How DOs are Saving Lives and Limbs!
Impact of an Interdisciplinary Approach to Limb Salvage

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Atherosclerotic Disease is a Pan Vascular Process

Coronary Artery Disease (CAD)

Non-coronary Atherosclerosis
- Peripheral Artery Disease (PAD)
- Lower extremity
- Upper extremity (subclavian stenosis)

Vascular disease is there...
but it may need to be discovered

- Aortic aneurysm
- Vasculogenic Erectile Dysfunction
Asymptomatic PAD

Non-life style limiting claudication

Life style limiting claudication

Critical Limb Ischemia

Acute Limb Ischemia

Rutherford Class I

Rutherford Class II

Rutherford Class III
Intermittent Claudication

Recurring burning, aching, fatigue, or heaviness in the leg muscles with predictable level of walking, that resolves with a predictable duration of rest (< 10 minutes)
Simple Screening Tool for Claudication

#1 Do you get pain in either leg when you walk?

#2 Does the pain go away when you stop walking (within 10 minutes)?

If answers are “Yes” to both questions, the likelihood of PAD is > 95%

Adapted from Rose, FA. Bulletin of the WHO. 1962;27:645
Claudication is the Exception Rather than the Rule: PARTNERS Study


N=1857 Patients with ABI ≤ 0.9

- 55% No Pain
- 34% Atypical Leg Pain
- 11% Classic Claudication
69 yo male with know CAD presents with severe bilateral calf pain. An exercise ABI reveals severe PAD. After endovascular revascularizations 6 months ago he feels better. At this point you recommend?

a) Aspirin alone  
b) Aspirin plus high dose statin therapy  
c) Aspirin plus Ticagrelor  
d) Aspirin plus Clopidgrel  
e) Aspirin plus Cilostazol
4 major medical therapy recommendations to reduce CV events:

– Statins (Class I)
– Smoking cessation (Class I)
– Antiplatelet therapy (Class I)
– ACE inhibitors (Class IIa)
– Supervised exercise
Screening for Claudication Alone is Inadequate to Detect PAD

- Intermittent Claudication
- Atypical or No Symptoms
The Ankle-Brachial Index

\[ \text{ABI} = \frac{\text{Ankle systolic pressure}}{\text{Brachial systolic pressure}} \]

- **Cornerstone of PAD Diagnosis**

For example:

- **Right Arm:**
  - Systolic Pressure: 120 mmHg
- **Left Arm:**
  - Systolic Pressure: 100 mmHg

- **Right Ankle:**
  - Posterior Tibial (PT): 68 mmHg
  - Dorsalis Pedis (DP): 64 mmHg
- **Left Ankle:**
  - Posterior Tibial (PT): 136 mmHg
  - Dorsalis Pedis (DP): 132 mmHg

**Right ABI equals Ratio of:**
- Higher of the Right Ankle Pressure (PT or DP)
- Higher Arm Pressure (right or left arm)

\[ \frac{68 \text{ mmHg}}{120 \text{ mmHg}} = 0.57^* \]

**Left ABI equals Ratio of:**
- Higher of the Left Ankle Pressure (PT or DP)
- Higher Arm Pressure (right or left arm)

\[ \frac{136 \text{ mmHg}}{120 \text{ mmHg}} = 1.13^* \]

*The lower of these numbers is the patient’s overall ABI. Overall ABI (lower ABI) = 0.57
Critical Limb Ischemia

- Rutherford 4-6
  or
- Fontaine III, IV

Rest Pain

Tissue Loss or Gangrene
Critical Limb Ischemia

- 68 year old man with ischemic cardiomyopathy, CHF, MI, A-fib, CAD s/p CABG x 4, and mitral valve disease presented with painful ulcers on the L foot for 2 years

- Pain attributed to multifactorial lower extremity edema

- On exam, cool skin temperature and absent pulses
Aortoiliac Reconstruction
Always Assume There is an Underlying Arterial Component
Critical Limb Ischemia (CLI)
Knowledge
Nationwide Trends of Hospital Admission and Outcomes Among Critical Limb Ischemia Patients During 2003–2011

