

Peripheral Arterial Disease – The New Cardiovascular Endemic

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Horizons
International
Peripheral
Group





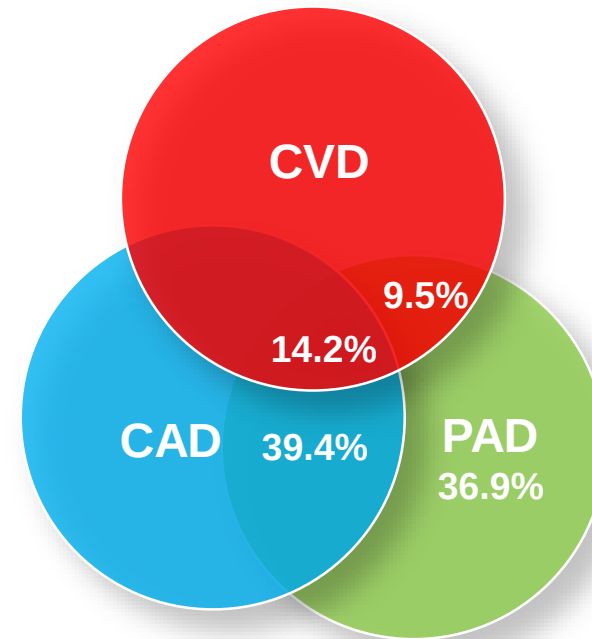
Executive Summary

- Peripheral artery disease or PAD commonly refers to the presence of a stenosis or occlusion in the aorta or arteries of the limbs
- Individuals with PAD have an **exceptionally elevated risk for cardiovascular events**, and the majority will eventually die of cardiac or cerebrovascular etiology
- Prognosis is correlated with the severity of PAD as measured by the ankle brachial index (ABI)
- **General practitioners (e.g., PCP, podiatrists, etc) must be engaged in the diagnosis and management of PAD—it can be life saving**
- Early referral to a (cardio)vascular specialist can facilitate optimal risk factor modification and management—this saves lives
 - WHEN revascularization is necessary, endovascular therapy for PAD should be considered FIRST-LINE therapy in most cases

PAD Epidemiology

Definition of PAD^{1,2}

- The presence of a stenosis or occlusion in the aorta or arteries of the limbs
- One of the three cardinal manifestations of atherosclerosis in addition to CAD and CVD
- Associated with an increased risk of cardiovascular and cerebrovascular events, including death, MI and stroke



**Patients with one manifestation
often have coexistent disease in other
vascular beds¹**

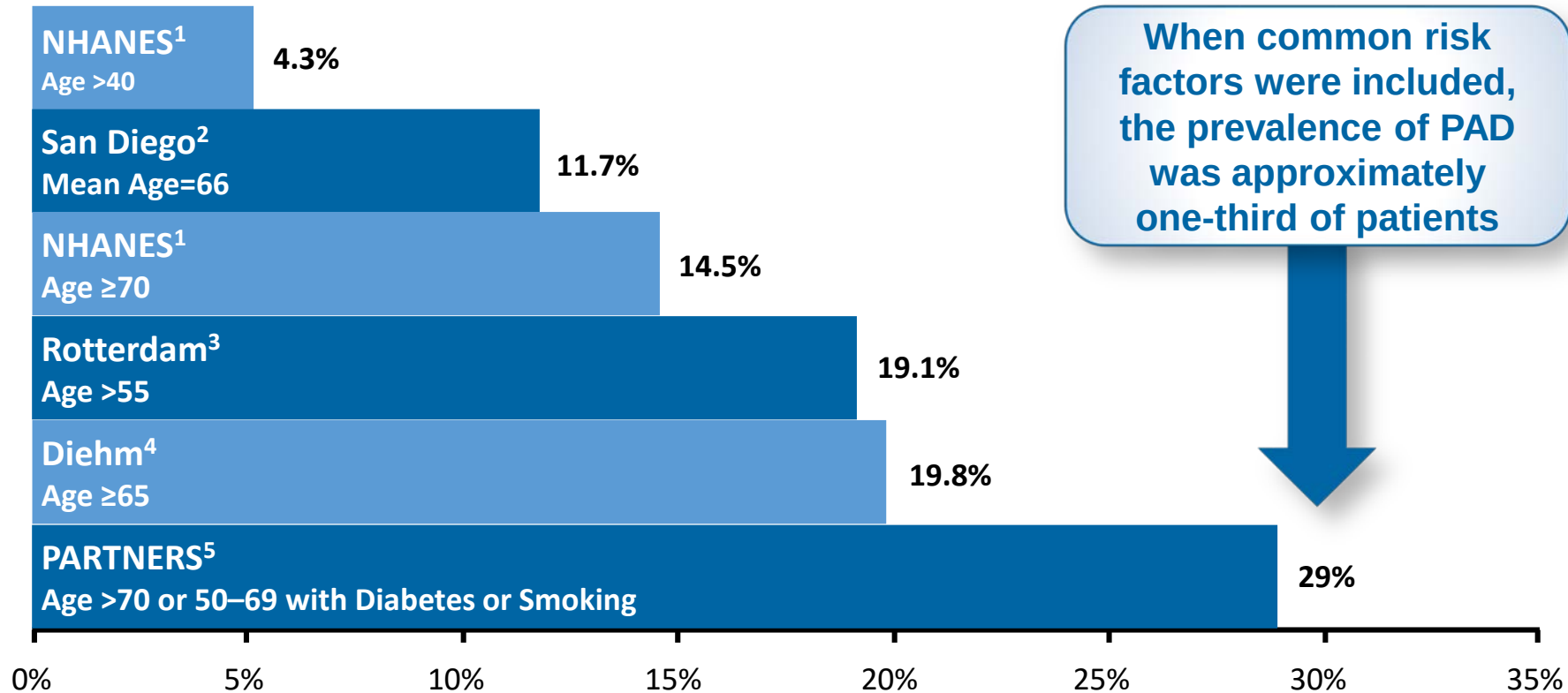
CAD=coronary artery disease; CVD=cardiovascular disease; MI=myocardial infarction.

1. Bhatt DL et al, on behalf of the REACH Registry Investigators. JAMA 2006; 295(2): 180-189

2. Rooke T et al. 2011 ACCF/AHA focused update of the guideline for the management of patients with peripheral arterial disease (updating the 2005 guideline): a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines.

Circulation. 2011;124:2020–2045.

Prevalence of PAD



NHANES=National Health and Nutrition Examination Survey.

