**Lower Extremity
Peripheral Artery Disease (LE-PAD)**

Essentials of LE-PAD: natural Hx, risk profile, and non-invasive diagnosis (ABI, TBI, duplex US)

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Coordinator/PI, Jose Haddad Cardiovascular Investigation Center (CIC)
University Hospital Ciencias Medicas
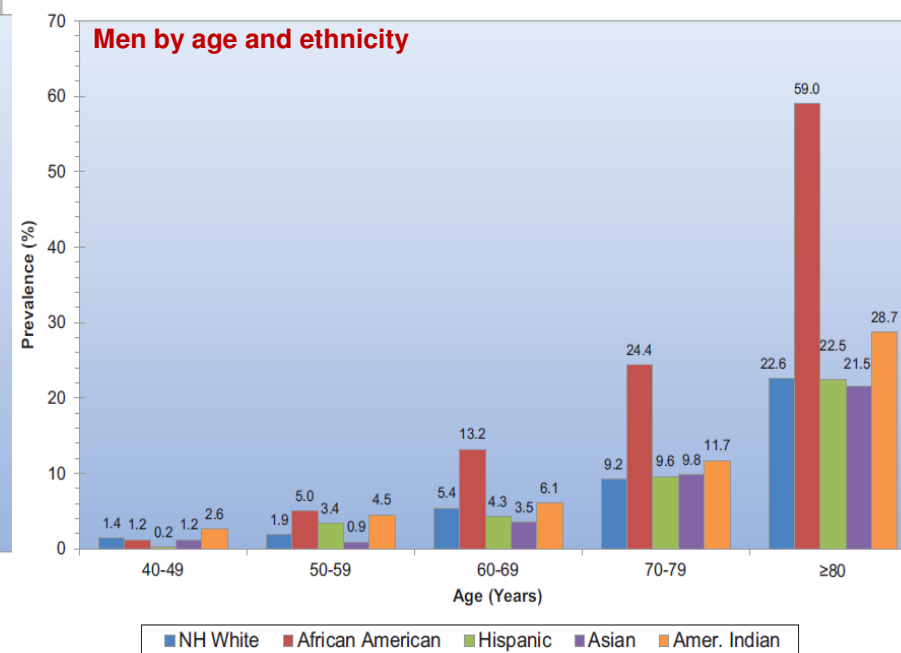Belo Horizonte - MG, Brazil

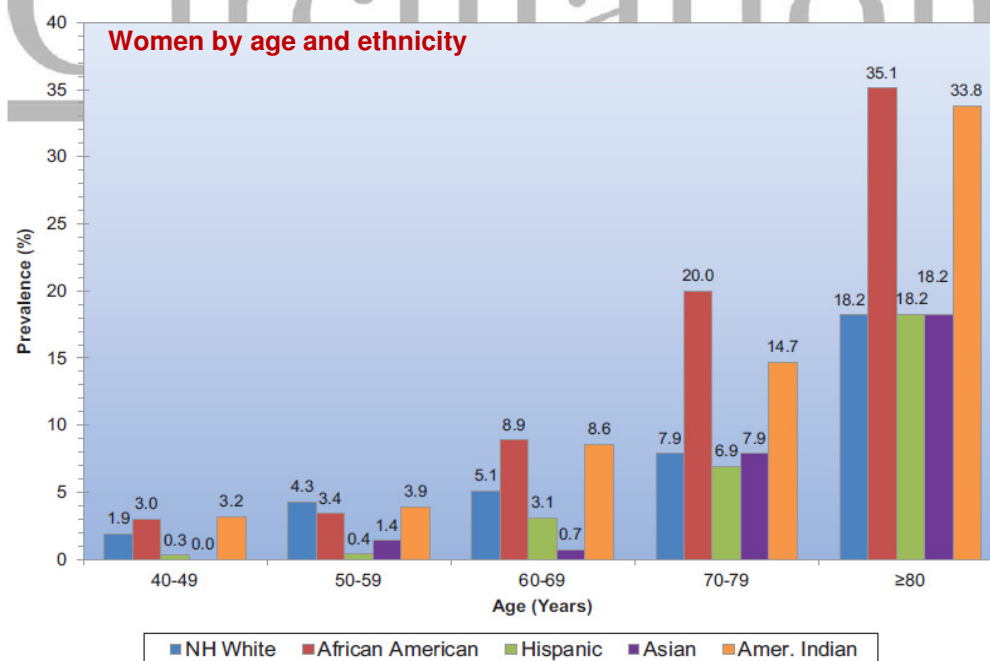**MEXICO CITY**
JUNE 22 – 24, 2017

GLOBAL EXPERTS, LOCAL LEARNING

Estimates of prevalence of peripheral artery disease in men/women by age and ethnicity

Allison MA, et al. Ethnic-specific prevalence of peripheral arterial disease in the United States. Published correction appears in *Am J Prev Med* 2014;47:103. *Am J Prev Med 2007;32:328-333.*

Mozaffarian D, *et al*. Heart Disease and Stroke Statistics-2016 Update: A Report From the American Heart Association. *Circulation* 2016;133(4):e38-360.

