2019 MID-ATLANTIC
CONFERENCE

9th ANNUAL CURRENT CONCEPTS IN

VASCULAR THERAPIES

2019

Hilton Virginia Beach Oceanfront
Virginia Beach, Virginia

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May 3rd, 2019

LIMB SALVAGE IS A TEAM SPORT

OBJECTIVES

- Outline the epidemiology of diabetes and the morbidity of foot ulcerations
- Review the pathophysiology of diabetic neuropathy and pathway to amputation
- Discuss podiatric surgery and its role as a member of the limb salvage team
- Evaluate specific case example of the highly coordinated and complex nature of limb salvage

REALITY OF DIABETES MELLITUS

- Diabetes affects **30.3 million people** in the United States
- 9.4% of the population
- 16 million have been diagnosed
- 8.5 million are undiagnosed
- 3 million African Americans (11.4%)
- 2 million (8.2%) Hispanics, with **25%** of Hispanics 45-74 years of age have diabetes.
- Healthcare costs of treating diabetes: $100 billion/year
- There are currently **85,000 leg amputations / year**

REALITY OF DIABETES MELLITUS

- More than 40% of people with diabetes mellitus are unaware of their disease
- About 15% of annual global health care budgets are spent on diabetes mellitus
- Diabetes mellitus is the seventh leading cause of death in the United States
- Diabetes mellitus is the leading cause of :
  - renal failure
  - lower extremity amputations
  - new cases of blindness in adult Americans

THE DIABETIC FOOT

- 25% of foot ulcers progress to a leg amputation.
- 20% of those with a minor amputation will go on to a major amputation in 6 months.
- DM patients have a 40% higher risk of death after amputation compared to non-diabetics, with 50% mortality within 3 years.
- By the time the amputation is done total cost including hospitalization, wound care, loss of productivity is $100,000.
- If DM patient loses a leg, most lose other leg within 3 years, most are deceased within 5 years.

- Diabetic foot disease costs **$16,000,000,000 /year**

Mortality and Reoperations following Lower Limb Amputations

Noam Rosen MD, Roy Gigi MD, Amir Haim MD, Moshe Salai MD and Ofir Chechik MD

Division of Orthopedics, Tel Aviv Sourasky Medical Center, affiliated with Sackler Faculty of Medicine, Tel Aviv University, Tel Aviv, Israel

- 198 amputations (91 AKA, 107 BKA, 10 bilateral)
- Overall mortality (AKA + BKA)
  - 30 day: 16.7%
  - 1 year: 44%
- 1 year mortality:
  - 58% AKA versus 33% BKA
  - AKA with higher cardiovascular complication rate
    - 33.7% AKA versus 18.8% BKA