1. Selvin E, Erlinger T. Prevalence of and risk factors for peripheral arterial disease in the United States: results from the National Health and Nutrition Examination Survey, 1999–2000. *Circulation*. 2004;110:738–743.

2. Criqui M et al. The prevalence of peripheral arterial disease in a defined population. *Circulation*. 1985;71:510–515.

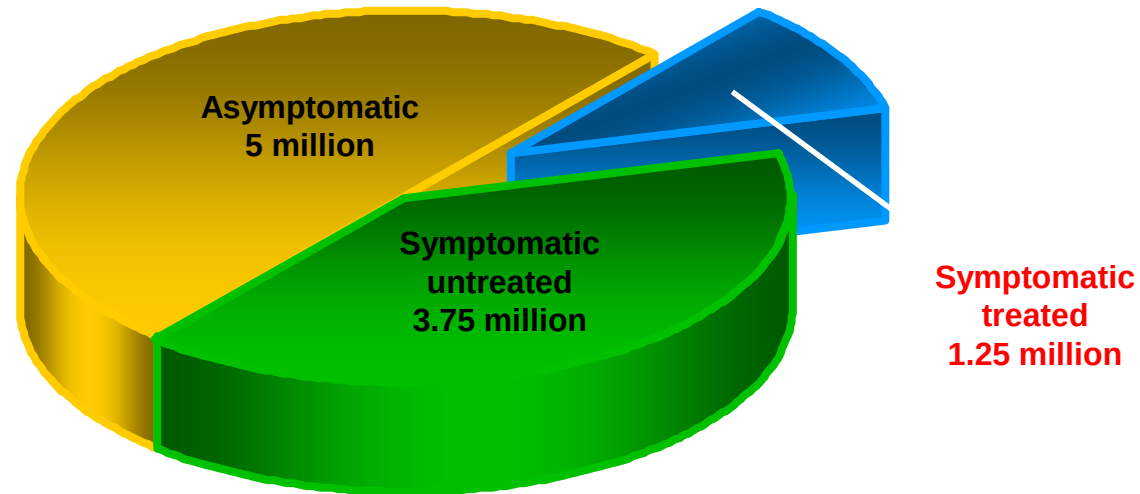
3. Meijer W et al. Peripheral arterial disease in the elderly: the Rotterdam Study. *Arterioscler Thromb Vasc Biol*. 1998;18:185–192.

4. Diehm C et al. High prevalence of peripheral arterial disease and co-morbidity in 6880 primary care patients: cross-sectional study. *Atherosclerosis*. 2004;172:95–105.

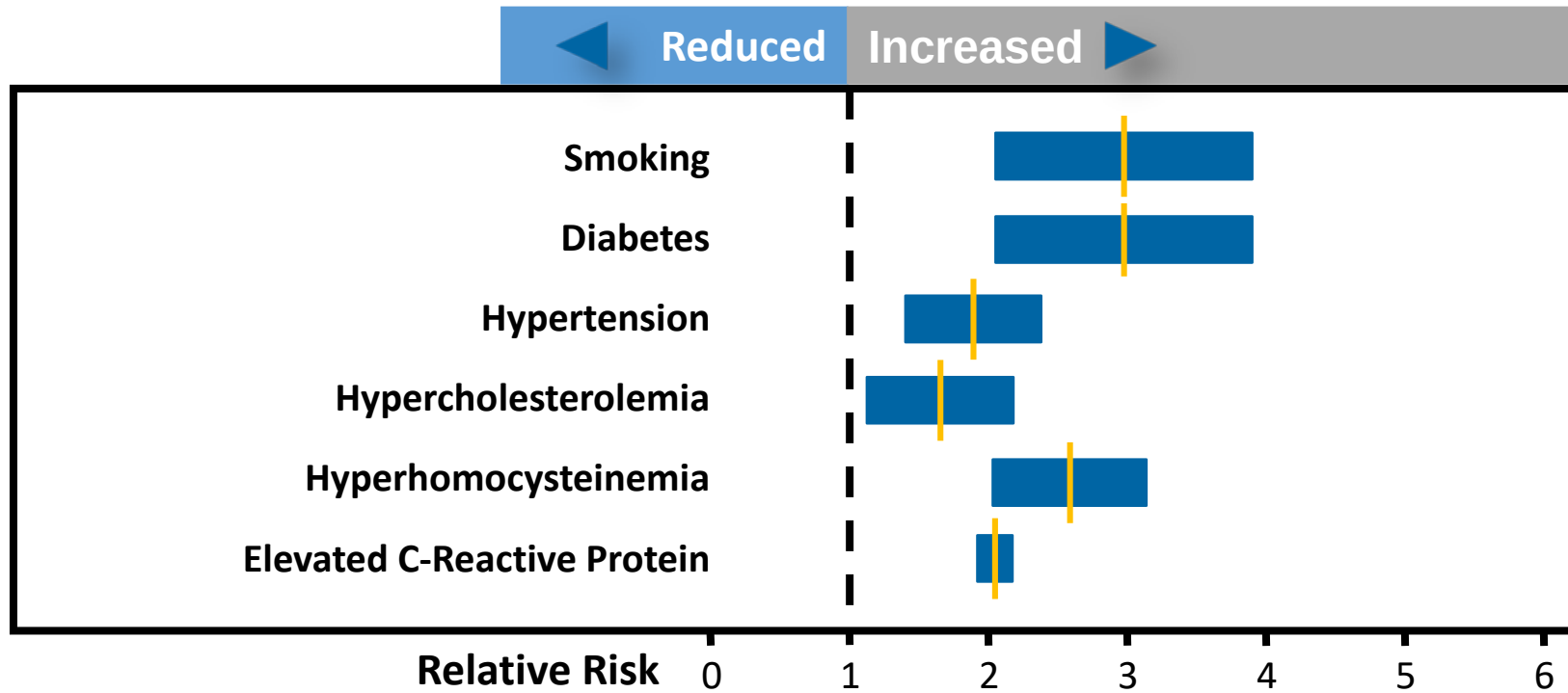
5. Hirsch A et al. Peripheral arterial disease detection, awareness, and treatment in primary care. *JAMA*. 2001;286:1317–1324.