Age-specific prevalence estimates for peripheral artery disease by sex and country income level
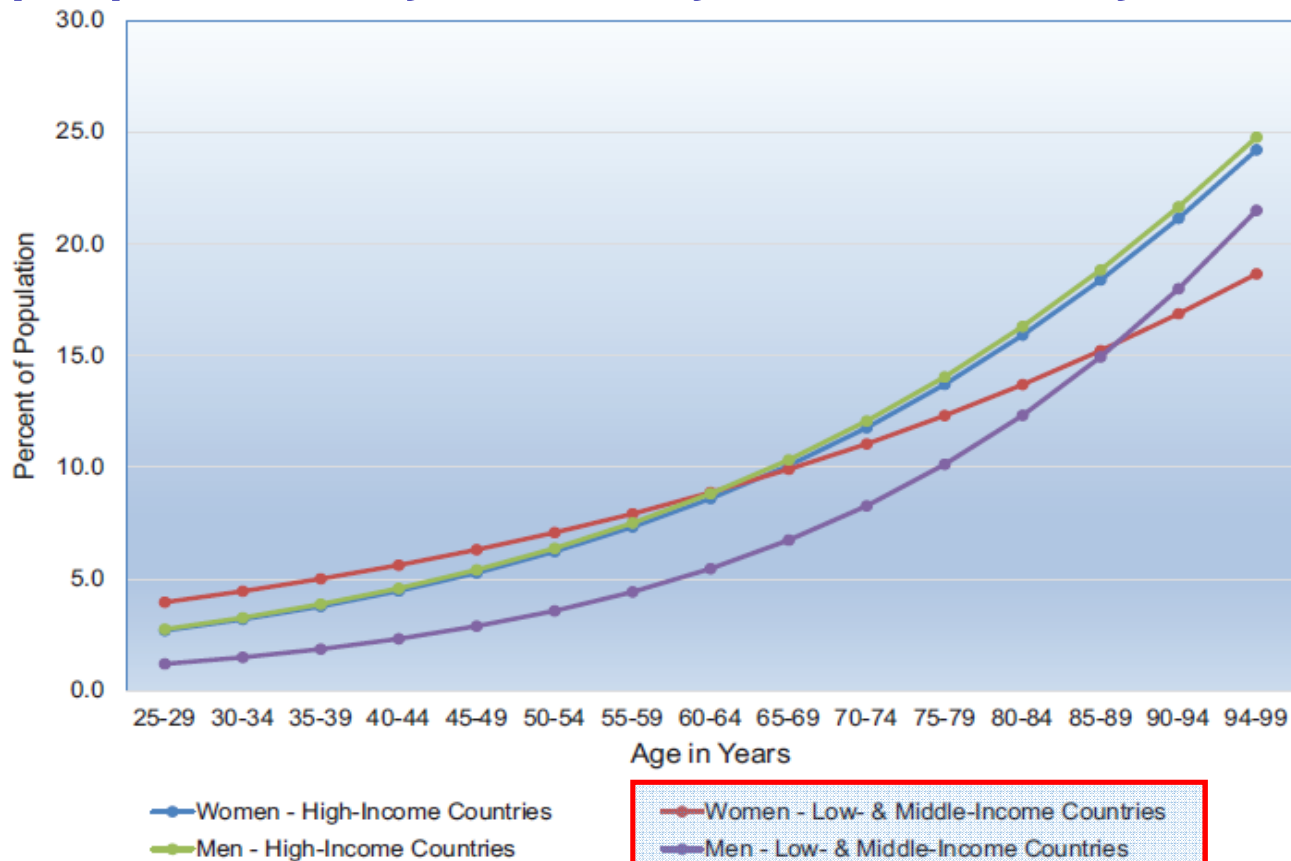
Mozaffarian D, *et al.* Heart Disease and Stroke Statistics-2016 Update: A Report From the American Heart Association. *Circulation* **2016;133(4):e38-360.**

Fowkes FG, *et al.* Comparison of global estimates of prevalence and risk factors for peripheral artery disease in 2000 and 2010: a systematic review and analysis. *Lancet* **2013;382:1329-1340.**

Peripheral Vascular Disease variation in phenotype (*location and severity of vascular disease*) according to sex

A population database of over 3.6 million people in the US

Location of Vascular Disease	Adjusted Odds Ratio aOR (Women *versus* Men)	95% Confidence Interval	*p*-value for interaction
PAD	1.62	1.60 - 1.64	
CAS	0.90	0.89 - 0.91	<0.0001
AAA	0.17	0.17 - 0.18	

ACC.16

Vascular Medicine

ASSOCIATION BETWEEN SEX AND VASCULAR DISEASE IN DIFFERENT ARTERIAL BEDS: A POPULATION DATABASE OF OVER 3.6 MILLION PEOPLE

Poster Contributions
Poster Area, South Hall A1
Saturday, April 02, 2016, 10:00 a.m.-10:45 a.m.

