NUFFIELD DEPARTMENT OF
PRIMARY CARE
HEALTH SCIENCES

UNIVERSITY OF
OXFORD

What's the evidence, why do guidelines differ, and what should the GP do?

Richard McManus

Barcelona 2018

Overview

- What is hypertension?
- How should blood pressure be measured/diagnosed?
- What should we be aiming for in treatment?
- How do the guidelines deal with this and how do they differ?
- Conclusions

What is hypertension?

ESH and ESC Guidelines

2013 ESH/ESC Guidelines for the management of arterial hypertension

The Task Force for the management of arterial hypertension of the European Society of Hypertension (ESH) and of the European Society of Cardiology (ESC)

List of authors/Task Force Members: Giuseppe Mancia (Chairperson) (Italy)*, Robert Fagard (Chairperson) (Belgium)*, Krzysztof Narkiewicz (Section co-ordinator) (Poland), Josep Redón (Section co-ordinator) (Spain), Alberto Zanchetti (Section co-ordinator) (Italy), Michael Böhm (Germany), Thierry Christiaens (Belgium), Renata Cifkova (Czech Republic), Guy De Backer (Belgium), Anna Dominiczak (UK), Maurizio Galderisi (Italy), Diederick E. Grobbee (Netherlands), Tiny Jaarsma (Sweden), Paulus Kirchhof (Germany/UK), Sverre E. Kjeldsen (Norway), Stéphane Laurent (France), Athanasios J. Manolis (Greece), Peter M. Nilsson (Sweden), Luis Miguel Ruilope (Spain), Roland E. Schmieder (Germany), Per Anton Sirnes (Norway), Peter Sleight (UK), Margus Viigimaa (Estonia), Bernard Waeber (Switzerland), and Faiez Zannad (France)

Hypertension CANADA

Google Custom Search Search

tion & Treatment | Resources | Ressources françaises | About

Hypertension and Guidelines for Follow-

Previous Next

r, RN, PhD; Sheldon Tobe, MD, MSc(HPTE); Maxime Lamarre-Cliche, MD; Peter
P, PhD; Alain Milot, MD, MSc; Raj Padwal, MD, MSc; Karen Tran, MD
u, MD, PhD; Kaberi Dasgupta, MD, MSc; Kelly B. Zarnke, MD, MSc; Kara Neren-
n C. Harris, MD, MHSc; Kerry McBrien, MD, MPH; Sonia Butalia, BSc, MD; Meran-
da Nakhla, MD, MSc
Chair: Doreen M. Rabi, MD, MSc

This information is based on the Hypertension Canada guidelines published in Leung, Alexander A. et al. Hypertension Canada's 2017 Guidelines for Diagnosis, Risk Assessment, Prevention, and Treatment of Hypertension in Adults. *Can J Cardiol* 2017; 33(5): 557-576.

The Japanese Society of Hype
for the Management of Hyperten

Kazuaki SHIMAMOTO, Katsuyuki ANDO, Toshiro FUJITA, Na
Masatsugu HORIUCHI, Yutaka IMAI, Tsutomu IMAIZUN
Masaaki ITO, Sadayoshi ITO, Hiroshi ITOH, Hiroshi IWAO,
Naoki KASHIHARA, Yuhei KAWANO, Shokei KIM-MITSU
Katsuhiko KOHARA, Issei KOMURO, Hiroo KUMAGAI, Hideo
Ryuichi MORISHITA, Mitsuhide NARUSE, Koichi NODE, Yus
Ikuo SAITO, Shigeyuki SAITOH, Kazuyuki SHIMADA, Tatsuo SH
Kouichi TAMURA, Norio TANAHASHI, Takuya TSUCHIH
Shinichiro UEDA, Satoshi UMEMURA, on behalf of The Japa
Committee for Guidelines for the Management

NCGC National Clinical Guideline Centre

Update of clinical guidelines 18 and 34

Hypertension

The clinical management of primary hypertension in adults

140/90 mmHg measured in office

Or

135/85mmHg measured ABPM or Home

Category	Systolic		Diastolic
Optimal	<120	and	<80
Normal	120–129	and/or	80–84
High normal	130–139	and/or	85–89
Grade 1 hypertension	140–159	and/or	90–99
Grade 2 hypertension	160–179	and/or	100–109
Grade 3 hypertension	≥180	and/or	≥110
Isolated systolic hypertension	≥140	and	<90

(Office measurements)

ESC/ESH Hypertension Guidelines 2013

2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults

Whelton PK, et al.