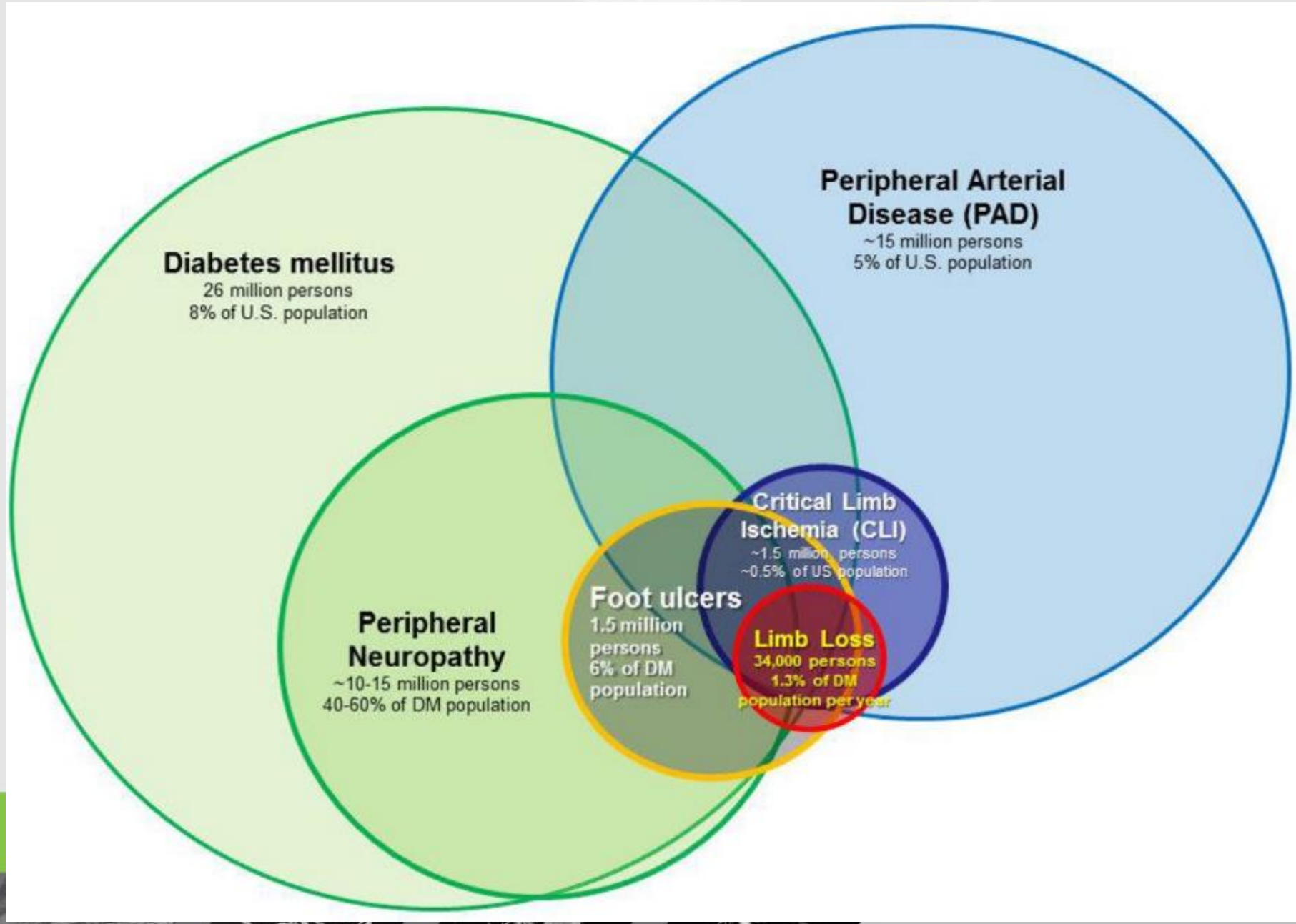
Rosen, N, et al. Mortality and reoperation following lower limb amputation. IMAJ 16: 83-87, 2014.

