Systolic inter-arm blood pressure difference and cardiovascular and all-cause mortality in hypertension

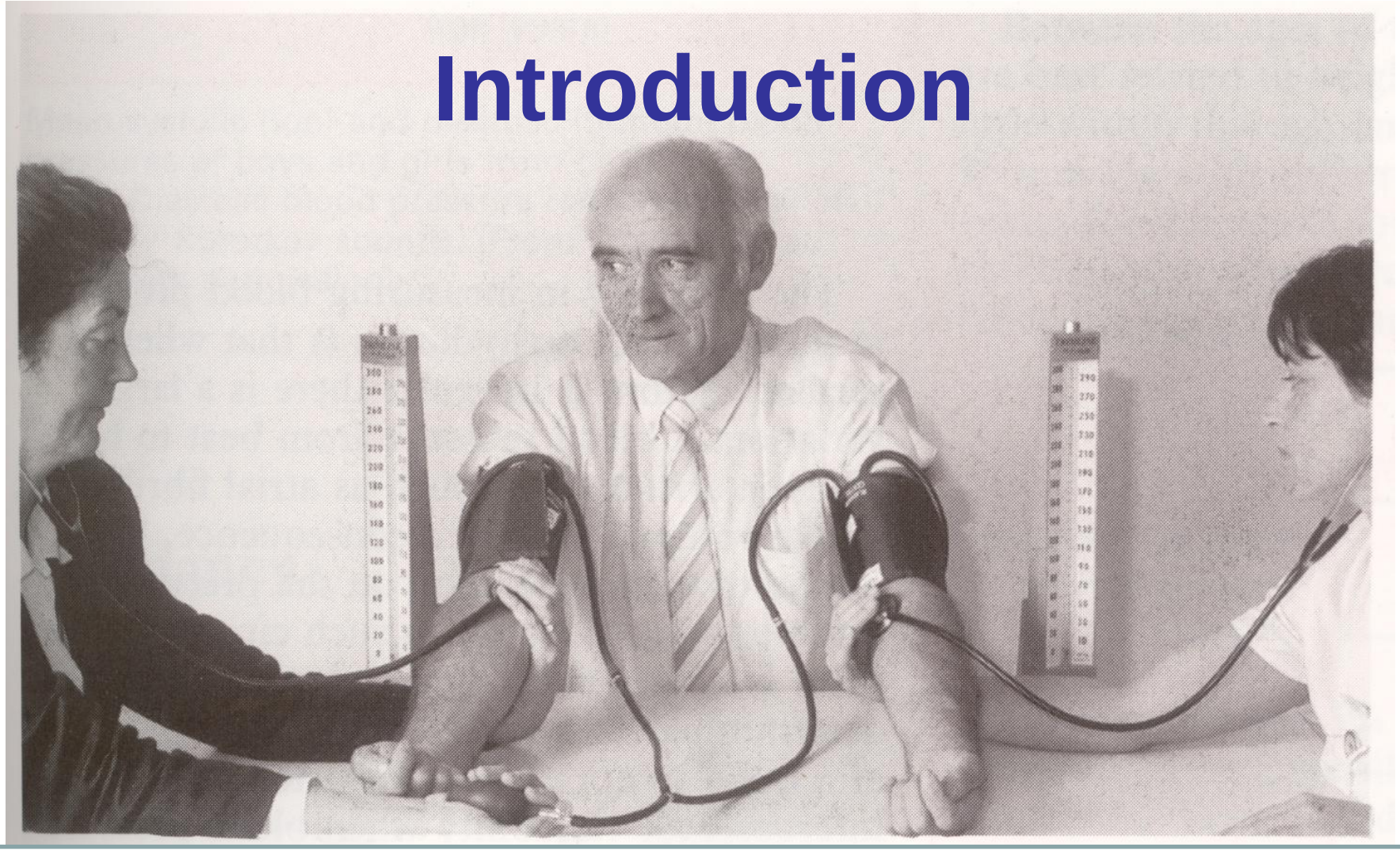
Chris Clark, Rod Taylor,
Angela Shore, John Campbell

christopher.clark@pms,ac,uk

Primary Care Research Group, Institute of Health & Social Care Research, Peninsula College of Medicine & Dentistry, Smeall Building, St Luke's Campus, Magdalen Rd, Exeter, Devon, England EX1 2LU