2017 High Blood Pressure Clinical Practice Guideline: Executive Summary

2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults

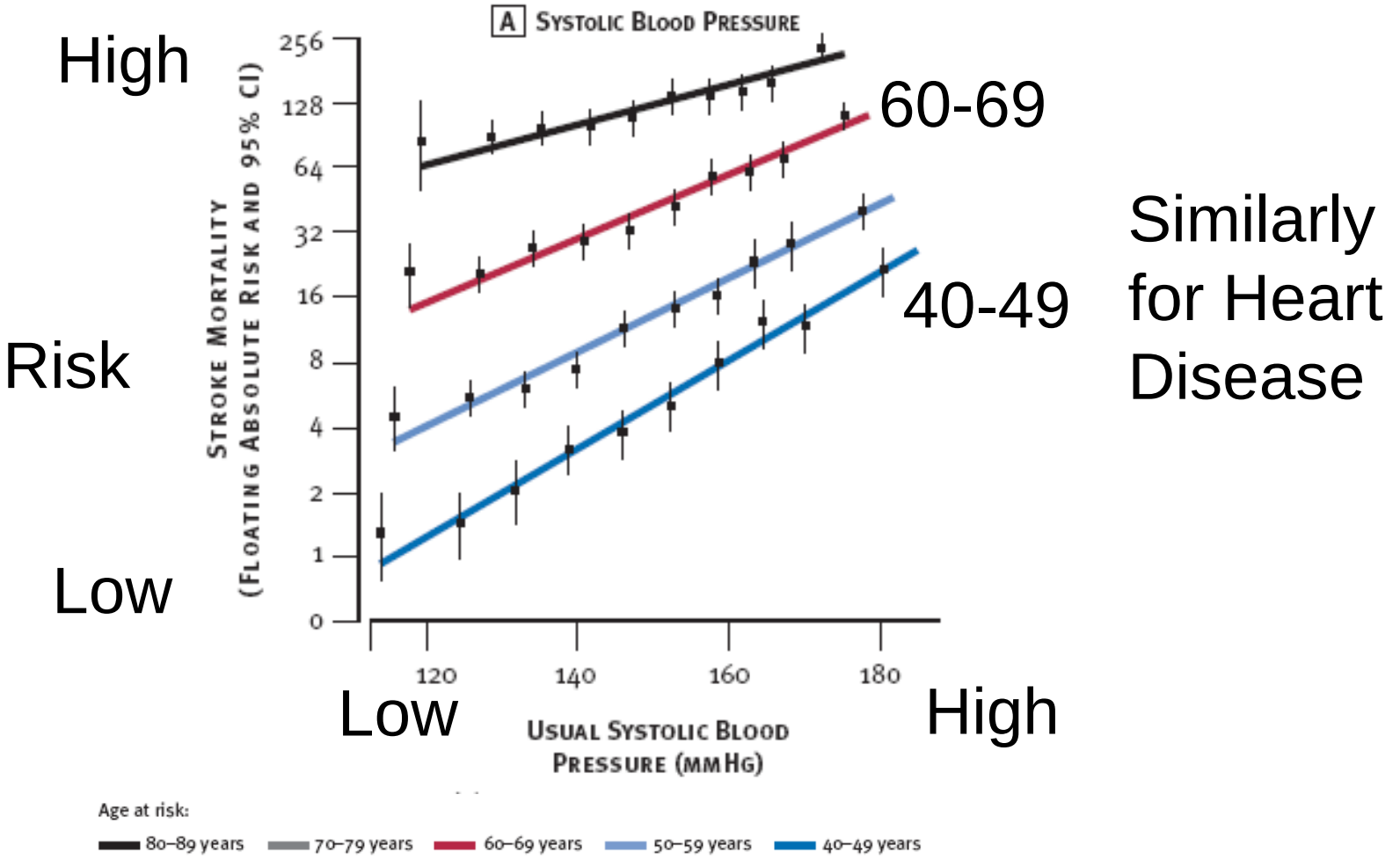
Executive Summary

A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines

Hypertension reclassified!

BP Category	SBP		DBP
Normal	<120 mm Hg	and	<80 mm Hg
Elevated	120–129 mm Hg	and	<80 mm Hg
Hypertension			
Stage 1	130–139 mm Hg	or	80–89 mm Hg
Stage 2	≥140 mm Hg	or	≥90 mm Hg

Stroke Risk increases with age & usual BP



Bottom line BP vs Risk

10 mmHg
38% stroke risk
18% CHD risk

What is in a definition?

- Until the new US guidelines, there was remarkable unanimity
- Threshold and targets 140/90mmHg (office)
- Threshold arbitrary (previously 160/100mmHg)
- Is there new evidence to change current practice?

How should BP be measured / Hypertension diagnosed?

ESH/ESC Diagnosis

ESH and ESC Guidelines

2013 ESH/ESC Guidelines for the n
arterial hypertension

The Task Force for the management of arteri
European Society of Hypertension (ESH)
Society of Cardiology (ESC)

List of authors/Task Force Members: Giuseppe Mancia (Chair
(Chairperson) (Belgium)*, Krzysztof Narkiewicz (Section co-or
(Section co-ordinator) (Spain), Alberto Zanchetti (Section co-o
(Germany), Thierry Christiaens (Belgium), Renata Cifkova (Cz
(Belgium), Anna Dominiczak (UK), Maurizio Galderisi (Italy),
Tiny Jaarsma (Sweden), Paulus Kirchhof (Germany/UK), Sverr
Laurent (France), Athanasios J. Manolis (Greece), Peter M. Nil
(Spain), Roland E. Schmieder (Germany), Per Anton Sirnes (N
Margus Viigimaa (Estonia), Bernard Waeber (Switzerland), ar

Recommendations	Class[a]	Level[b]	Ref.[c]
Office BP is recommended for screening and diagnosis of hypertension.	I	B	3
It is recommended that the diagnosis of hypertension be based on at least two BP measurements per visit and on at least two visits.	I	C	-
It is recommended that all hypertensive patients undergo palpation of the pulse at rest to determine heart rate and to search for arrhythmias, especially atrial fibrillation.	I	B	62, 63
Out-of-office BP should be considered to confirm the diagnosis of hypertension, identify the type of hypertension, detect hypotensive episodes, and maximize prediction of CV risk.	IIa	B	89, 90, 103, 105, 109, 113, 117
For out-of-office BP measurements, ABPM or HBPM may be considered depending on indication, availability, ease, cost of use and, if appropriate, patient preference.	IIb	C	-

ESH/ESC Out of office measurement

ESH and ESC Guidelines

2013 ESH/ESC Guidelines for the man
arterial hypertension

The Task Force for the management of arterial hy
European Society of Hypertension (ESH) and
Society of Cardiology (ESC)

List of authors/Task Force Members: Giuseppe Mancia (Chairperson
(Chairperson) (Belgium)*, Krzysztof Narkiewicz (Section co-ordinato
(Section co-ordinator) (Spain), Alberto Zanchetti (Section co-ordinat
(Germany), Thierry Christiaens (Belgium), Renata Cifkova (Czech Re
(Belgium), Anna Dominiczak (UK), Maurizio Galderisi (Italy), Diederi
Tiny Jaarsma (Sweden), Paulus Kirchhof (Germany/UK), Sverre E. Kj
Laurent (France), Athanasios J. Manolis (Greece), Peter M. Nilsson (S
(Spain), Roland E. Schmieder (Germany), Per Anton Sirnes (Norway)
Margus Viigimaa (Estonia), Bernard Waeber (Switzerland), and Faie

Clinical indications for HBPM or ABPM
• Suspicion of white-coat hypertension
- Grade I hypertension in the office
- High office BP in individuals without asymptomatic organ damage and at low total CV risk
• Suspicion of masked hypertension
- High normal BP in the office
- Normal office BP in individuals with asymptomatic organ damage or at high total CV risk
• Identification of white-coat effect in hypertensive patients
• Considerable variability of office BP over the same or different visits
• Autonomic, postural, post-prandial, siesta- and drug-induced hypotension
• Elevated office BP or suspected pre-eclampsia in pregnant women
• Identification of true and false resistant hypertension
Specific indications for ABPM
• Marked discordance between office BP and home BP
• Assessment of dipping status
• Suspicion of nocturnal hypertension or absence of dipping, such as in patients with sleep apnoea, CKD, or diabetes
• Assessment of BP variability

US: Out-of-Office and Self-Monitoring of BP recommended

COR	LOE	Recommendation for Out-of-Office and Self-Monitoring of BP
I	A^{SR}	Out-of-office BP measurements are recommended to confirm the diagnosis of hypertension and for titration of BP-lowering medication, in conjunction with telehealth counseling or clinical interventions.

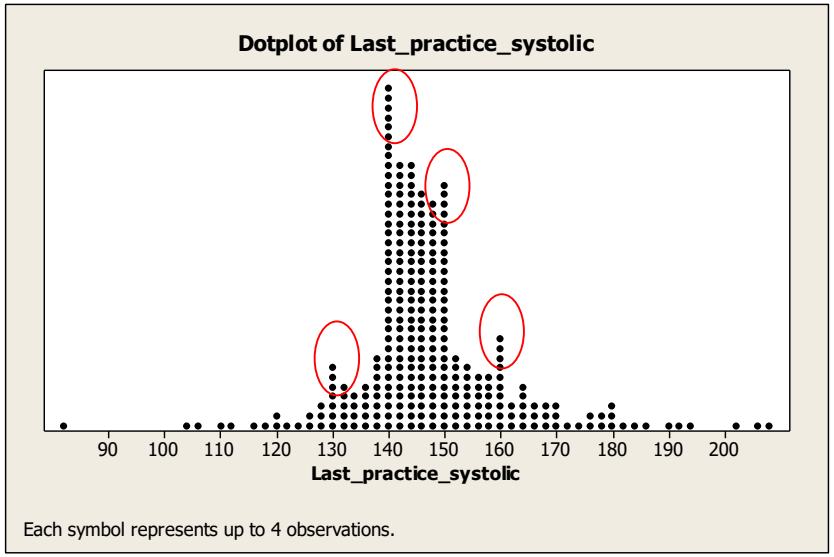
Whelton PK, et al.
2017 High Blood Pressure Clinical Practice Guideline: Executive Summary