THE DIABETIC FOOT

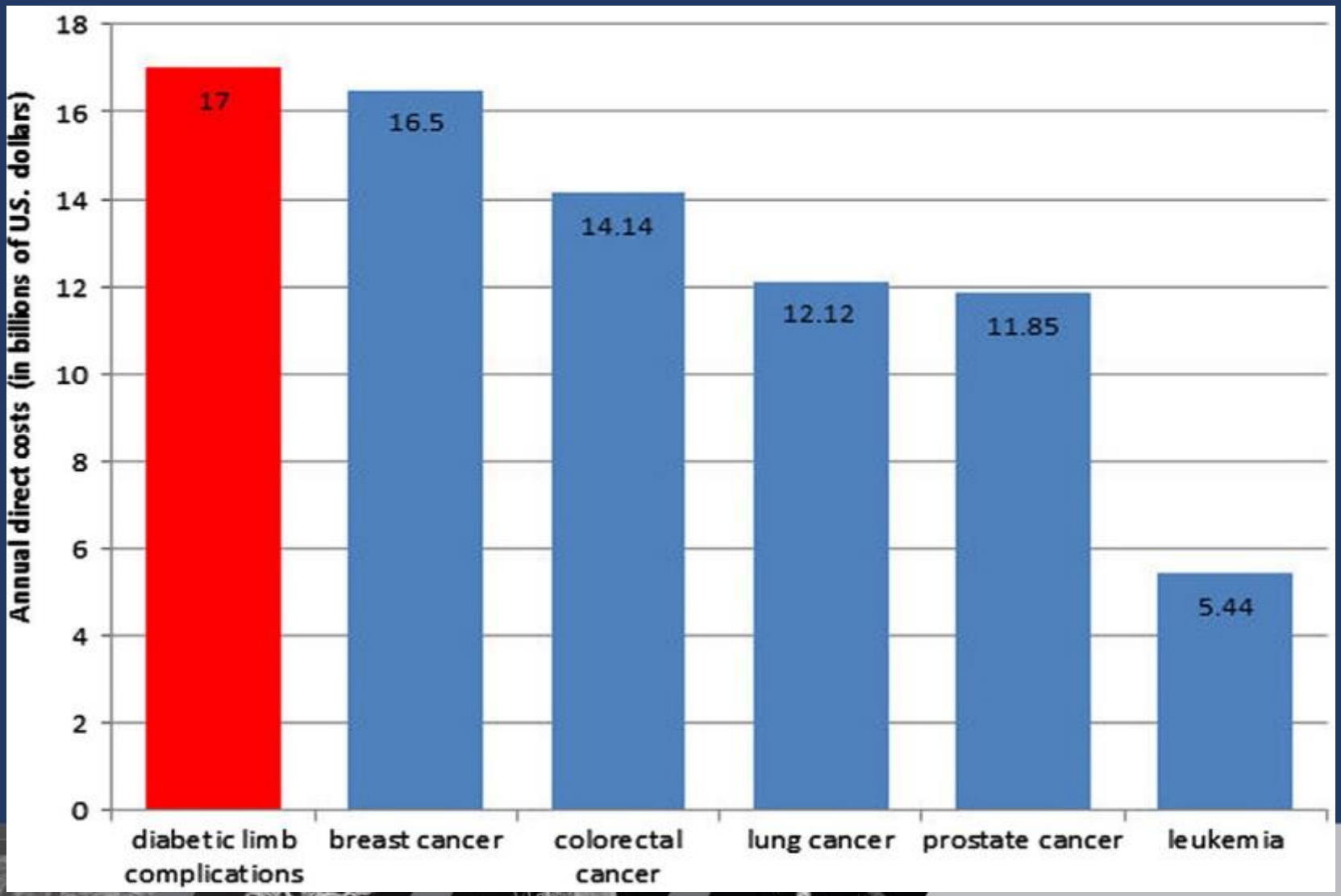
- Diabetic foot ulcers are often preventable BUT treatment is frequently suboptimal
- Diabetic foot ulcers are the most costly complication of diabetes mellitus
- The average lower limb amputation and rehabilitation costs $45,000 per limb