Session Title: Vascular Medicine: Aortic and Peripheral Artery Diseases
Abstract Category: 44. Vascular Medicine: Non Coronary Arterial Disease
Presentation Number: 1110-214

Authors: Nazir Savji, Caron Rockman, Yu Guo, Adam Skolnick, Harmony Reynolds, Mark Adelman, Judith Hochman, Jeffrey Berger, New York University School of Medicine, New York, NY, USA

Peripheral Vascular Disease variation in phenotype (*location and severity of vascular disease*) according to sex

A population database of over 3.6 million people in the US

PAD Odds in Women Across Different Severities	Adjusted Odds Ratio aOR (Women *versus* Men)	95% Confidence Interval	*p*-value for trend
Mild	2.12	2.08 - 2.16	
Moderate	1.24	1.21 - 1.27	<0.0001
Severe	1.08	1.04 - 1.11	

Vascular Medicine

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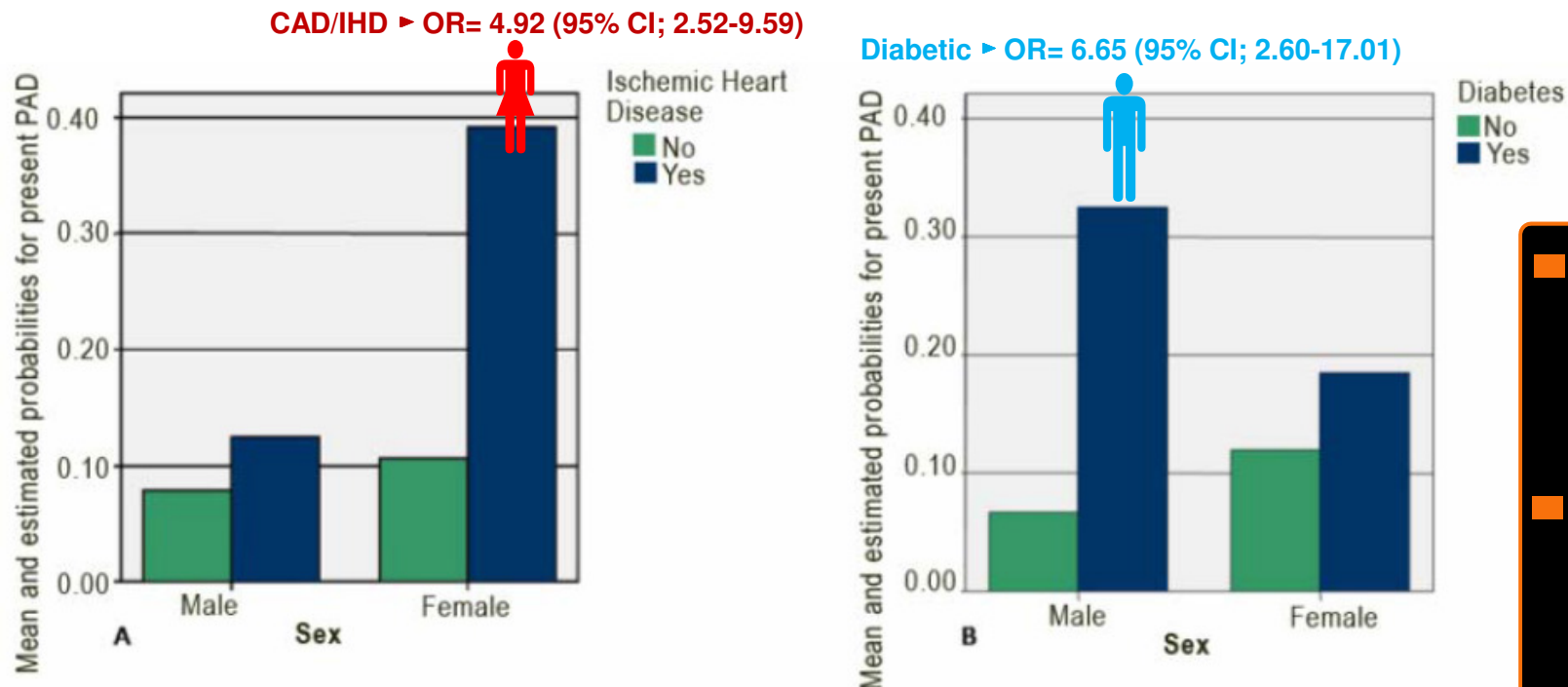
Estimated likelihood of LEPAD according to comorbidities after multivariate logistic regression

CAD/IHD ► OR= 4.92 (95% CI; 2.52-9.59)

Diabetic ► OR= 6.65 (95% CI; 2.60-17.01)

- PAD was associated with diabetes, total and abdominal obesity, stroke, and MI

- NS trend of greater PAD prevalence with hypertension, CHF, RF/dialysis, and smoking

Chart 1 - Comparison of the probability means of having Peripheral Arterial Disease (PAD) estimated by the multivariable logistic regression model for Ischemic Heart Disease (IHD) (A) and for Diabetes (B) per Sex; The analyses show that the effect of the presence of IHD for the female sex was highly significant for the presence of PAD (OR=4.92, 95%CI=2.52-9.59); In the male sex, the presence of Diabetes is significantly associated to PAD (OR=6.65, 95%CI=2.6 -17.01).