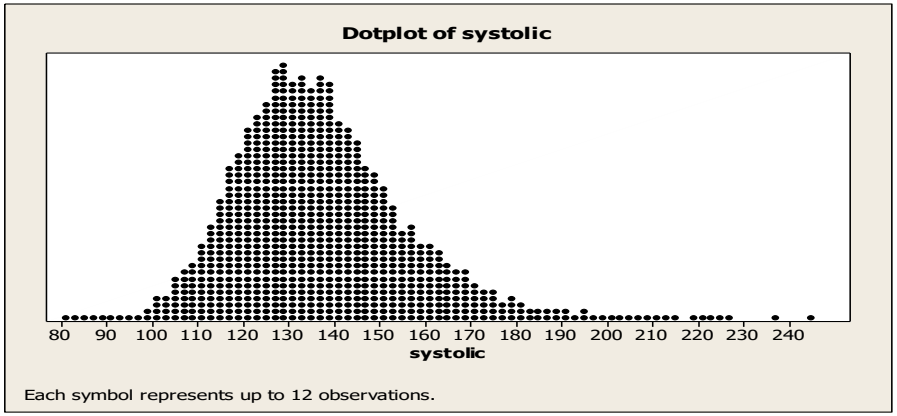
2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults

Executive Summary

A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines

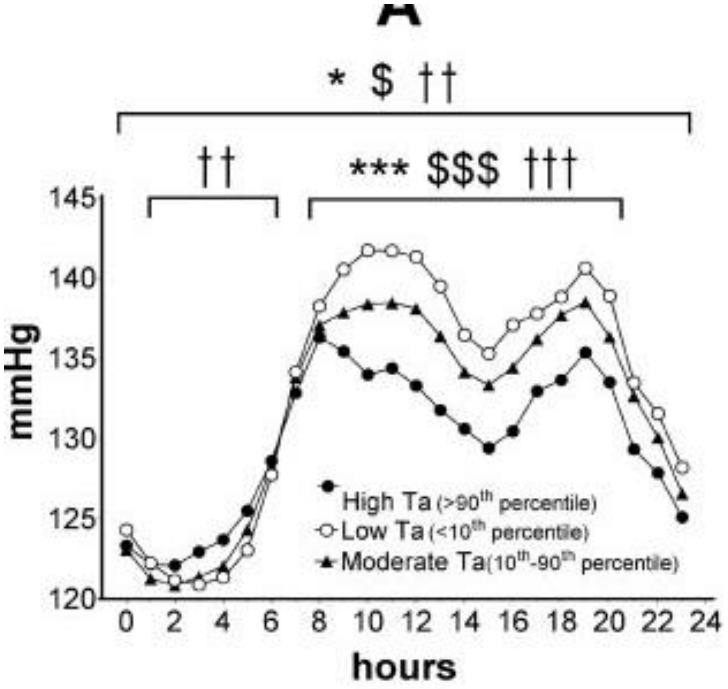
Routine measurement is often flawed





Same population with routine and research measurement

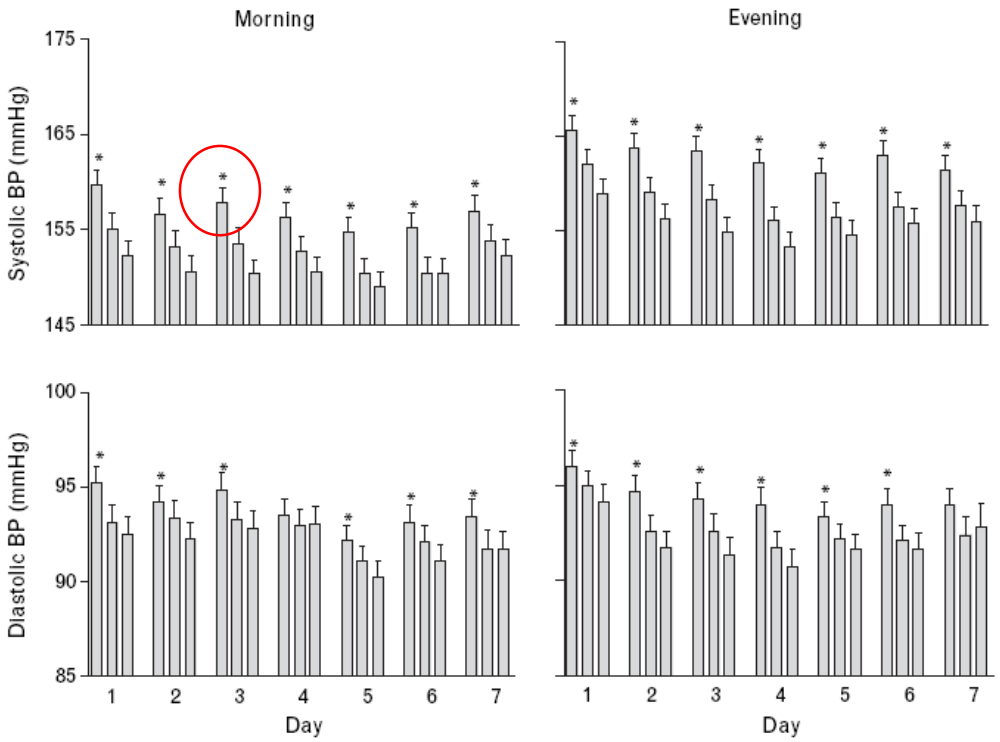
Blood Pressure varies through the day and between seasons



***Hypertension*. 2006;47:155-161**

Multiple measurements better estimate mean blood pressure

Fig. 1



Triplicate morning and evening home blood pressure (BP) measurements assessed during a 7-day period in patients without hypertensive treatment. Results are expressed as means ± SEM; *indicates that measurements are significantly higher than subsequent ones ($P < 0.001$).