Shikhar Agarwal, MD, MPH, Karan Sud, MD, Mehdi H. Shishehbor, DO, MPH, PhD

RESULTS We included a total of 642,433 admissions with CLI across 2003 to 2011. The annual rate of CLI admissions has been relatively constant across 2003 to 2011 (~150 per 100,000 people in the United States). There has been a
TABLE 1  Trend of Cardiovascular Risk Factors in the Study Cohort Across 2003 to 2011

<table>
<thead>
<tr>
<th>Year</th>
<th>Hypertension</th>
<th>Obesity</th>
<th>Diabetes</th>
<th>Chronic Kidney Disease</th>
<th>Prior Amputation</th>
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<td>6.6</td>
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<tr>
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<td>15.0</td>
<td>56.7</td>
<td>37.8</td>
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</tbody>
</table>
CLI is a Deadly Disease

Bypass versus angioplasty in severe ischaemia of the leg (BASIL): multicentre, randomised controlled trial
CLI is Associated with the Highest Rates of Readmission

46.5% READMIT IN 90-DAYS POST DISCHARGE*

$15K INPATIENT HOSPITAL SPEND PER READMISSION*

Reed and Shishehbor, J Am Heart Assoc. 2016 May 20;5(5).
CLI is Extremely Under Treated

![Graph showing the proportion of patients undergoing a vascular procedure in the year prior to amputation.](image)

- Very Low Intensity Regions: 33%
- Low Intensity Regions: 41%
- Medium Intensity Regions: 46%
- High Intensity Regions: 50%
- Very High Intensity Regions: 58%

*p < 0.001*

Significant Disparities in Outcomes (Amputations)
Racial/Ethnic Disparities in Revascularization for Limb Salvage: An Analysis of the National Surgical Quality Improvement Program Database

Kakra Hughes, MD, FACS¹, Christopher Boyd, MD¹, Tolulope Oyetunji, MD¹, Daniel Tran, MD¹, David Chang, MD², David Rose, MD¹, Suryanarayan Siram, MD¹, Edward Cornwell III, MD¹, and Thomas Obisesan, MD³
Technique
96 years old with right foot ulcers
96 years old with right foot ulcers
Devices
59 y/o female with PAD, **churg-strauss syndrome, prior LLE BKA**. She was doing well until recently. She developed an ulcer on the right 2nd and right great toe since September 2017.

Follows with podiatrist who referred for evaluation prior to intervention on the right 2nd and great toes.
Right PT angioplasty.
Unsuccessful revascularization of the pedal arteries.
Continues to have pain and non-healing ischemic ulcers of the right foot that were worsening.

Patient is taking vicodin for pain.
LimFlow Procedure for limb salvage 4/11/2018
Pre LimFlow

2/15/2018

4/13/2018

TBI = 0.18

Post LimFlow

11/27/2018

TBI = 0.54
Commitment and Passion
Limb Salvage Advisory Council

Multidisciplinary Team: Vascular Medicine, Vascular Surgery, Podiatry, Wound Care, Interventional Cardiology
Impact of Interdisciplinary System-W salvage Advisory Council on Lower Limb Amputation

Mehdi H. Shishehbor, DO, MPH, PhD; Tarek A. Hammad, MD; Tonia J. Rhone, MS; Ahmad Youri Norman Kumins, MD; Abdullah Abdullah, MD; Jun Li, MD; Karem Harth, MD; Teresa L. Carm: Heather L. Gornik, MD; Peter J. Pronovost, MD, PhD; Vikram Kashyap, MD
In launching a successful interdisciplinary limb salvage team, a culture of patient-centered cooperation and education, is essential, with mutual trust and respect among various specialties, rather than competition and judging. Using CPT codes, we identified 80 patients with CLTI on whom LSAC was not activated and underwent major amputation during the same time period.
Thank you!

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