Makdisse M, Pereira AC, Brasil DP, *et al*. *Arq Bras Cardiol* **2008;91(6):370-82**
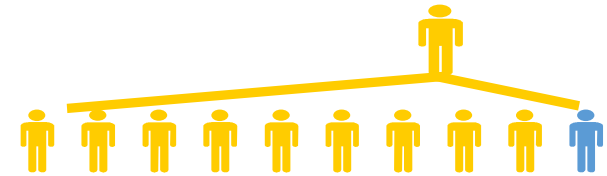
Epidemiological Importance of Asymptmatic LEPAD

GetABI

1 in 5 individuals over age of 65 has PAD[†]

[†] ABI < 0.9

Only 1 in 10 of these patients had *classical symptoms of intermittent claudication* (IC)

Diehm C, *et al. Atherosclerosis* 2004;172:95-105

Original Article

Prevalence and Risk Factors Associated with Peripheral Arterial Disease in the Hearts of Brazil Project

Marcia Makdisse[1,2], Alexandre da Costa Pereira[3], David de Pádua Brasil[4], Jairo Lins Borges[5], George Luiz Lins Machado-Coelho[6], José Eduardo Krieger[3], Raimundo Marques Nascimento Neto[6], Antonio Carlos Palandri Chagas[3] and on behalf of the investigators of the Hearts of Brazil Study and Peripheral Arterial Disease Committee of the Brazilian Society of Cardiology/Funcor

Hospital Israelita Albert Einstein, São Paulo, SP[1], Universidade Federal de São Paulo (Unifesp), São Paulo, SP[2], Instituto do Coração da Faculdade de Medicina da Universidade de São Paulo (Incor USP), São Paulo, SP[3], Faculdade de Ciências Médicas de Minas Gerais, Belo Horizonte, MG[4], Instituto Dante Pazzanese de Cardiologia, São Paulo, SP[5], Departamento de Ciências Médicas da Universidade Federal de Ouro Preto, Ouro Preto, MG[6] - Brazil

Asymptomatic PAD

91,0 %

Symptomatic PAD

9,0 %
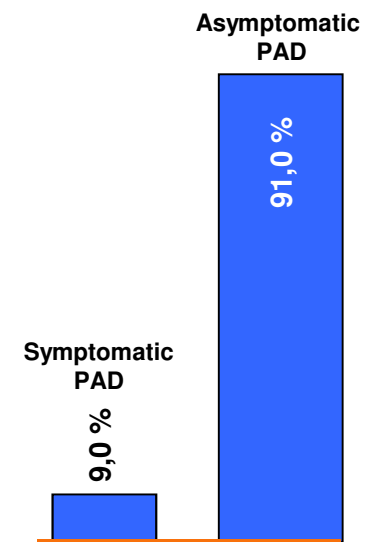
LEPAD and Incident Total Mortality

Study	PAD Definition	Hazard Ratio	95% CI	
			Low	High
Total mortality				
Criqui, 1992[130]	Large-vessel PAD	3.1	1.8	5.3
Newman, 1993[131]	ABI<0.9	3.4	1.6	7.1
Vogt, 1993[132]	ABI<0.9	3.1	1.5	6.7
Ogren, 1993[133]	ABI<0.90	2.3	1.4	3.8
Kornitzer, 1995[134]	ABI<0.9	2.1	0.9	4.8
Jager, 1999[135]	ABI<0.9	1.5	0.8	2.8
Newman, 1999[136]	ABI<0.9	1.6	1.2	2.1
Hooi, 2002[137]	ABI<0.7 (vs. >0.95)	2.1	1.6	2.8
Murabito, 2003[138]	ABI<0.9	1.4	0.9	2.1
Lee, 2004[139]	ABI≤0.9	1.1	0.9	1.4
Resnick, 2004[140]	ABI≤0.9	1.7	1.3	2.1