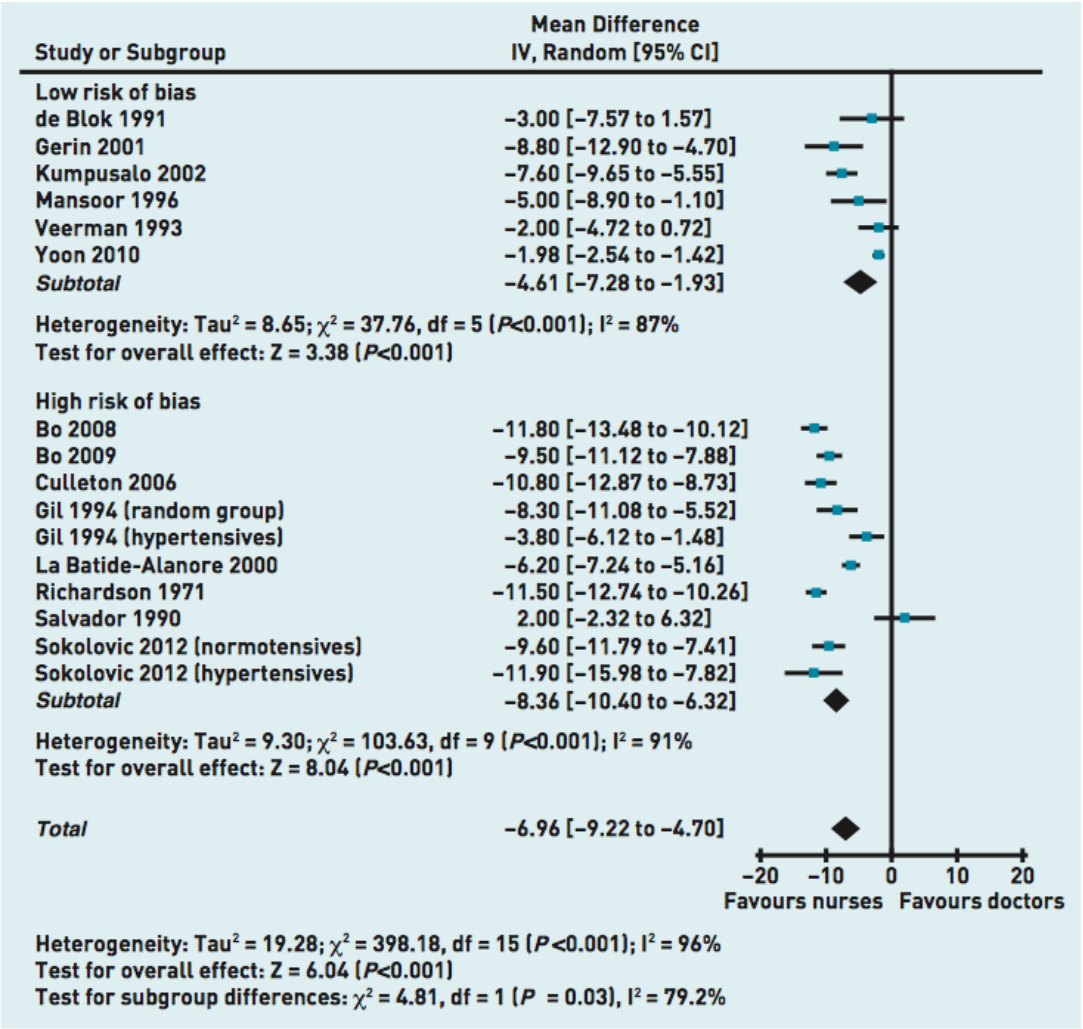
Many factors affect BP measurement

	Measured *v* actual blood pressure*	
Factor	**Systolic blood pressure**	**Diastolic blood pressure**
Patient		
Talking	↑ 17 mm Hg	↑ 13 mm Hg
Acute exposure to cold	↑ 11 mm Hg	↑ 8 mm Hg
Acute ingestion of alcohol	↑ 8 mm Hg for ⩽3 hrs	↑ 7 mm Hg for ⩽3 hrs
Technique		
Patient supine rather than sitting	No effect;↑ 3 mm Hg in supine position	↓ 2-5 mm Hg in supine position
Position of patient's arm	↓ (or ↑) 8 mm Hg for every 10 cm above (or below) heart level	↓ (or ↑) 8 mm Hg for every 10 cm above (or below) heart level
Failure to support arm	↑ 2 mm Hg	↑ 2 mm Hg
Cuff too small	↓ 8 mm Hg	↑ 8 mm Hg
Measurer		
Expectation bias (including end digit preference)	Rounding to nearest 5 or 10 mm Hg	Rounding to nearest 5 or 10 mm Hg

*Mean values obtained from referenced studies.
†Using levels of evidence for diagnostic studies.

BMJ 2001;322;908-911

Nurse measured BP is 7mmHg systolic lower than GPs



Clark et al BJGP 2014

What really happens when GPs measure blood pressure? A prospective “mystery shopper” study.

Sarah Stevens

Methods

- An online survey was advertised to UK charities and patient groups July 2015-January 2016.

- Respondents reported
  - basic demographic and health data,
  - if/ how BP was measured at their last surgery appointment (1 BP reading),
  - willingness to take part in the prospective study after their next appointment.

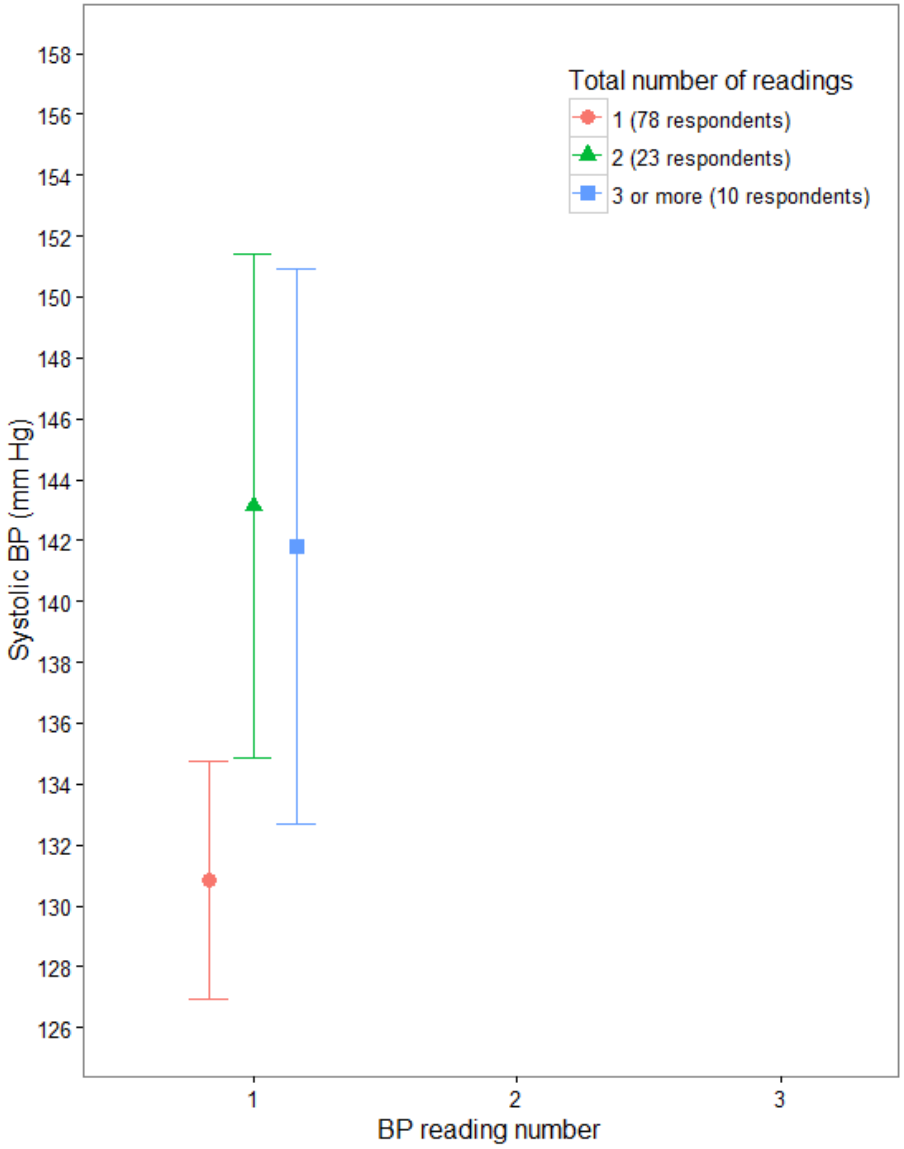
- Prospectively, patients reported if and how their BP was measured at their appointment (3 BP readings) using an online questionnaire.