Prevalence

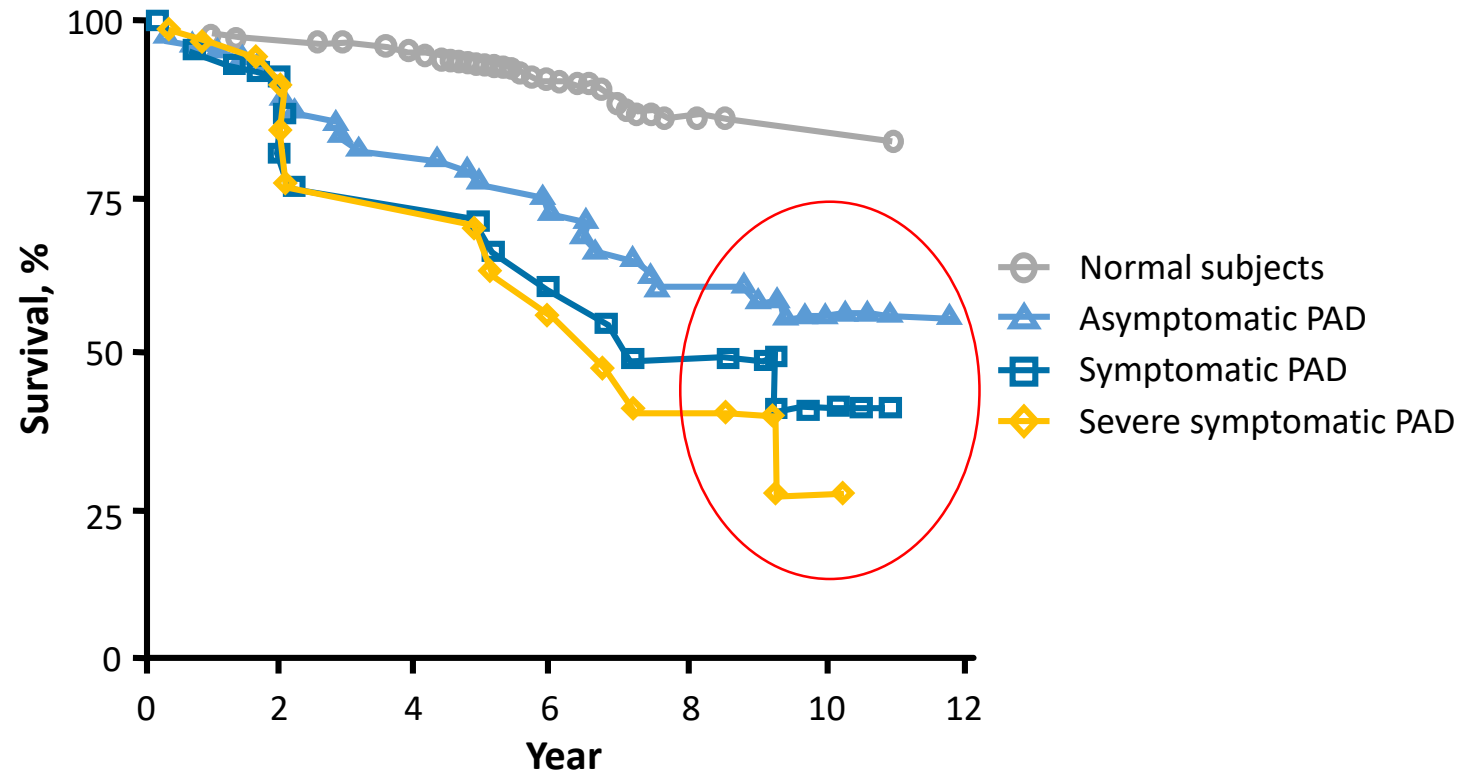
Total ~ 10 million U.S. patients



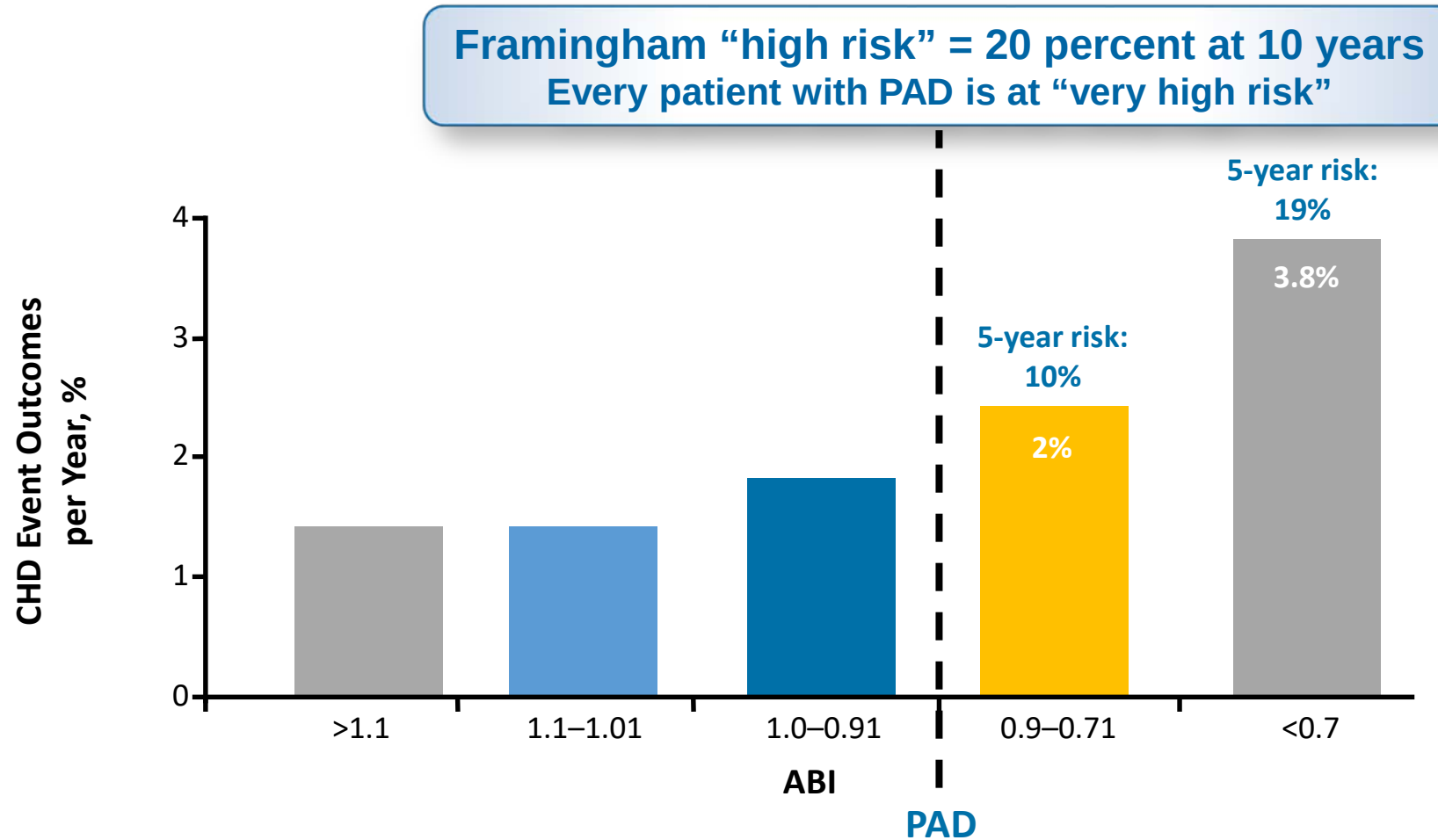
Risk Factors for PAD



10-Year Survival Rates for Patients with PAD



Cardiovascular Risk Increases with Decreases in ABI



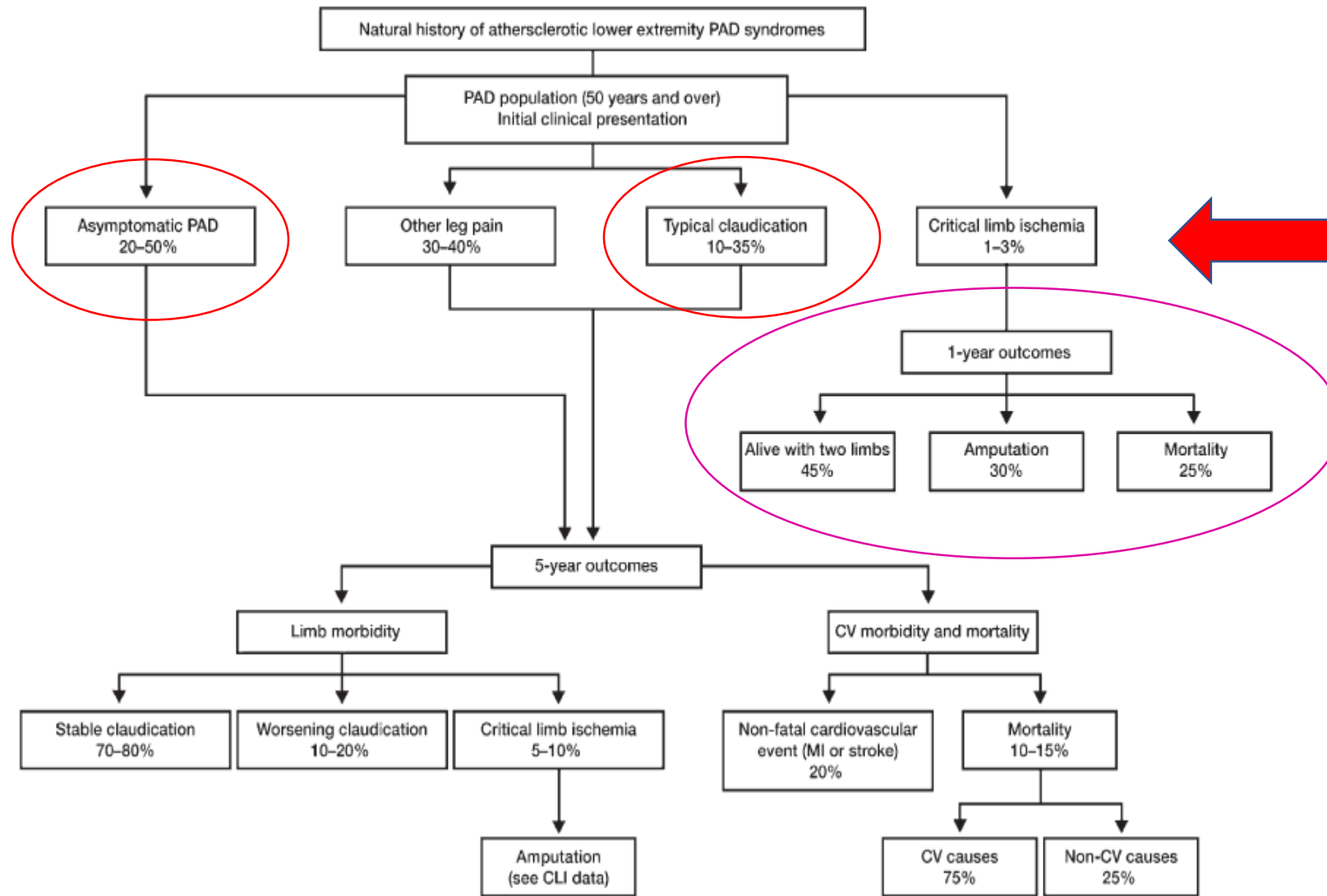
Clinical Presentation

- Asymtomatic 20-50 %
- Atypical leg pain 40-50 %
- Classic claudication 10-35 %
- Critical limb ischemia 1-2 %

Hirsch, AT et al. ACC/AHA 2005 Practice guidelines for management of patients with PAD, Circ 2006

Clinical Manifestations of PAD

- Patients can be asymptomatic for PAD (up to 50-60% of the time)
- Or patients can experience
 - **Symptoms of intermittent claudication**
 - Discomfort
 - Aching
 - Leg cramps with exercise that resolve with rest
 - Functional impairment
 - Slow walking speed, gait disorder
 - Rest pain
 - Pain or paresthesia in foot or toes, worsened by leg elevation and improved by dependency
 - Ischemic ulceration and gangrene (**Critical Limb Ischemia**)



Classification of PAD

Fontaine Stages		Rutherford Categories		
Stage	Clinical	Grade	Category	Clinical
I	Asymptomatic	0	0	Asymptomatic
IIA	Mild claudication	I	1	Mild claudication
IIB	Moderate-severe claudication	I	2	Moderate claudication
		I	3	Severe claudication
III	Ischemic rest pain	II	4	Ischemic rest pain
IV	Ulceration or gangrene	III	5	Minor tissue loss
		IV	6	Ulceration or gangrene

Diagnosis of PAD



Comprehensive Vascular Examination

Pulse* Examination

- Carotid
- Radial/ulnar
- Femoral
- Popliteal
- Dorsalis pedis
- Posterior tibial

Physical Examination

- Bilateral arm blood pressure
- Cardiac exam
- Palpation of abdomen for potential aneurysmal disease
- Auscultation for bruits
- Examination of legs and feet