- **Diabetic foot ulcers precede 85% of lower limb amputations ➔**

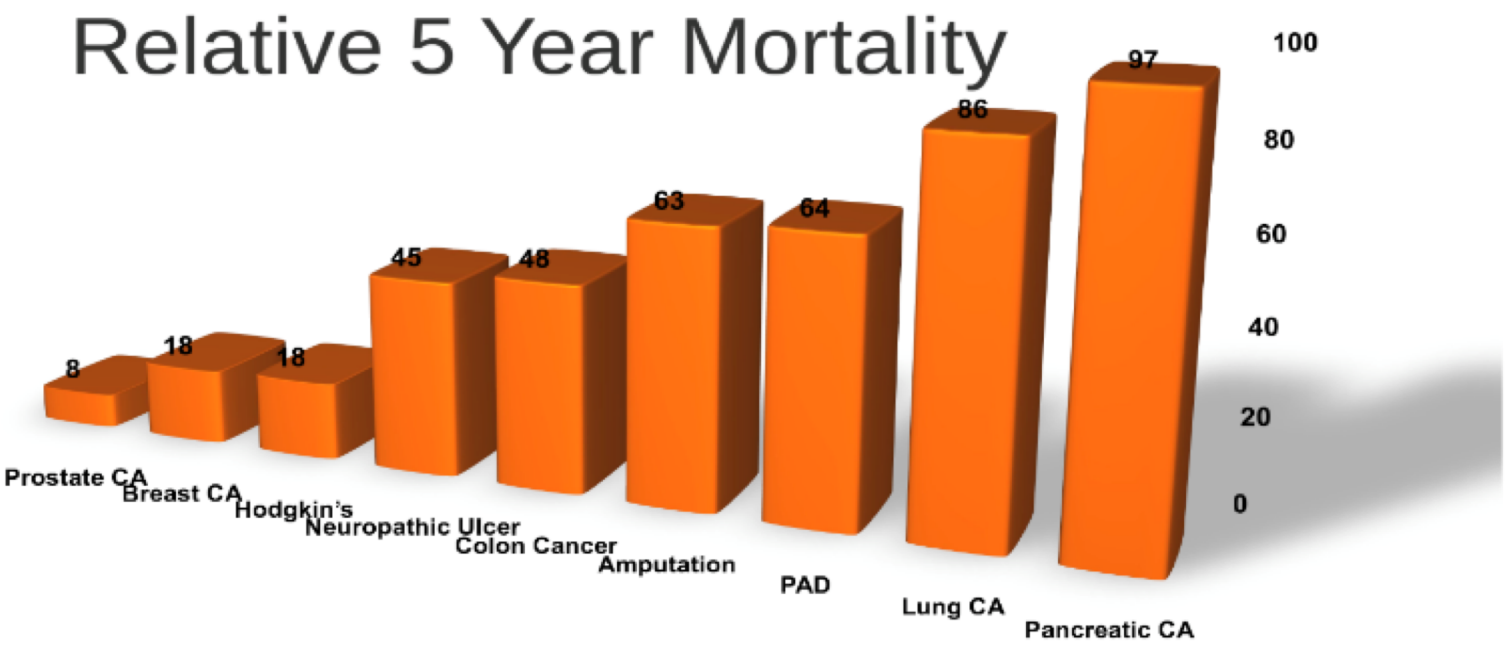
PREVENTION


Diabetes mellitus
26 million persons
8% of U.S. population
Peripheral Arterial Disease (PAD)
~15 million persons
5% of U.S. population
Peripheral Neuropathy
~10-15 million persons
40-60% of DM population
Foot ulcers
1.5 million persons
6% of DM population
Critical Limb Ischemia (CLI)
~1.5 million persons
~0.5% of US population
Limb Loss
34,000 persons
1.3% of DM population per year

COST COMPARISON: DIABETIC FOOT TO MALIGNANCY



FOOT ULCER/PAD MORTALITY VERSUS MALIGNANCY



Armstrong, et al, Int Wound J, 2007
Aulivola, et al, Arch Surg, 2004
American Cancer Society, 2000
National Cancer Institute (http://seer.cancer.gov), 2007
Moulik, et al, Diabetes Care, 2003
Faglia, et al, Circulation, 2006
Office Natl. Statistics, UK, 2006
Singh, Armstrong, Lipsky, JAMA, 2006