Results: Participant characteristics

	Total respondents = 334
Characteristic	Mean (SD) / N (%)
Male	172 (52%)
Age	59 (12)
Current smoker	25 (7.5%)
Hypertensive	200 (60%)
Antihypertensive medication	173 (87%)
Diabetes	279 (85%)
BP measured during last appointment	217 (65%)
By a GP	59 (27%)
By a nurse	150 (69%)
By the respondent in the waiting room	8 (3.7%)

NHS
National Institute for Health Research

Results: BP measurement

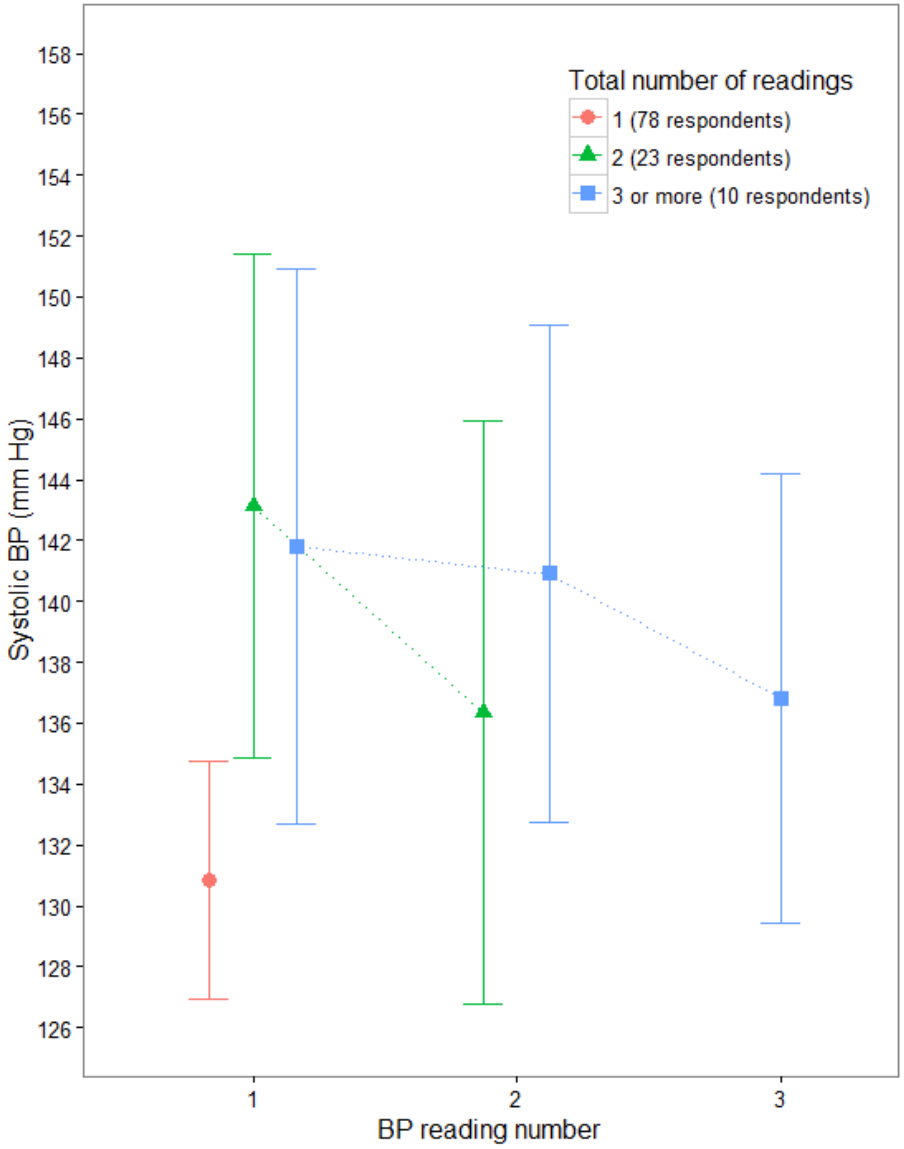


In those reporting all readings (n=111):

- Initial BP was significantly lower in those who had their BP measured once, compared to those who had it measured 2 or 3 times.

NHS
National Institute for Health Research

Results: BP measurement



In those reporting all readings (n=111):

- Initial BP was significantly lower in those who had their BP measured once, compared to those who had it measured 2 or 3 times.
- A majority (n=70, 63% [53 to 72%]) had their BP measured in line with current NICE guidelines.

NHS
National Institute for Health Research

How should hypertension be diagnosed?