Physical Examination Findings Suggestive of PAD

- Performed with pants and shoes off
- Limb examination (and comparison with the opposite limb) includes
 - Absent or diminished femoral or pedal pulses (especially after exercising the limb)
 - Arterial bruits
 - Hair loss
 - Poor nail growth (brittle nails)
 - Dry, scaly, atrophic skin
 - Dependent rubor
- Pallor with leg elevation after 1 minute at 60° (normal color should return in 10–15 seconds; >40 seconds indicates severe ischemia)
- Ischemic tissue ulceration (punched-out, painful, with little bleeding), gangrene



Diagnosis

- ABI with exercise
- Duplex ultrasound
- CTA/MRA
- Conventional angiography

Noninvasive Assessments in CAD and PAD Are Similar

CAD

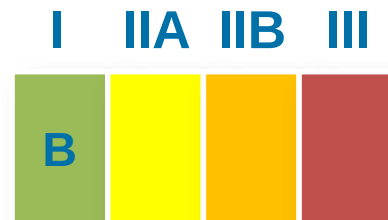
- Electrocardiogram
- Echocardiogram
- Stress test
- Angiography

PAD

- ABI
- PVR, segmental pressures
- Treadmill test
- DUS, CTA, MRA

ACCF/AHA 2011 PAD Guidelines Diagnostic Methods: ABI

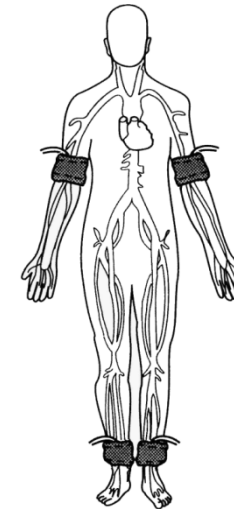
- The resting ABI should be used to establish the lower extremity PAD diagnosis in patients with suspected lower extremity PAD, defined as individuals
 - With exertional leg symptoms
 - With nonhealing wounds
 - Who are age ≥ 65
 - Or who are age ≥ 50 with a history of smoking or diabetes



Ankle Brachial Index

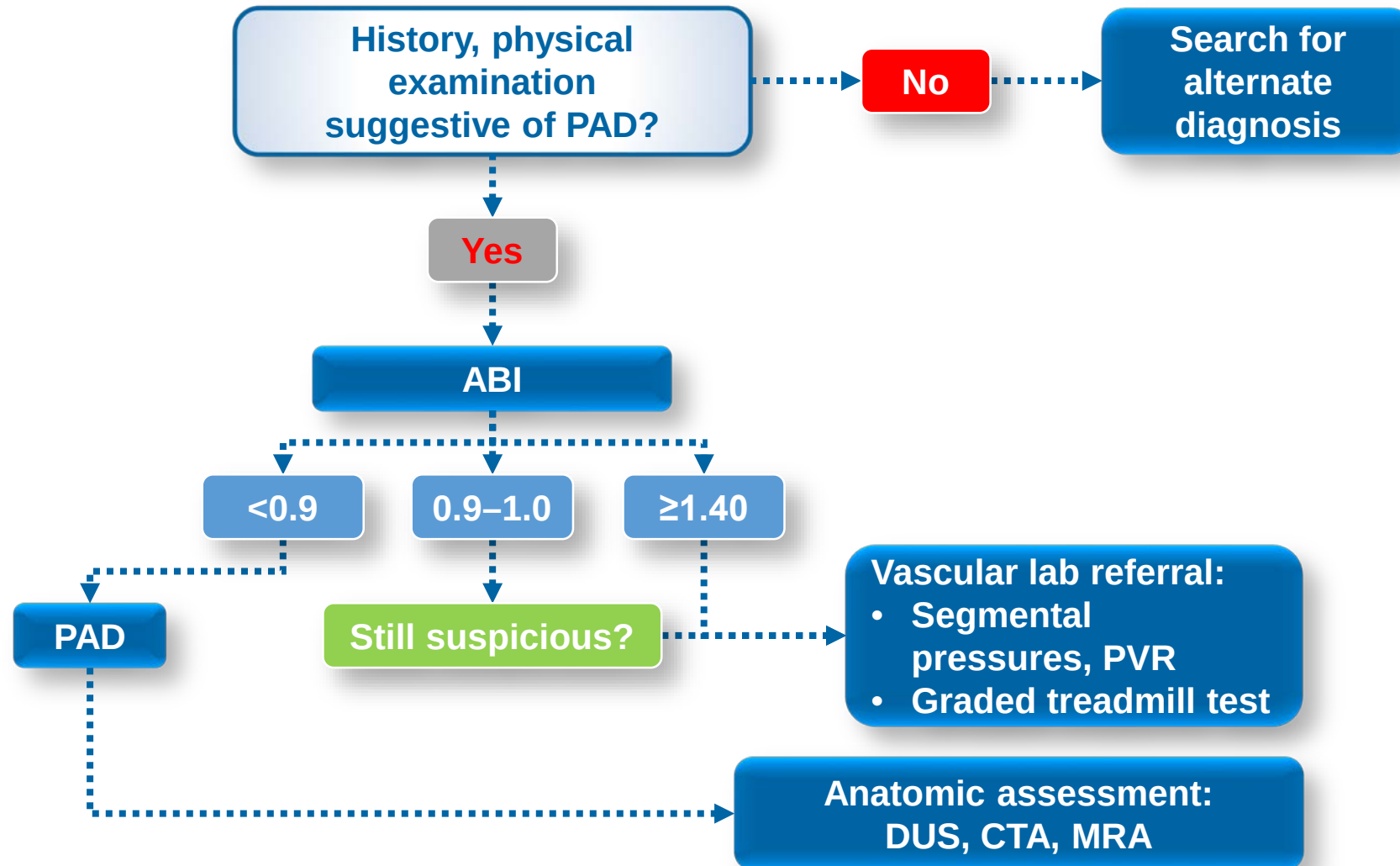
$$\text{ABI} = \frac{\text{Ankle systolic pressure}}{\text{Brachial systolic pressure}}$$

- Ankle and brachial systolic pressures taken using a hand-held Doppler instrument
- The ABI is 95-percent sensitive, 99-percent specific for PAD



Normal	1.00–1.40
Borderline	0.91–0.99
PAD	≤0.90
Pain/Ulceration	≤0.40
Noncompressible	≥1.40