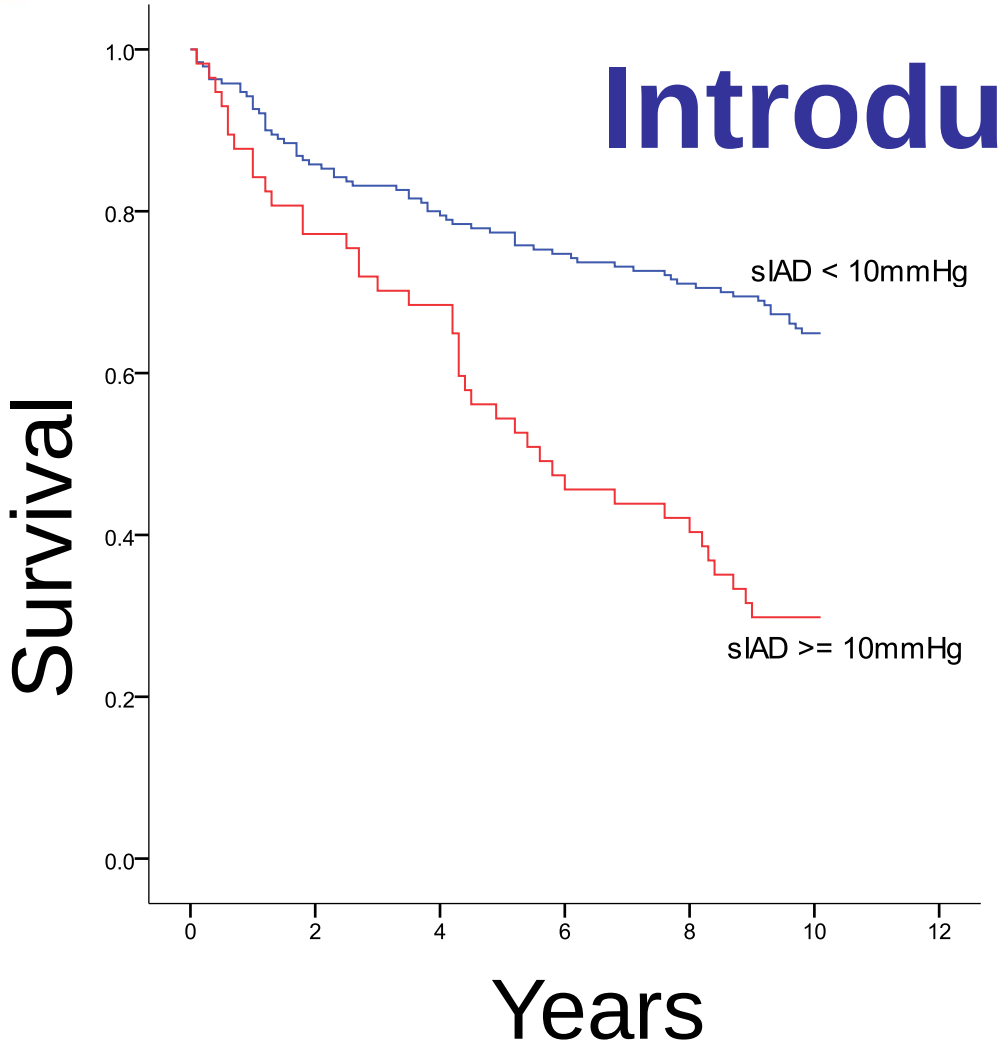
PENINSULA MEDICAL SCHOOL
UNIVERSITIES OF EXETER & PLYMOUTH

Introduction



O'Brien, E, Beevers D.G. & Marshall, H.J. 1995. ***ABC of hypertension***, 3rd ed. London, BMJ Publishing Group.