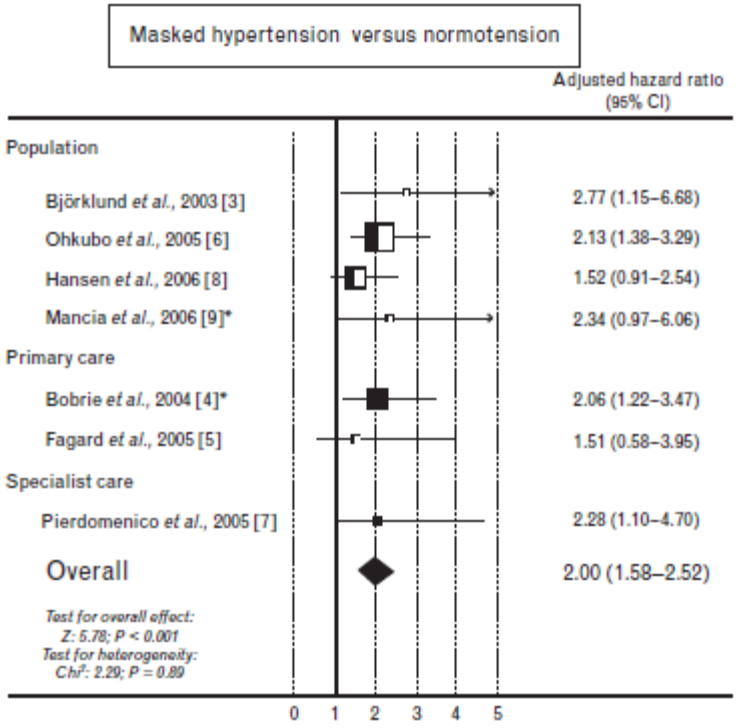
Diagnosing hypertension

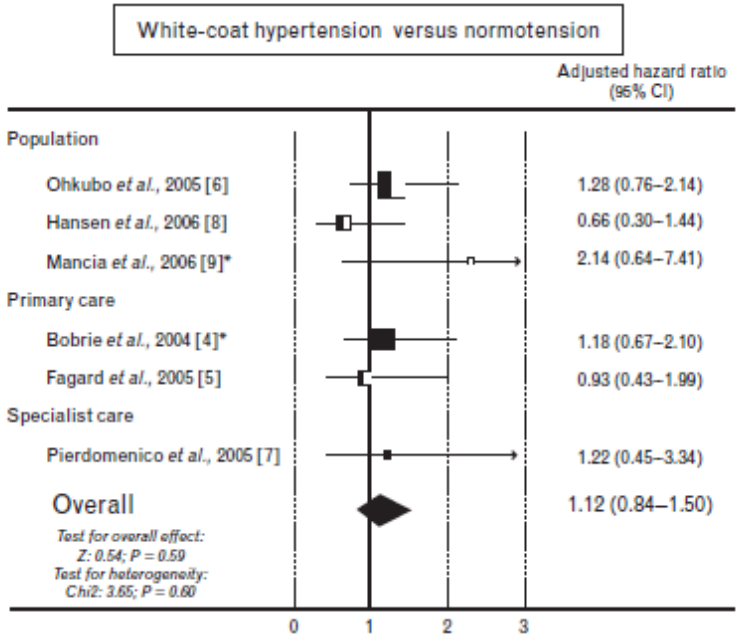
- Traditionally based on clinic measurement
- Most outcome trials use clinic measures
- But
  - Flawed measure (one off from continuum)
  - Takes weeks / months to make diagnosis

What about ABPM?

- Half hourly measurements during the day
  - Better measure➔ usual BP
- Hourly at night
- Main outcome is mean day time ABPM
- Other info available (dipping etc)
- Better correlated with end organ damage…

Detection of white coat and masked HT

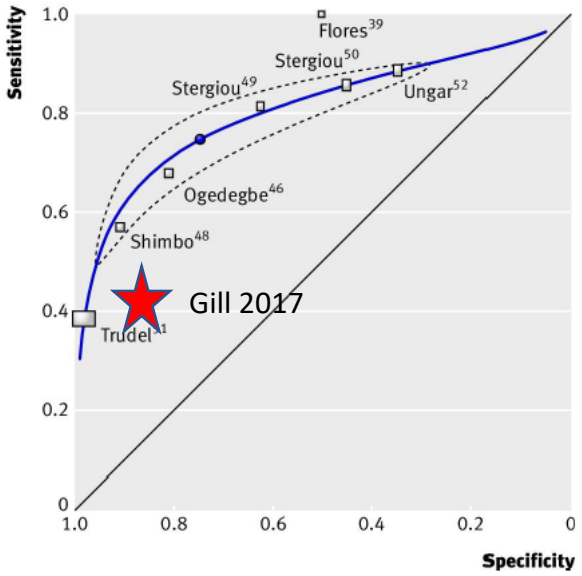




Fagard R J Hyp 2007

Many people currently potentially misdiagnosed...

Test name	Sensitivity % (95%CI)	Specificity % (95%CI)
Clinic measurement (n=7)	74.62 (60.72 to 84.83)	74.61(47.88 to 90.38)



Worse if only studies around **diagnostic threshold** used: sensitivity of 86% and specificity of 46%

BMJ 2011;342:d3621 doi: 10.1136/bmj.d3621

Cost effectiveness

- ABPM most cost effective for every age group

Subgroup	Incremental QALYs vs CBPM		Incremental costs vs CBPM		Most CE strategy	Probability CE
	HBPM	ABPM	HBPM	ABPM		
Male, 40 years	-0.001 (CI: -0.006, 0.004)	-0.004 (CI: -0.009, 0.005)	-£48 (CI: -£128, £17)	-£235 (CI: -£322, -£117)	ABPM	100%
Male, 50 years	0.001 (CI: -0.009, 0.009)	0.006 (CI: -0.003, 0.017)	-£34 (CI: -£89, £11)	-£156 (CI: -£233, -£62)	ABPM	100%
Male, 60 years	0.003 (CI: -0.010, 0.015)	0.017 (CI: 0.006, 0.029)	-£26 (CI: -£70, £7)	-£112 (CI: -£178, -£43)	ABPM	100%
Male, 70 years	0.005 (CI: -0.009, 0.017)	0.022 (CI: 0.012, 0.035)	-£23 (CI: -£65, £7)	-£89 (CI: -£150, -£30)	ABPM	100%
Male, 75 years	0.004 (CI: -0.007, 0.015)	0.021 (CI: 0.012, 0.030)	-£16 (CI: -£49, £6)	-£56 (CI: -£105, -£10)	ABPM	100%
Female, 40 years	-0.001 (CI: -0.004, 0.001)	-0.006 (CI: -0.008, -0.003)	-£68 (CI: -£167, £25)	-£323 (CI: -£389, -£222)	ABPM	100%
Female, 50 years	-0.001 (CI: -0.006, 0.004)	-0.001 (CI: -0.006, 0.007)	-£40 (CI: -£106, £15)	-£182 (CI: -£256, -£79)	ABPM	100%
Female, 60 years	0.001 (CI: -0.006, 0.008)	0.006 (CI: 0.000, 0.015)	-£32 (CI: -£83, £11)	-£146 (CI: -£220, -£55)	ABPM	100%
Female, 70 years	0.003 (CI: -0.005, 0.011)	0.014 (CI: 0.008, 0.021)	-£20 (CI: -£59, £8)	-£82 (CI: -£142, -£25)	ABPM	100%
Female, 75 years	0.002 (CI: -0.004, 0.007)	0.010 (CI: 0.006, 0.015)	-£17 (CI: -£52, £11)	-£63 (CI: -£121, -£8)	ABPM	100%

Lovibond et al Lancet 2011

BUT ABPM may be poorly tolerated

- 750 people in West Midlands underwent clinic (3 occasions), home (1 week) and ABPM (24hrs)
- ABPM rated significantly worse esp for disturbing sleep and disturbing usual activities (esp ethnic minorities)
- Focus Groups confirmed this…