Criqui MH *et Aboyans V. Circ Res.* 2015;116(9):1509-16

Hazard ratios for total mortality in men and women by ABI at baseline for all studies in the ABI collaboration
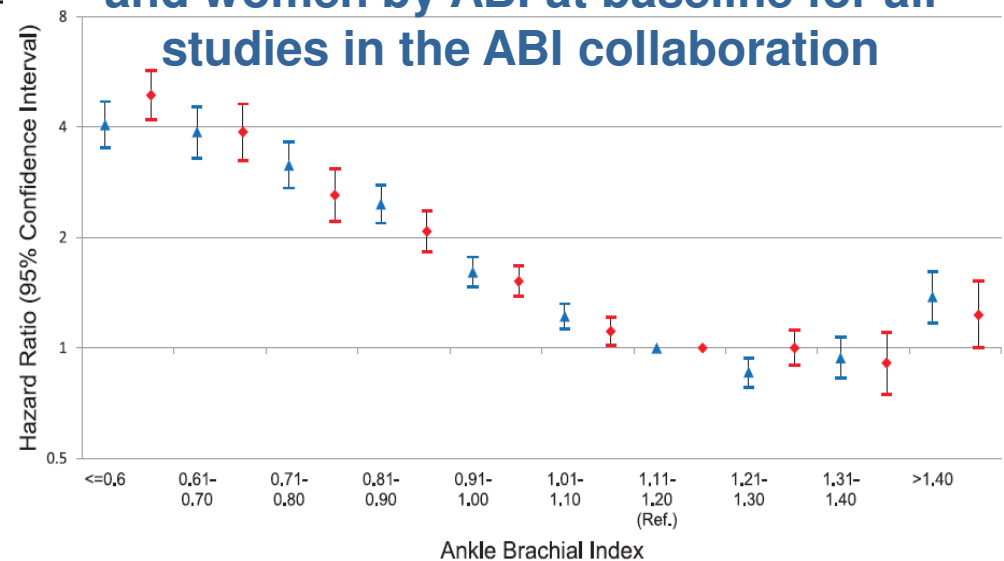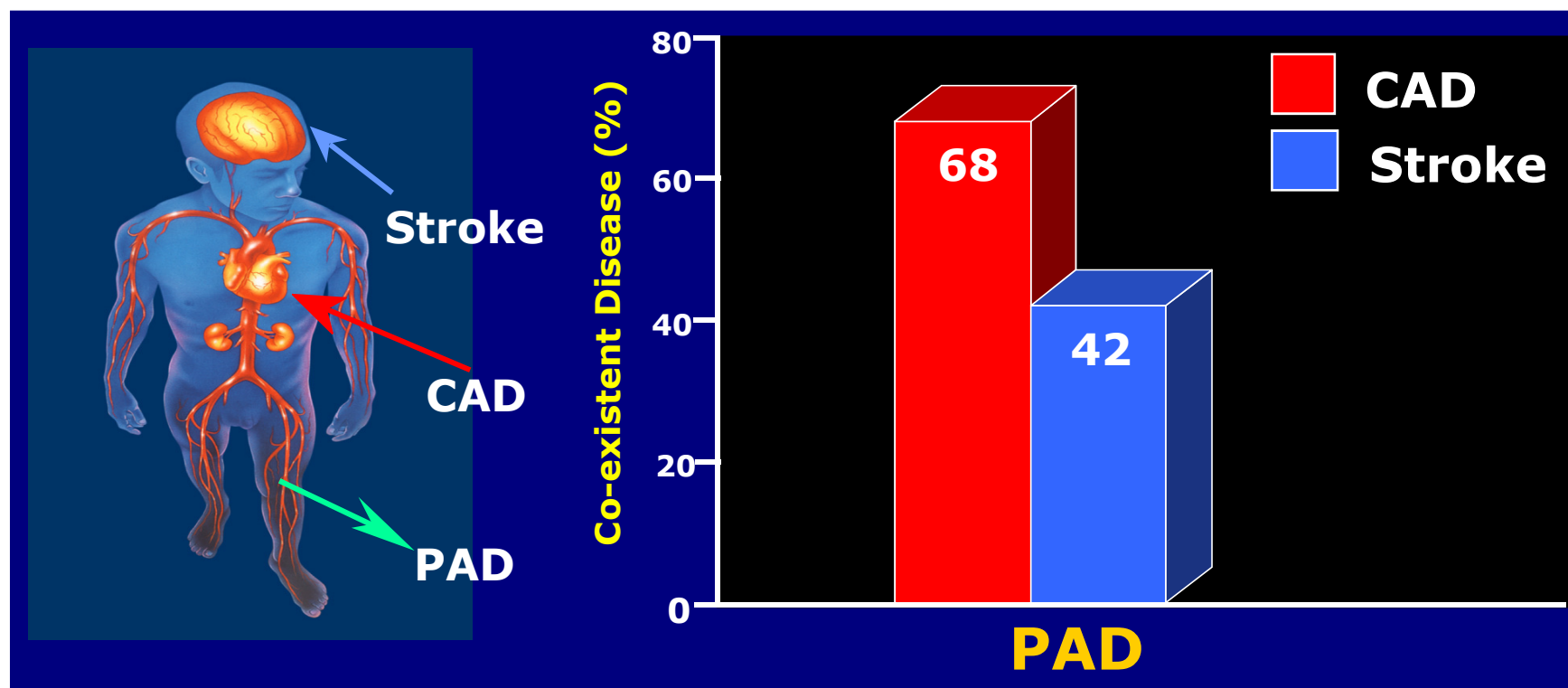

Criqui MH *et Aboyans V. Circ Res.* 2015;116(9):1509-16
Sutton-Tyrrell K, *et al. Stroke* 2008;39(3):863-9

PAD: Quantitative Correlation with CV Outcomes in Different Arterial Beds

Ness J et al. *J Am Geriatr Soc.* 1999;47:1255-1256

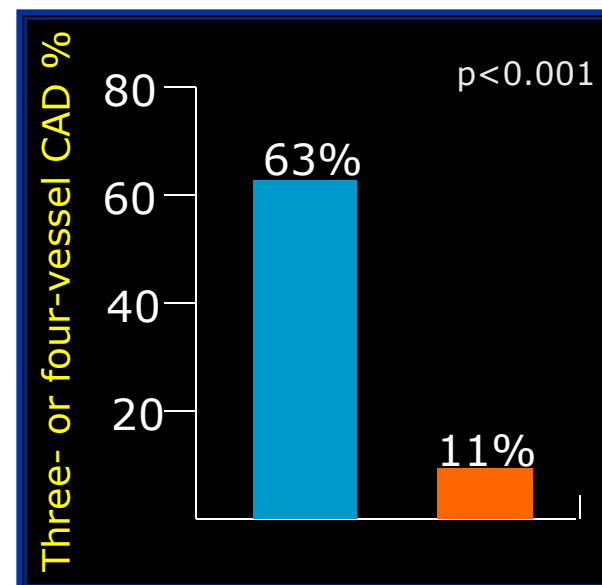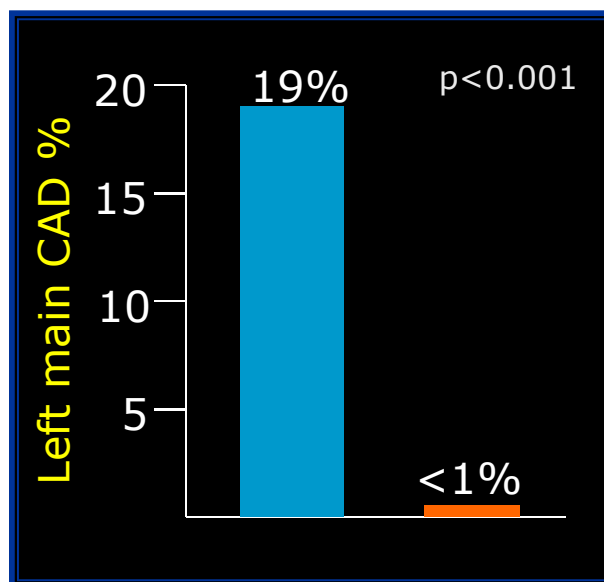# Prevalence of Severe CAD Among Patients With and Without PAD