Introduction



All cause mortality for 247 hypertensive subjects over 10 year follow up

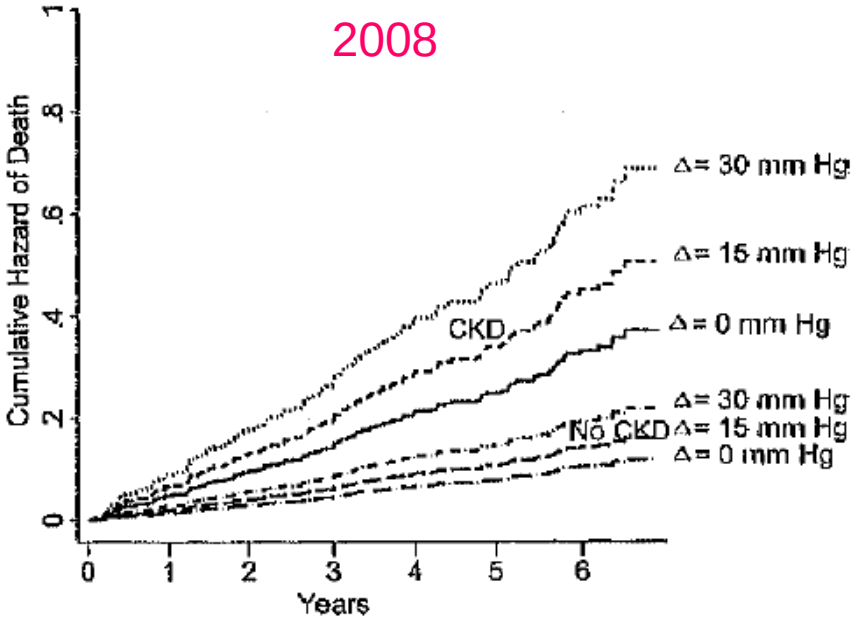
HR 3.4 (1.8 – 6.2); p <0.001

The Mid Devon Medical Practice

The inter-arm blood pressure difference as predictor of cardiovascular events in patients with hypertension in primary care: cohort study. Clark CE, Campbell JL, Powell RJ *J Hum Hypertens 2007* 21:633-638

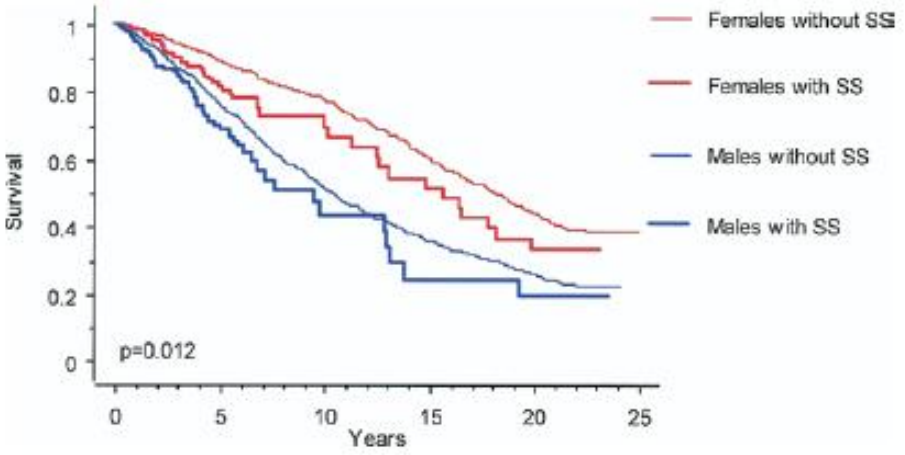
Introduction

2008



Agarwal R, Bunaye Z, Bekele DM. **Prognostic Significance of Between-Arm Blood Pressure Differences**. Hypertension 2008 Mar 1;51(3):657-62.

2007



Aboyans V, Criqui MH, McDermott MM, Allison MA, Denenberg JO, Shadman R et al. **The Vital Prognosis of Subclavian Stenosis.** Journal of the American College of Cardiology 2007; 49(14):1540-1545.