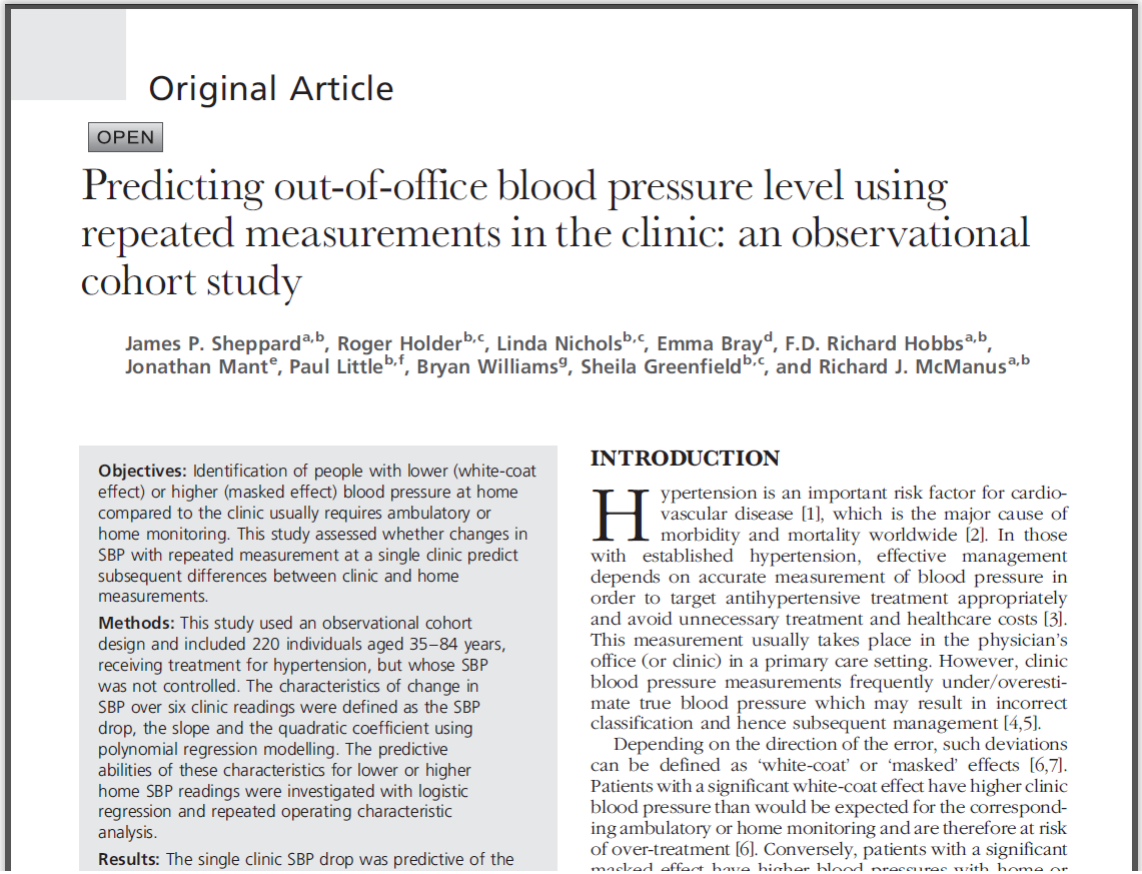
Wood BJGP 2016

- *“.....what I did mind was walking along the road and then I would get the warning and have to stop....and people were watching me.....and it was so embarrassing” (FAC6)*

- *“my children.....kept asking ‘what’s wrong with you?’, especially with the 24 hour one” (FSA1)*

Does everyone need ABPM for diagnosis?

Are multiple clinic blood pressure readings associated with the home-clinic blood pressure difference?



Original Article

OPEN

Predicting out-of-office blood pressure level using repeated measurements in the clinic: an observational cohort study

James P. Sheppard[a,b], Roger Holder[b,c], Linda Nichols[b,c], Emma Bray[d], F.D. Richard Hobbs[a,b], Jonathan Mant[e], Paul Little[b,f], Bryan Williams[g], Sheila Greenfield[b,c], and Richard J. McManus[a,b]

Objectives: Identification of people with lower (white-coat effect) or higher (masked effect) blood pressure at home compared to the clinic usually requires ambulatory or home monitoring. This study assessed whether changes in SBP with repeated measurement at a single clinic predict subsequent differences between clinic and home measurements.

Methods: This study used an observational cohort design and included 220 individuals aged 35–84 years, receiving treatment for hypertension, but whose SBP was not controlled. The characteristics of change in SBP over six clinic readings were defined as the SBP drop, the slope and the quadratic coefficient using polynomial regression modelling. The predictive abilities of these characteristics for lower or higher home SBP readings were investigated with logistic regression and repeated operating characteristic analysis.

Results: The single clinic SBP drop was predictive of the

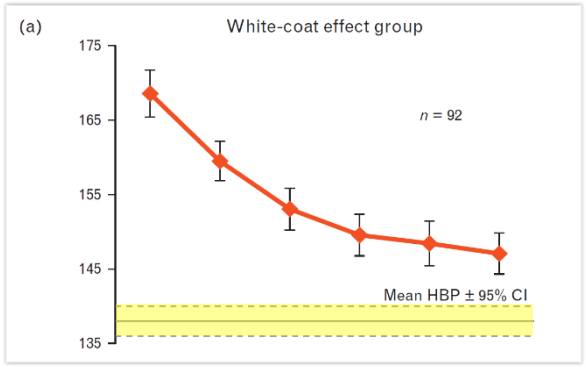
INTRODUCTION

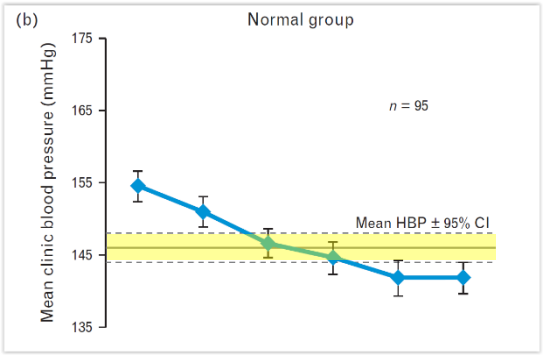
Hypertension is an important risk factor for cardiovascular disease [1], which is the major cause of morbidity and mortality worldwide [2]. In those with established hypertension, effective management depends on accurate measurement of blood pressure in order to target antihypertensive treatment appropriately and avoid unnecessary treatment and healthcare costs [3]. This measurement usually takes place in the physician's office (or clinic) in a primary care setting. However, clinic blood pressure measurements frequently under/overestimate true blood pressure which may result in incorrect classification and hence subsequent management [4,5].

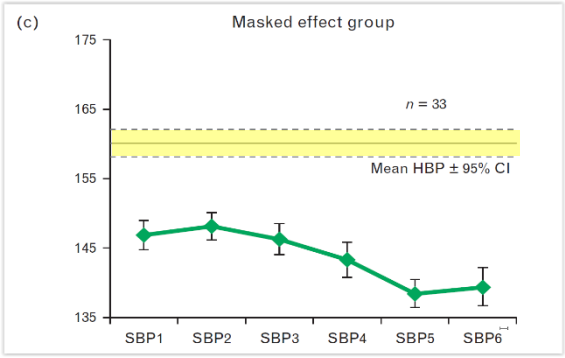
Depending on the direction of the error, such deviations can be defined as 'white-coat' or 'masked' effects [6,7]. Patients with a significant white-coat effect have higher clinic blood pressure than would be expected for the corresponding ambulatory or home monitoring and are therefore at risk of over-treatment [6]. Conversely, patients with a significant

[9]Sheppard JP, et al. (2014) . *Journal of hypertension*; 32(11):2171-8

Results


(a)
White-coat effect group
175
165
155
145
135
n = 92
Mean HBP ± 95% CI


(b)
Normal group
Mean clinic blood pressure (mmHg)
175
165
155
145
135
n = 95
Mean HBP ± 95% CI


(c)
Masked effect group
175
165
155
145
135
n = 33
Mean HBP ± 95% CI
SBP1
SBP2
SBP3
SBP4
SBP5
SBP6

Can clinic BP be combined with other factors to reduce need for ABPM?