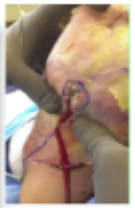
Diabetic Pathway to Amputation

Diabetes

Neuropathy

Ulceration

Infection



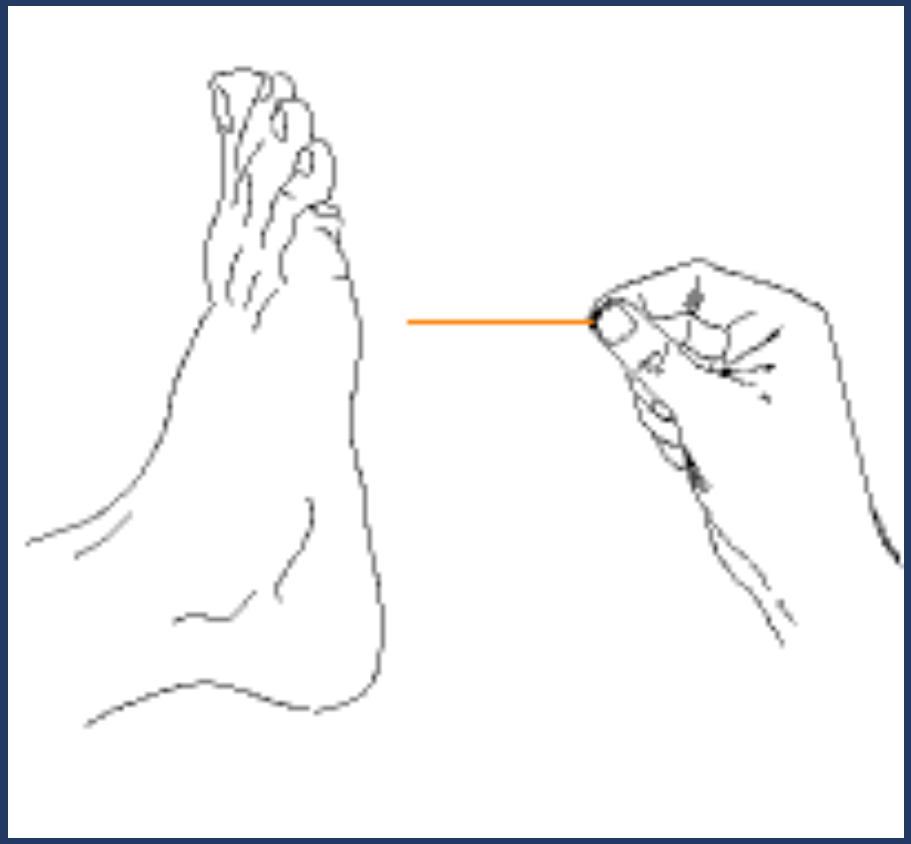
Ischemia

Amputation

Diabetic Peripheral Neuropathy

- Increased plantar pressure resulting from neuropathy is the cause of most diabetic foot ulcers
- Diabetic neuropathy has 3 components: sensory, autonomic, and motor neuropathy
- Loss of protective sensation can be measured with a 10-g monofilament (the Semmes Weinstein monofilament test)
- Autonomic neuropathy causes dryness of the skin, and motor neuropathy results in a toe deformities, loss of reflexes, and intrinsic muscle atrophy of the foot
- Diabetic sensorimotor polyneuropathy will develop in 45% of patients within 10 years of the onset of diabetes mellitus