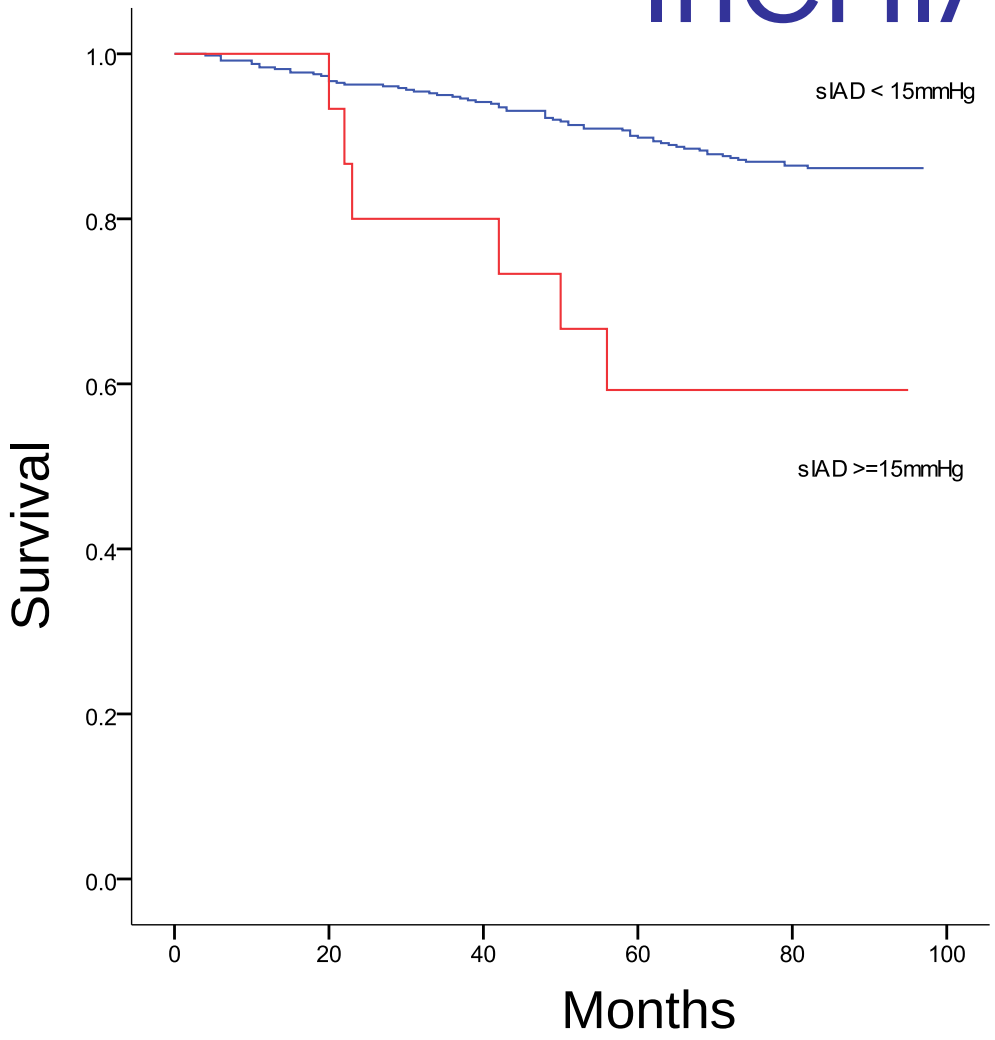
Introduction

- Inter-arm difference is common
- Association with peripheral vascular disease
- Association with increased mortality in cohorts at high vascular risk

Rationale for further studies

- Existing evidence derived from cohorts at elevated vascular risk
- Such subjects are likely to have all risk factors already addressed
- Can these findings be generalised to a general hypertensive population relevant to primary care?