ABI<0.90
PAD *n*= 279

- 107 (38%) CLI & surgery
- 138 (50%) Symptomatic PAD
- 038 (12%) Asymptomatic PAD

X

Non PAD Group
n= 218

Normal ABI

p<0.001

20
19%
15
10
5
<1%

Left main CAD %

p<0.001

80
63%
60
40
20
11%

Three- or four-vessel CAD %

PAD
Non PAD

Angiographic data from patients with CAD suspicion

Sukhija R, Yalamanchili K, Aronow WS. *Am J Cardiol* 2003;92:304-305

PAD: Natural Hx and Clinical Symptom Classification

**PARC (*Peripheral Academic Research Consortium*)**

Fontaine Classification				Proposed PARC Universal Data Elements		Rutherford Classification		
Stage	Symptoms	↔			↔	Grade	Category	Symptoms
I	Asymptomatic			Asymptomatic		0	0	Asymptomatic
II	Intermittent claudication/ other exertional limb symptoms			Mild claudication/limb symptoms (no limitation in walking)	↔	0	1	Mild claudication
IIa		↔		Moderate claudication/ limb symptoms (able to walk without stopping >2 blocks or 200 m or 4 min)		1	2	Moderate claudication
IIb				Severe claudication/limb symptoms (only able to walk without stopping <2 blocks or 200 m or 4 min)	↔	1	3	Severe claudication
III	Ischemic rest pain	↔		Ischemic rest pain (pain in the distal limb at rest felt to be due to limited arterial perfusion)	↔	II	4	Ischemic rest pain
IV	Ulceration or gangrene	↔		Ischemic ulcers on distal leg	↔	III	5	Ischemic ulceration
				Ischemic gangrene	↔	III	6	Ischemic gangrene

↔ = comparable terms.
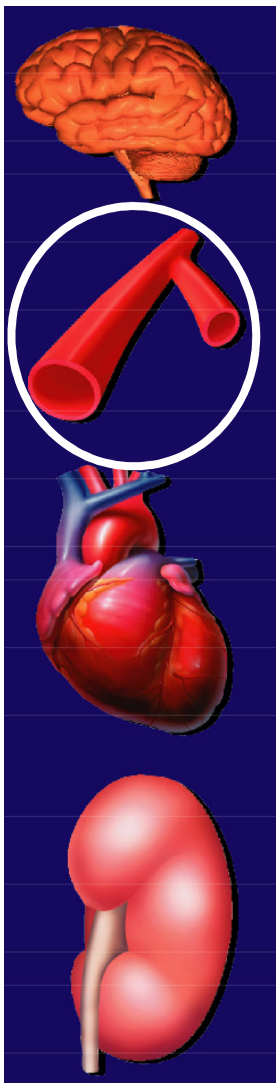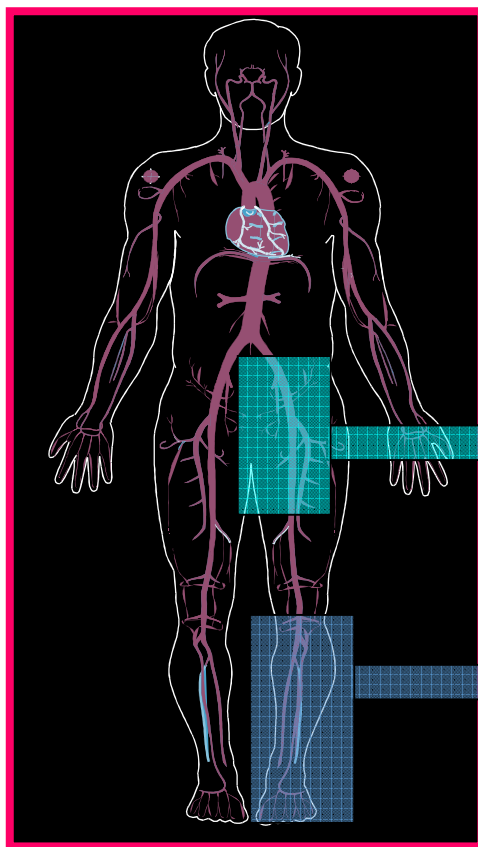
Major Manifestations of PAD According to Different Risk Factors