Early Foot Screening
Diabetic Neuropathy



Callus formation

↓

Subcutaneous bleeding

↓

Ulcer formation

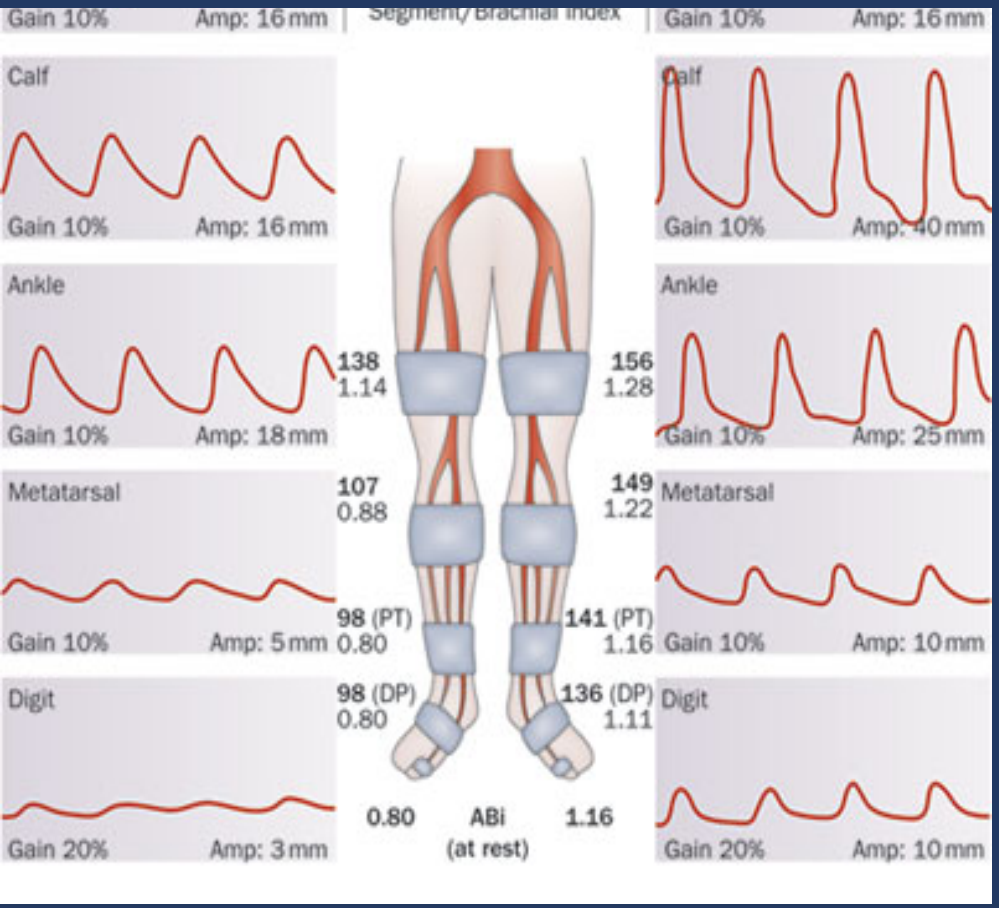
↓

Deeper infection
± osteomyelitis

Peripheral Arterial Disease

- Assessment of the vascular status requires a thorough history and physical examination; however, definitive diagnoses require an Arterial studies
- A palpable pulse in the foot does not always equate normal perfusion, especially in diabetics
- Segmental continuous wave Doppler examination, ankle-brachial index, and toe-brachial pressure index are regarded as the criterion standard for the evaluation of limb perfusion in persons with diabetes mellitus
- Ischemic disease increases the risk for limb loss.
- If vascular (ischemic) signs and symptoms are present, referral to vascular surgeon for proper testing and revascularization

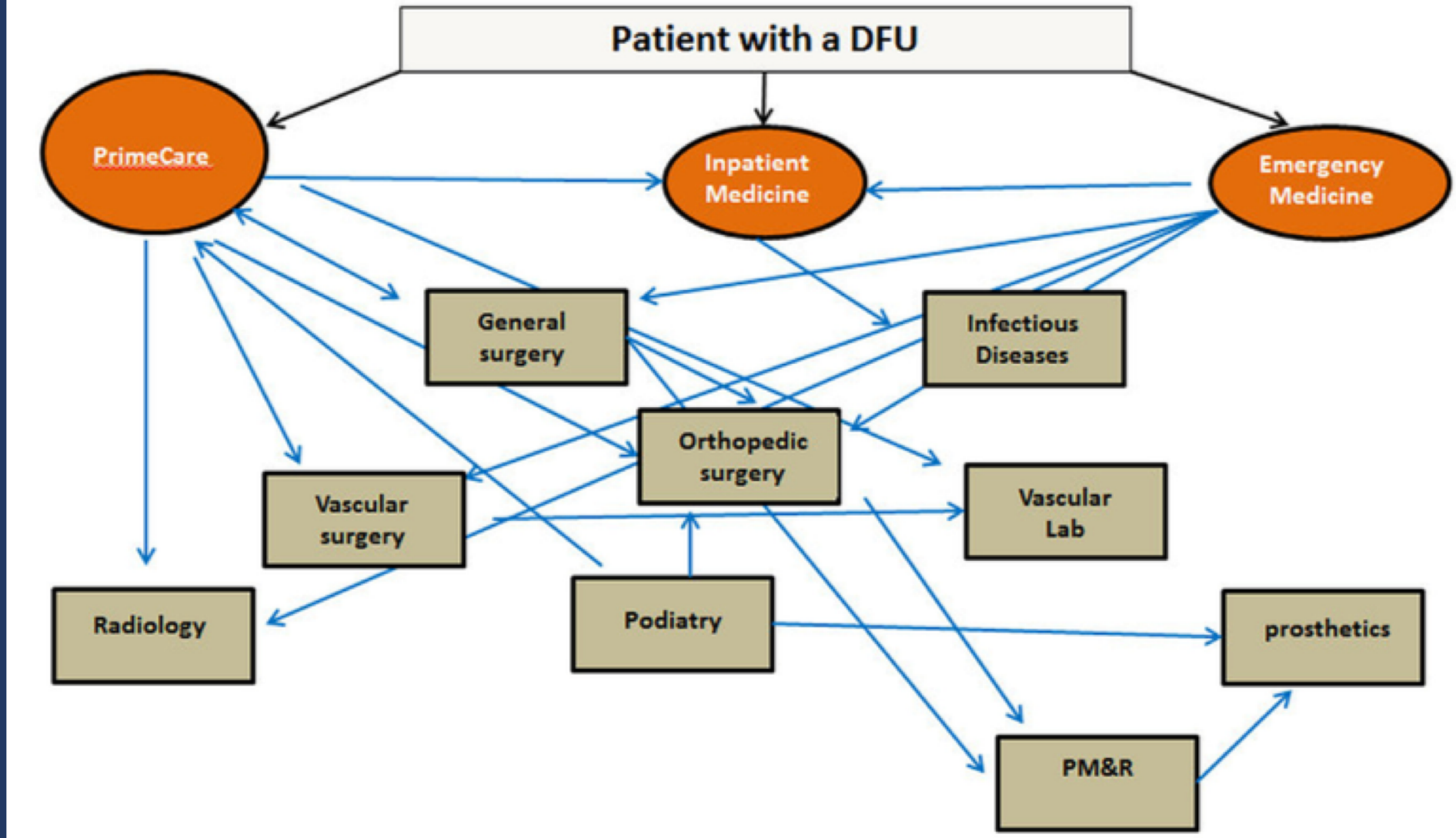
Early Foot Screening
Diabetic Evaluation for PVD