InCHIANTI

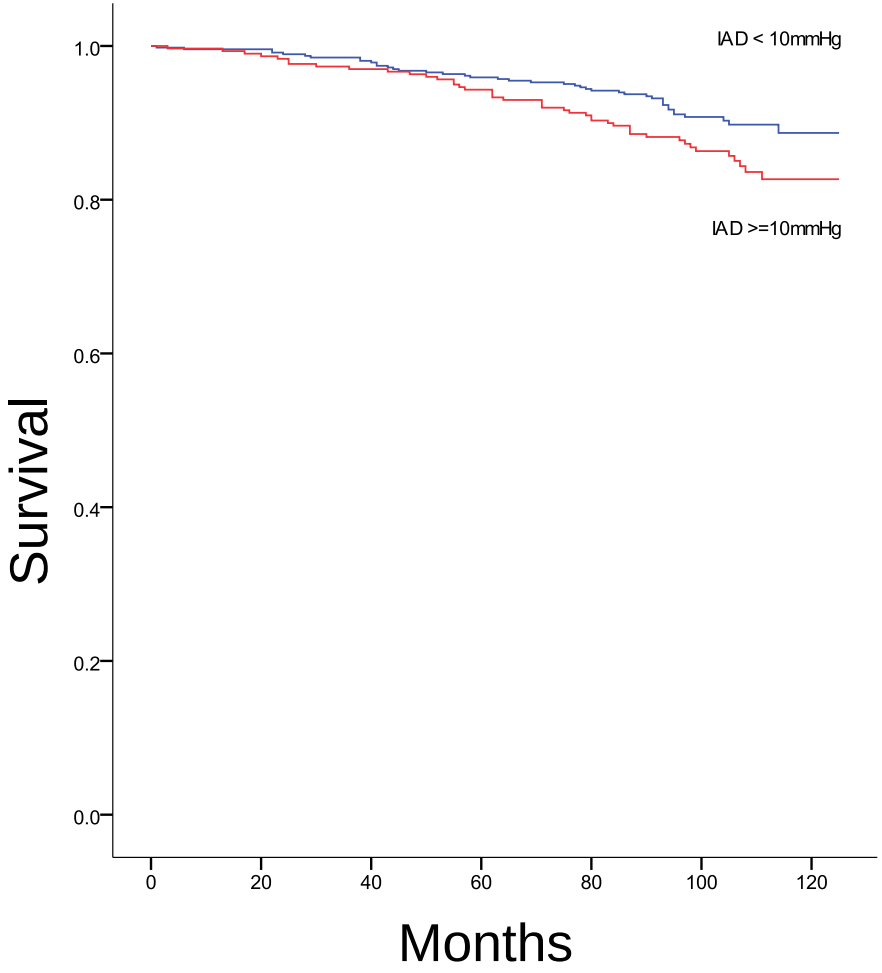


Cardiovascular mortality for 505 hypertensive subjects over 6 year follow up 15mmHg cut off

HR = 3.63 [1.56, 8.44]; p<0.01

InCHIANTI
Invecchiare nel CHIANTI

Aspirin in Asymptomatic Atherosclerosis



Cardiovascular mortality for 764 hypertensive subjects over 10 year follow up

HR = 3.0 (1.3 – 7.1) p=0.01

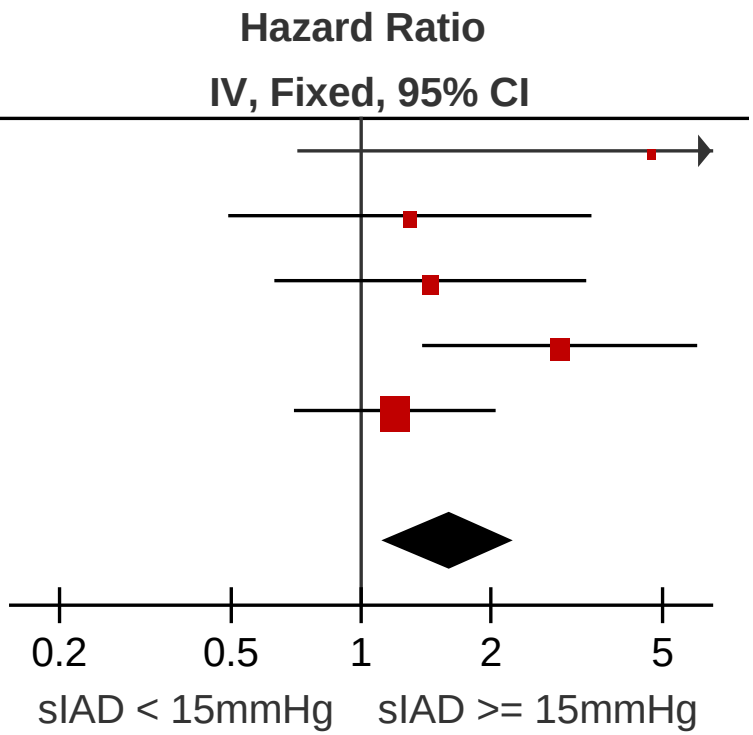
Results

All cause mortality with 15mmHg systolic inter-arm difference

Study or Subgroup	Hazard Ratio IV, Fixed, 95% CI
Clark 2002	4.71 [0.72, 30.93]
Ferrucci 2000	1.30 [0.50, 3.39]
Aboyans 2007	1.45 [0.64, 3.30]
Clark 2007	2.89 [1.40, 5.96]
Fowkes 2010	1.20 [0.71, 2.03]
Total (95% CI)	**1.60 [1.13, 2.27]**

