav@ohsu.edu
Phone-503-348-2196/ Pager thru Operator-503-494-8311

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