Suggested Diagnostic Algorithm for PAD



Advanced Vascular Imaging



CT Angiography

- Maximum-intensity projection (MIPs)
 - Angiographic like representation
- Volume rendering
 - Preserves depth information
- Multi-planar reformat
- Curved planar reformat (CPR)
 - Perpendicular to median arterial centerline



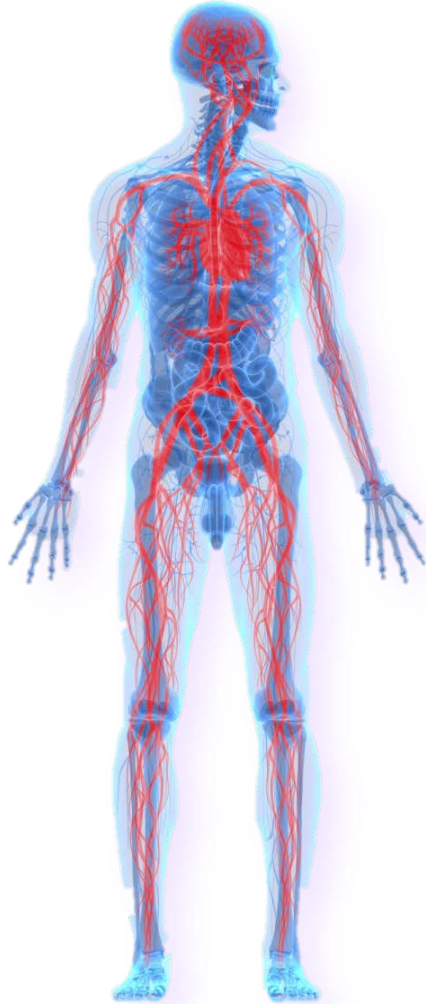
MR Angiography

- Traditional: Time of flights
- Contrast-enhanced MRA
 - Improves speed of exam, anatomic coverage, and small- vessel resolution
- Time-resolved gadolinium enhanced sequences
 - Time-resolved imaging of contrast kinetics (TRICKS)
 - Provides angiographic like dynamic contrast passage
- Moving-table technique or multi-array, parallel-imaging
 - Optimize large field-of-view imaging

Management

Medical Therapy and Risk Factor Modification

Therapies for PAD



Preventing death, MI, stroke

- Antiplatelets (Pletal/ASA/Plavix/Zontivity)
- Cholesterol lowering – statins
- Angiotensin-converting enzyme (ACE) inhibitors

Reducing symptoms

- Exercise
- Pletal (Cilostazol).
- Endovascular interventions
- Surgery

Saving limbs

- Endovascular interventions
- Surgery

Pharmacotherapy

- Drugs with evidence of clinical utility in claudication
 - **Cilostazol** [Phosphodiesterase Inhibitor]
- Drugs with supporting evidence of clinical utility in claudication
 - Carnitine and Propionyl L-Carnitine [skeletal muscle oxidative metabolism]
 - **Lipid lowering agents**
- Drugs with insufficient evidence of clinical utility in claudication
 - Pentoxifylline
 - **Antithrombotic agents [ASA/plavix]**
 - Vasodilators [CCB/ α -adrenergic antagonists/ β 2-adrenergic agonists/Papaverine]
 - 5-hydroxytryptamine antagonist [Ketanserin/Sarpogrelate]
 - Prostaglandins [PGE1]

Recommendation 14

Exercise therapy in intermittent claudication

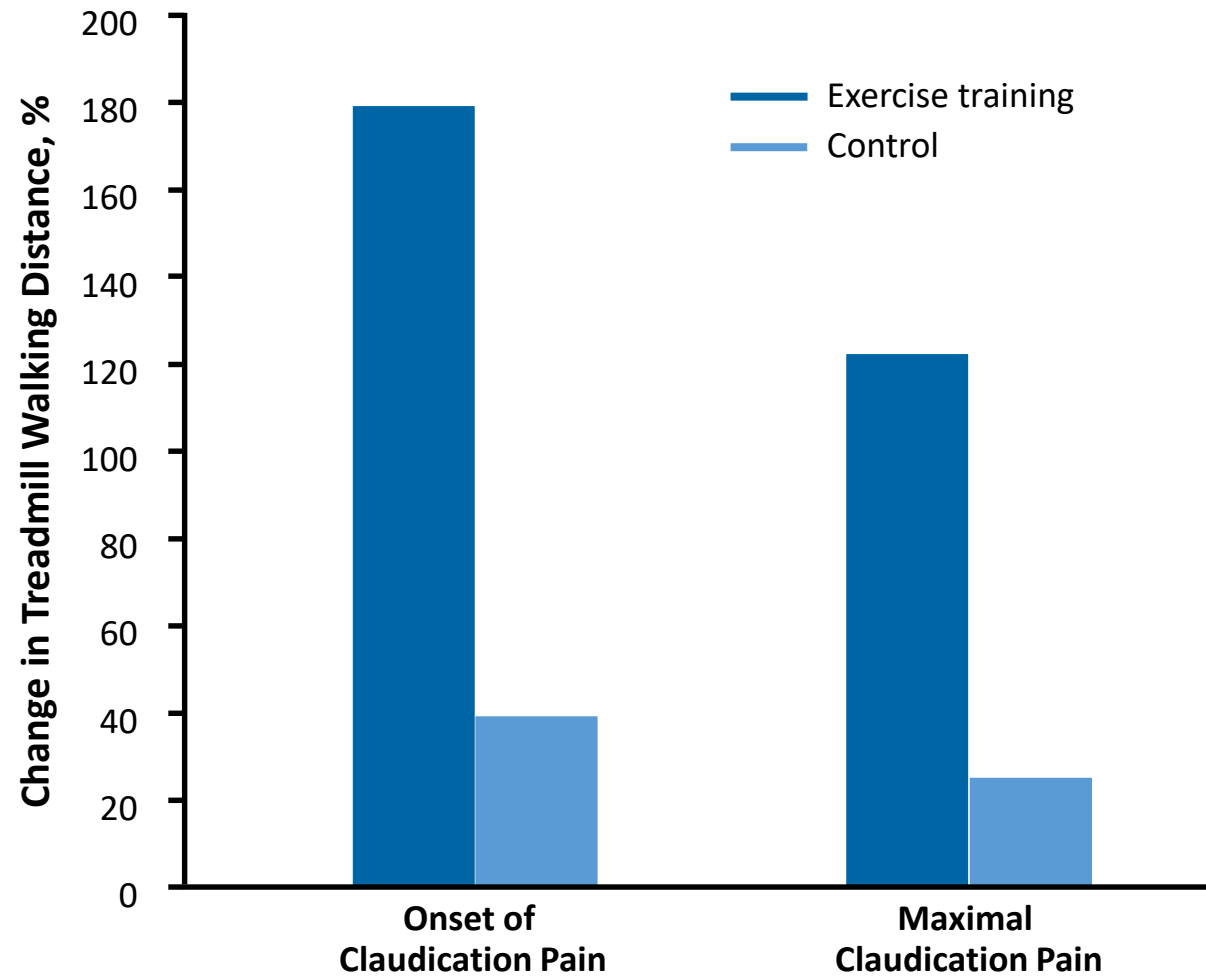
- Supervised exercise should be made available as part of the initial treatment for all patients with peripheral arterial disease [A].
- The most effective programs employ treadmill or track walking that is of sufficient intensity to bring on claudication, followed by rest, over the course of a 30–60 minute session. Exercise sessions are typically conducted three times a week for 3 months [A].