Peripheral Arterial Disease
- Intermittent Claudication
- Critical Limb Ischemia
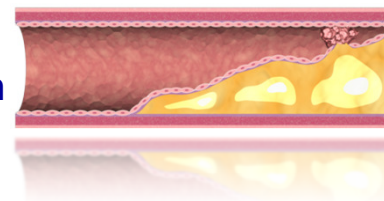
Smoking and Hypertension
commonly associated with more proximal PAD (aortoiliac-femoral arteries)

Diabetes
most strongly associated with infrapopliteal (distal) PAD

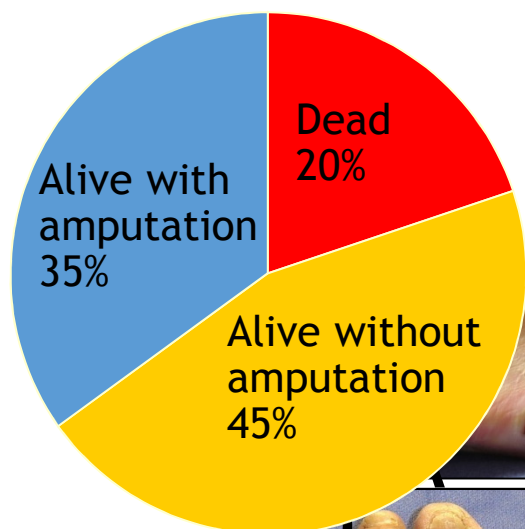ADA. *PAD in people with diabetes. Diabetes Care* 2003;26(12):3333-41

Fate of patients with CLI after initial treatment
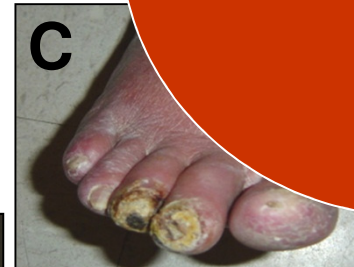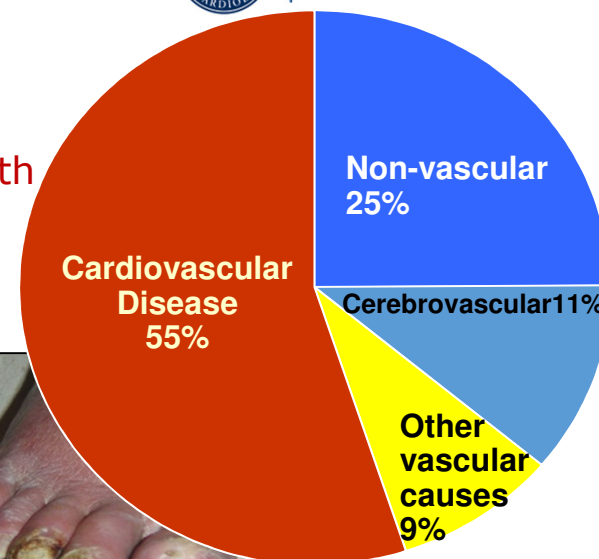Summary of 6-month outcomes from 19 studies

Dormandy JA, Rutherford RB. *J Vasc Surg.* 2000;31:S1-S296

ACC Latin America Conference 2017

Causes of death in patients with intermittent claudication

Pie chart 1 (Fate):
- Dead 20%
- Alive with amputation 35%
- Alive without amputation 45%

Pie chart 2 (Causes of death):
- Cardiovascular Disease 55%
- Non-vascular 25%
- Cerebrovascular 11%
- Other vascular causes 9%

Measurement of the Ankle-Brachial Index (ABI)

Right ABI

$$\frac{\text{Higher of the Right Ankle Systolic BPs}}{\text{Higher Arm Systolic BP (R or L)}}$$

Left ABI:

$$\frac{\text{Higher of the Left Ankle Systolic BPs}}{\text{Higher Arm Systolic BP (R or L)}}$$

DP

PT

DP

PT
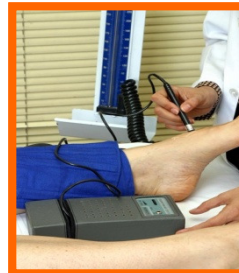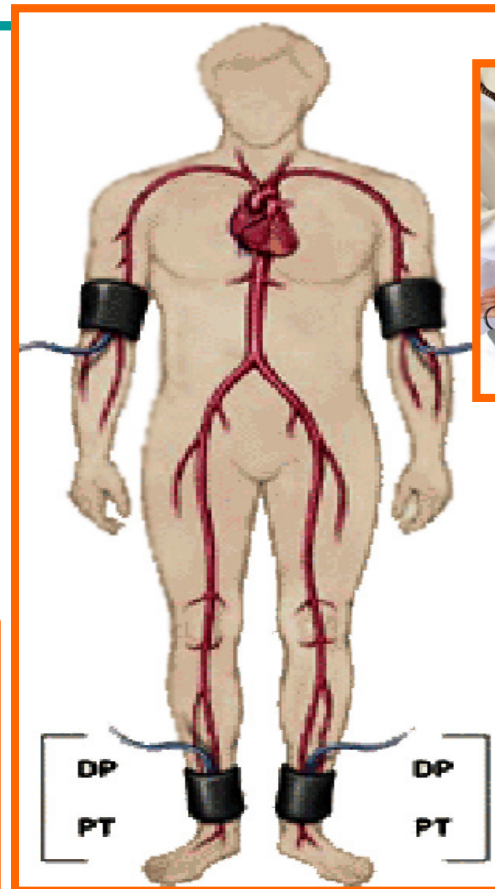
TASC II
Eur J Vasc Endovasc Surg Vol 33, Suppl 1, 2007