Offloading the Diabetic Ulcer

DIABETIC FOOT SUMMARY

- Patients with diabetes mellitus have an increased risk of developing diabetic foot ulcers and are at risk for delayed healing
- Peripheral neuropathy and vascular disease are major factors.
- Comprehensive evaluation of the patient should be performed in concert with local wound care and vascular consultation.
- The keys of local wound care and treatment include pressure redistribution (off-loading), surgical debridement of the callus and ulcer, and the treatment of local infection.
- Keep the wound moist but the skin dry.
- Antibiotics and infectious disease consultation.


Patient with a DFU
PrimeCare
Inpatient Medicine
Emergency Medicine
General surgery
Infectious Diseases
Orthopedic surgery
Vascular surgery
Vascular Lab
Radiology
Podiatry
prosthetics
PM&R

Case Study

- 72 yo M with PMH significant for:
- NIDDM
- Rheumatoid Arthritis
- Active tobacco use
- Chronic Pain
- PAD s/p BL Popliteal Aneurysm Repair, R SFA-Popliteal Bypass, L Femoral-Peroneal Bypass

- 11/2017
- Presents for LLE Fem-Peroneal Bypass occlusion with acute ischemia in need of emergent left lower extremity revascularization with thromboembolectomy of the peroneal artery and bypass graft.
- Also noted to have chronic left hallux ulcer
- 12/2017
- Repeat intervention for LLE bypass stenosis
- Found to have acute RLE ischemia in need of emergent revascularization
- Underwent Iliofemoral Thrombectomy, PTA/Stent R EIA, Fem-pop thrombectomy PTA/Stent R SFA, Revision R Fempop to AT with Rev GSV
- Left hallux amputation at the MTPJ level