p =0.008

Total 1990 subjects



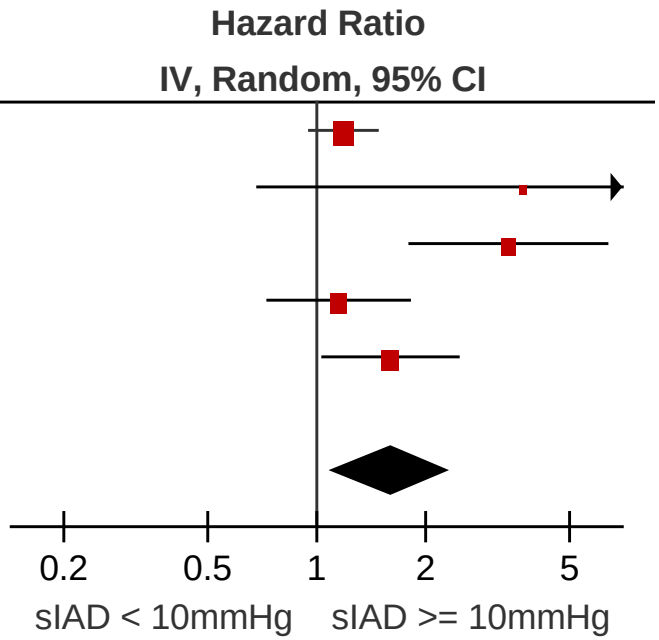
Results

All cause mortality with 10mmHg systolic inter-arm difference

Study or Subgroup	Hazard Ratio IV, Random, 95% CI
Agarwal 2008	1.19 [0.96, 1.47]
Clark 2002	3.71 [0.69, 20.00]
Clark 2007	3.39 [1.81, 6.34]
Ferrucci 2000	1.15 [0.73, 1.81]
Fowkes 2010	1.60 [1.04, 2.46]
Total (95% CI)	**1.60 [1.10, 2.33]**

Heterogeneity: $Tau^2 = 0.11$; $Chi^2 = 12.12$, df = 4 (P = 0.02); $I^2 = 67\%$

Test for overall effect: Z = 2.44 (P = 0.01)



Total 2309 subjects

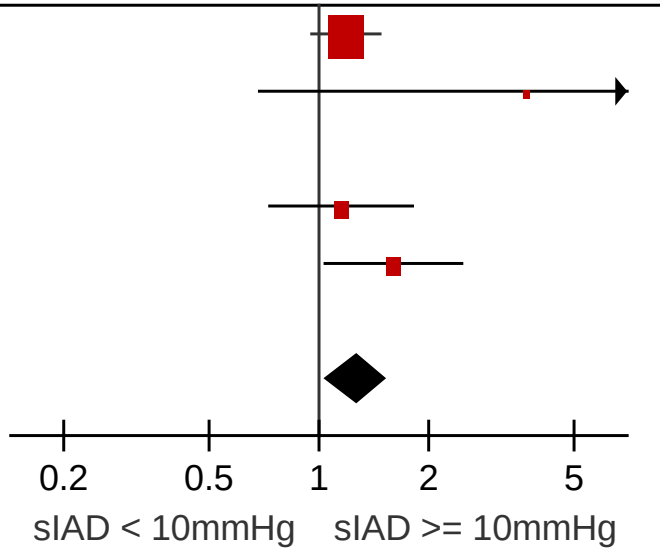
Results

All cause mortality with 10mmHg systolic inter-arm difference

Study or Subgroup	Hazard Ratio IV, Random, 95% CI
Agarwal 2008	1.19 [0.96, 1.47]
Clark 2002	3.71 [0.69, 20.00]
Clark 2007	3.39 [1.81, 6.34]
Ferrucci 2000	1.15 [0.73, 1.81]
Fowkes 2010	1.60 [1.04, 2.46]
Total (95% CI)	**1.27 [1.04, 1.54]**

Heterogeneity: $Tau^2 = 0.00$; $Chi^2 = 3.22$, df = 3 (P = 0.36); $I^2 = 7\%$

Test for overall effect: Z = 2.39 (P = 0.02)