Measurement and Interpretation of the Ankle-Brachial Index: A Scientific Statement From the American Heart Association

Victor Aboyans, Michael H. Criqui, Pierre Abraham, Matthew A. Allison, Mark A. Creager, Curt Diehm, F. Gerry R. Fowkes, William R. Hiatt, Björn Jönsson, Philippe Lacroix, Benôit Marin, Mary M. McDermott, Lars Norgren, Reena L. Pande, Pierre-Marie Preux, H.E. (Jelle) Stoffers and Diane Treat-Jacobson

➤ In the case of clinical suspicion based on symptoms and clinical findings, the ABI should be used as the **first-line noninvasive test for the diagnosis of PAD** (*Class I; Level of Evidence A*).[11,38,41,50,56]

➤ An **ABI ≤0.90 should be considered the threshold for confirming the diagnosis of lower-extremity PAD** (*Class I; Level of Evidence A*).[11,37–39,42–44,46,50,51]

➤ **When the ABI is >1.40 but there is clinical suspicion of PAD, a toe-brachial index or other noninvasive tests, which may include imaging, should be used** (*Class I; Level of Evidence A*).[65,66]
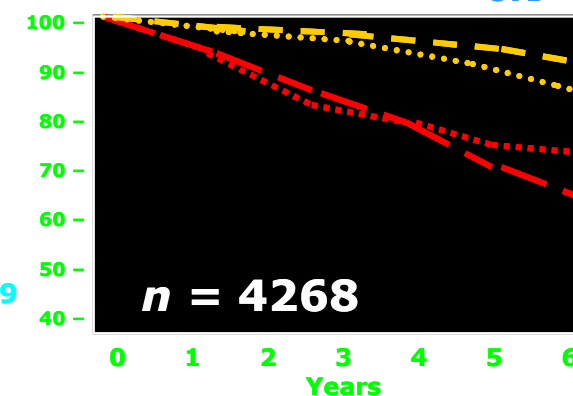
Circulation. 2012;126(24):2890-909.

Toe-Braquial Index
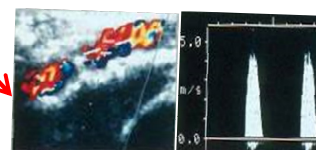
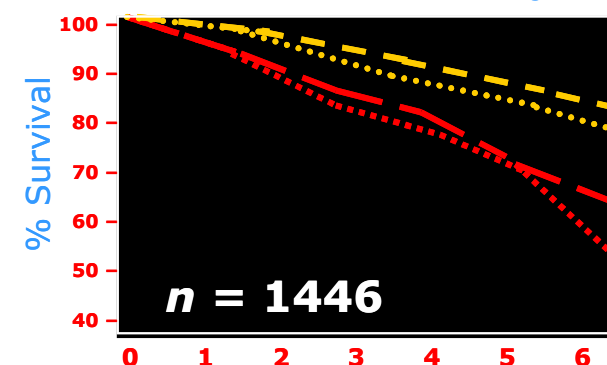**Duplex US**

ABI as a Predictor of CV Risk
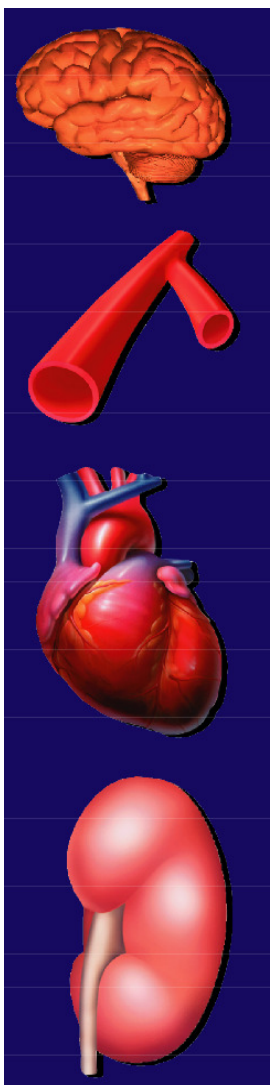*The Cardiovascular Health Study*

CVD –

······· ABI 0.9 - <1
– – – · ABI 1 - <1.5
– – – ABI < 0.8
········ ABI 0.8 - <0.9

n = 4268

Observational Study ≥ 65 years

CVD +

n = 1446

Arterioscler Thromb Vasc Biol 1999;19:538-45

Essentials of LE-PAD: natural Hx, risk profile, and non-invasive diagnosis (ABI, TBI, duplex US)

Conclusions

The risk of death is increased whether or not PAD is symptomatic, and patients with CLI face a high mortality, overwhelmingly due to **MI** and **ischemic stroke**

"PAD prevalence is sharply age-related, rising >10% among patients in their 60s and 70s"

Smoking, **diabetes**, and hypertension are particularly strong risk factors for PAD

"Awareness of PAD is most likely to gain a foothold in the mind of the public if the symptoms and outcomes of the disease are taught more widely in health education programs"

Halperin JL *et* Fuster V. *Arch Intern Med* 2003;163(8):877-8   Criqui MH *et* Aboyans V. *Circ Res* 2015;116(9):1509-16