NOT SO FAST

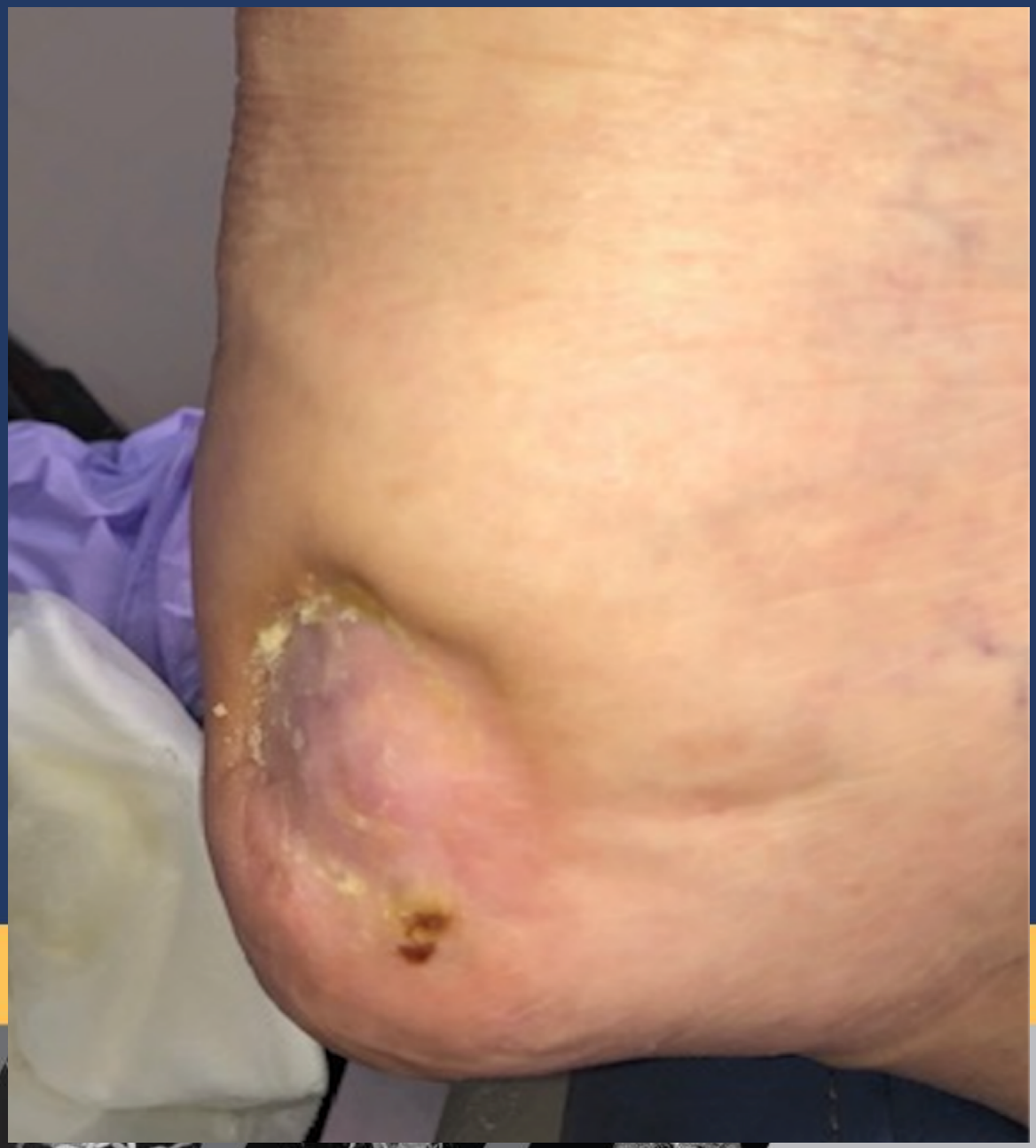
- Patient developed a large area of tissue infarction from acute RLE ischemia to right medial heel
- Treated with offloading, allowed time for demarcation

- 3/2018
- Right heel becomes acutely infected requiring admission, 2 surgical debridements on 3/24 and 3/27
- Essentially left with entirely evacuated fat pad on right heel
- ID consulted, patient discharged with Wound VAC and several week course of IV antibiotics for soft tissue infection
- 4/2018
- Returned to OR for outpatient surgical debridement of right heel with application of skin substitute, partial calcanectomy, bone biopsy and VAC
- Bone culture and pathology positive, referred back to ID for 6 weeks of IV antibiotics for osteomyelitis
- 4/2018-6/2018
- Continuation of close follow-up in office with Vascular, Podiatry

- 6/2018
- Patient sustains RLE subtrochanteric/intertrochanteric fracture following a fall
- 6/29 Undergoes ORIF with intramedullary nail
- 7/2018
- Developed early failure of hardware to RLE, required revision of ORIF with plate fixation
- Right heel wound remained open, however improving
- 7/31 underwent additional right calcaneal wound debridement, repeat skin substitute application with VAC

- 10/2018

- 11/2018



Team Effort

- Hospitalist
- PCP
- Vascular Surgery
- Orthopedic Surgery
- Podiatric Surgery
- Infectious Disease
- Rheumatology
- Pain Management
- Physical Therapy
- Pedorthotist
- Home Health Agency

A TEAM APPROACH

DIABETIC LIMB SALVAGE

MEDSTAR GEORGETOWN UNIVERSITY HOSPITAL

SENTARA™

- **Michael Chung, DPM**
- **Rex Diaz, DPM**
- **James Callahan, DPM**
- **Jeremy Walters, DPM**

Chad Rizzardi, DPM
Tracy Klimaz, DPM
Robert Marroquin, DPM
Anthony Cavallo, DPM