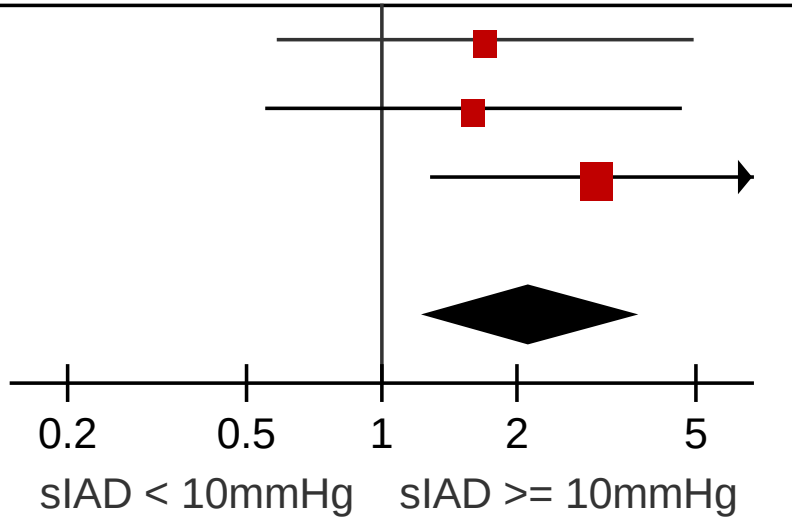
Total 2062 subjects

Results

Cardiovascular mortality with 10mmHg systolic inter-arm difference

Study or Subgroup	Hazard Ratio IV, Fixed, 95% CI
Ferrucci 2000	1.70 [0.59, 4.90]
Clark 2007	1.60 [0.56, 4.61]
Fowkes 2010	3.00 [1.29, 6.98]
Total (95% CI)	**2.15 [1.23, 3.76]**

P<0.01



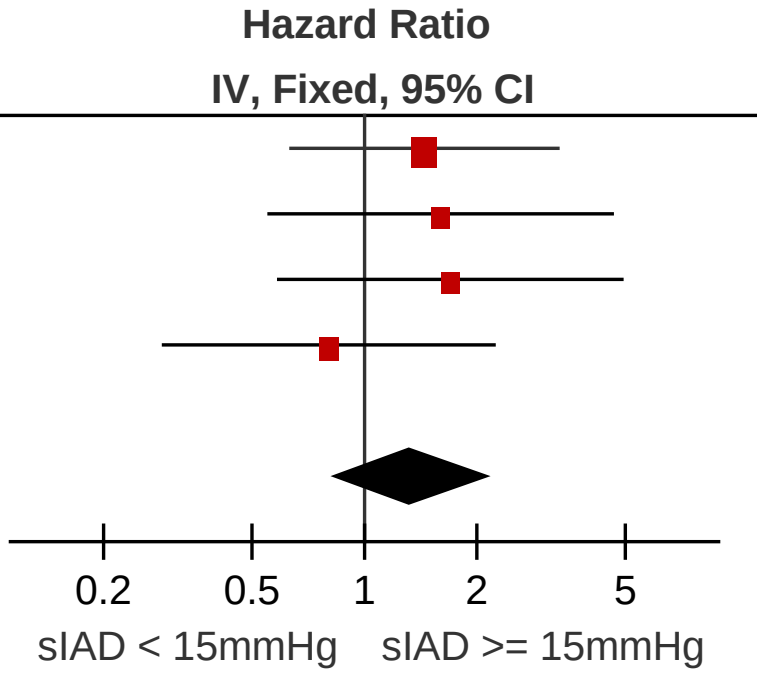
Total 1516 subjects

Results

Cardiovascular mortality with 15mmHg systolic inter-arm difference

Study or Subgroup	Hazard Ratio IV, Fixed, 95% CI
Aboyans 2007 (1)	1.45 [0.64, 3.30]
Clark 2007	1.60 [0.56, 4.61]
Ferrucci 2000	1.70 [0.59, 4.90]
Fowkes 2010	0.80 [0.29, 2.22]
Total (95% CI)	**1.34 [0.82, 2.18]**

P=0.24



Total 2058 subjects

Conclusions

- An inter-arm difference ≥10mmHg or ≥15mmHg is associated with increased mortality in hypertensive populations relevant to primary care

- Inter-arm difference should be looked for and aggressively managed, as a sign of established PVD, when confirmed

Acknowledgements

Prof J Campbell, Prof R Taylor & Prof A Shore
Peninsula College of Medicine & Dentistry

Prof G Fowkes, University of Edinburgh

Dr V Aboyans, University of Limoges

RCGP Royal College of General Practitioners

Scientific Foundation Board

NHS National Institute for Health Research

Peninsula CLAHRC

Peninsula Medical School
Universities of Exeter & Plymouth