Recommendation 15

Pharmacotherapy for symptoms of intermittent claudication

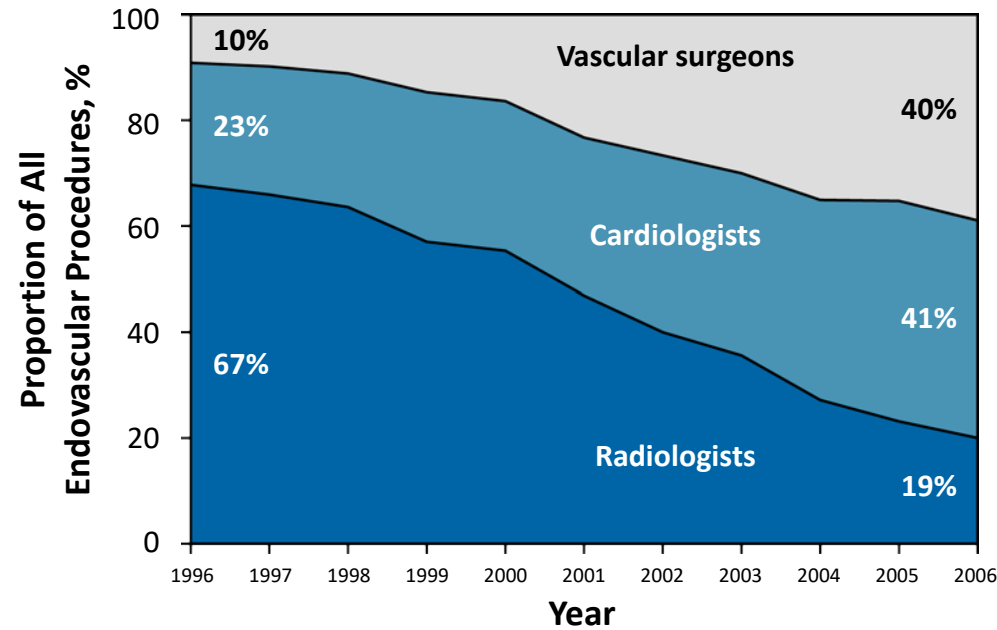
- A 3- to 6-month course of cilostazol should be first-line pharmacotherapy for the relief of claudication symptoms, as evidence shows both an improvement in treadmill exercise performance and in quality of life [A].
- Naftidrofuryl can also be considered for treatment of claudication symptoms [A].

Effects of Exercise on Claudication: Meta-analysis of 21 Studies



Revascularization Options

Who Is Doing Peripheral Interventions These Days?



1. Interventional Cardiologists (41 percent)
2. Vascular surgeons (40 percent)
3. Interventional radiologists (19 percent)

PAD: Surgical Revascularization Has Risks

- Complications
 - Mortality: 2–5 percent
 - MI: 1.9–3.4 percent
 - Hemorrhage: 2 percent
 - Graft thrombosis: 2–7 percent
 - Wound infection: 8–19 percent
 - Surgical revision: >20 percent



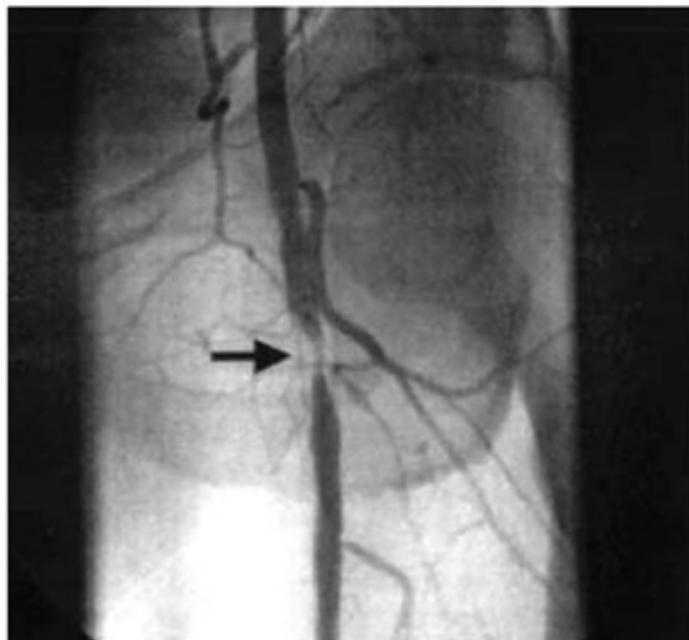
Aortoiliac (Suprainguinal) Revascularization

- Initial clinical success of PTA for iliac stenosis exceeds 90%.
- Approaches 100% success rate with focal iliac lesions.
- Technical success of 80-85% for recanalization of long segment iliac occlusions.
- 5 year patency 70-79%
- Factors negatively affecting long term patency
 - Quality of distal runoffs
 - Severity of ischemia
 - Length of diseased segment
 - Female gender

CFA/SFA Occlusive Disease

- Claudication of thigh, calf or both.
- Calf claudication
 - Most common complaint
 - Cramping pain consistently reproduced with exercise and relieved promptly with rest
 - Differential Diagnosis
 - Nocturnal leg cramps (elderly/nocturnal/rest)
 - Calf pressure and tightness (athletes/chronic exercise)

a



b



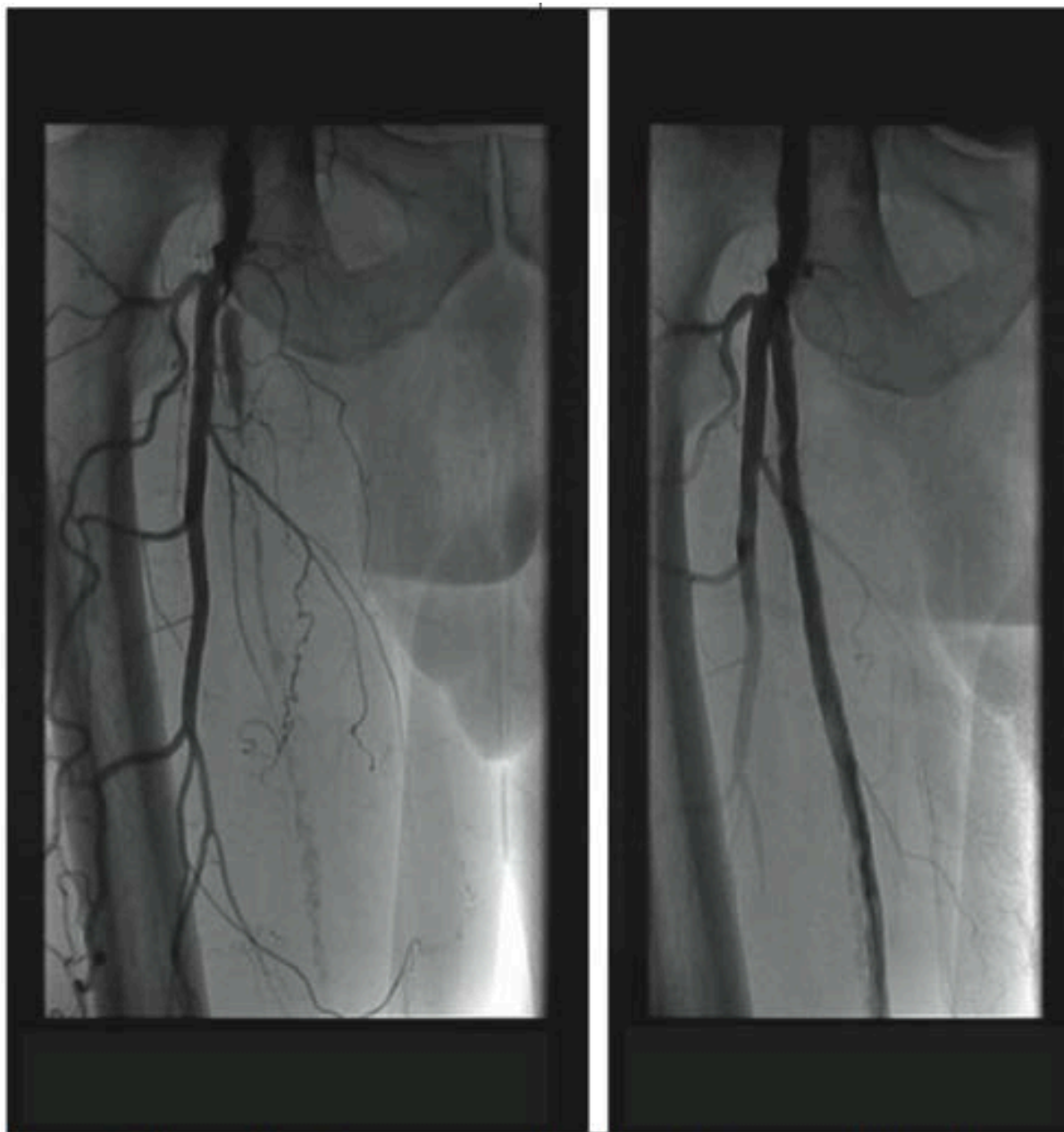


Figure – Right superficial femoral artery is shown here before (left) and after (right) percutaneous transluminal angioplasty.

Infrainguinal Revascularization

- Endovascular preferred choice of therapy.
- Clinical success rate of PTA 95%
- Predictors of restenosis
 - Length of lesion
 - Extent of outflow disease
 - Tobacco abuse

Table F6. Pooled results of femoral popliteal dilatations

	<i>1-year % patency (range)</i>	<i>3-year % patency (range)</i>	<i>5-year % patency (range)</i>
PTA: stenosis	77 (78–80)	61 (55–68)	55 (52–62)
PTA: occlusion	65 (55–71)	48 (40–55)	42 (33–51)
PTA+stent: stenosis	75 (73–79)	66 (64–70)	
PTA+stent: occlusion	73 (69–75)	64 (59–67)	

PTA – Percutaneous Transluminal Angioplasty.

Tibial/Peroneal Occlusive Disease



Infrapopliteal Endovascular Revascularization

- Indicated for limb salvage.
- Increasing evidence to support a recommendation of PTA in patients with CLI and Infrapopliteal artery occlusion.
- Controversy remains for PTA versus PTA with stent placement.
- Atherectomy starting to play a significant role.

Thank You

Need for Clinical Integration

Why Now – Patient Population Factors

- Aging population.
- Increased prevalence of Diabetics.
- Smoking remains a true healthcare nightmare.
- High percentage of “Asymptomatic” presentation.

Why now – Economic Factors

- Cost of Amputation.
- Disability claims.
- Cost of prosthesis.
- High mortality and morbidity associated with amputation.

Why now – Technical Factors

- Tremendous advancements have been made in the medical device industry allowing for better outcomes and limb salvage.
- A few providers from various disciplines have appropriate training and passion to care for these patients.
- A better understanding of “**multidisciplinary**” approach to treat these patients.
- All team members are of equal significance/importance to save a limb.

Where do we start

- Identifying the patients at risk.
- Provider and community awareness to this disease.
- Enhancing risk factor modification.
- Enrolling these patients in surveillance programs.
- Enrolling these patients in PAD rehabilitation programs.

Then what

- Identifying the patients at risk.
 - DM/Age/Tobacco abuse
- Enhancing risk factor modification.
 - Consult visit with PAD specialist.
- Enrolling these patients in surveillance programs.
 - Annual Arterial ABI/Duplex Ultrasound.

Then what – Asymptomatic Patient

- If patient asymptomatic;
 - PAD Consult.
 - Arterial venous ultrasound.
- Surveillance ultrasounds.
- Monitoring of progression of disease state.
- PAD Rehabilitation/education.
- Supervised exercise walking programs.

Then what – Symptomatic Patient

- If patient symptomatic;
 - CTA/Angiogram.
 - Interventional procedure.
 - Surgical Bypass.
- Surveillance ultrasounds.
- PAD rehabilitation enrollment.
- Supervised exercise walking programs.