Extension of hypothesis
Derivation and validation data sets

Combines BP and clinical/demographics factors

Blood Pressure Measurement

Predicting Out-of-Office Blood Pressure in the Clinic (PROOF-BP)

Derivation and Validation of a Tool to Improve the Accuracy of Blood Pressure Measurement in Clinical Practice

James P. Sheppard, Richard Stevens, Paramjit Gill, Una Martin, Marshall Godwin, Janet Hanley, Carl Heneghan, F.D. Richard Hobbs, Jonathan Mant, Brian McKinstry, Martin Myers, David Nunan, Alison Ward, Bryan Williams, Richard J. McManus

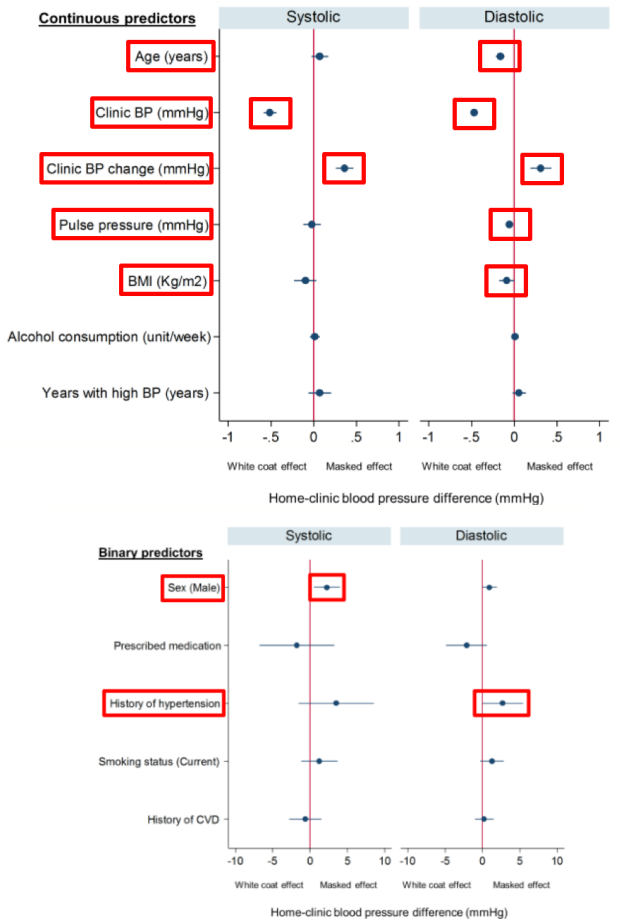
See Editorial Commentary, pp 834–835

Abstract—Patients often have lower (white coat effect) or higher (masked effect) ambulatory/home blood pressure readings compared with clinic measurements, resulting in misdiagnosis of hypertension. The present study assessed whether blood pressure and patient characteristics from a single clinic visit can accurately predict the difference between ambulatory/home and clinic blood pressure readings (the home–clinic difference). A linear regression model predicting the home–clinic blood pressure difference was derived in 2 data sets measuring automated clinic and ambulatory/home blood pressure (n=991) using candidate predictors identified from a literature review. The model was validated in 4 further data sets (n=1172) using area under the receiver operator characteristic curve analysis. A masked effect was associated with male sex, a positive clinic blood pressure change (difference between consecutive measurements during a single visit), and a diagnosis of hypertension. Increasing age, clinic blood pressure level, and pulse pressure were associated with a white coat effect. The model showed good calibration across data sets (Pearson correlation, 0.48–0.80) and performed well-predicting ambulatory hypertension (area under the receiver operator characteristic curve, 0.75; 95% confidence interval, 0.72–0.79 [systolic]; 0.87; 0.85–0.89 [diastolic]). Used as a triaging tool for ambulatory monitoring, the model improved classification of a patient's blood pressure status compared with other guideline recommended approaches (93% [92% to 95%] classified correctly; United States, 73% [70% to 75%]; Canada, 74% [71% to 77%]; United Kingdom, 78% [76% to 81%]). This study demonstrates that patient characteristics from a single clinic visit can accurately predict a patient's ambulatory blood pressure. Usage of this prediction tool for triaging of ambulatory monitoring could result in more accurate diagnosis of hypertension and hence more appropriate treatment. (***Hypertension***. **2016;67:941-950. DOI: 10.1161/HYPERTENSIONAHA.115.07108.)** • **Online Data Supplement**

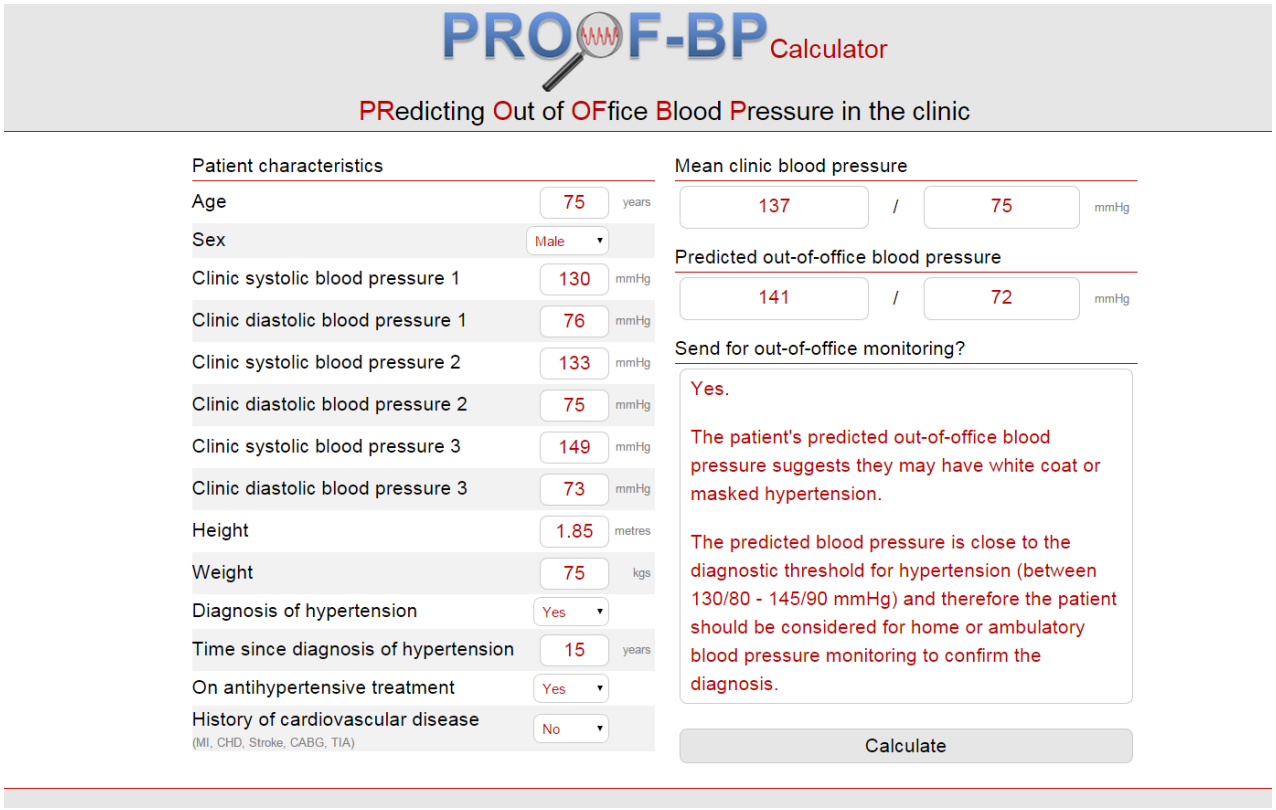
Results

Significant predictors of the home-clinic BP difference:

- Clinic blood pressure change
- Plus age, sex, mean clinic blood pressure, pulse pressure, BMI, and history of hypertension

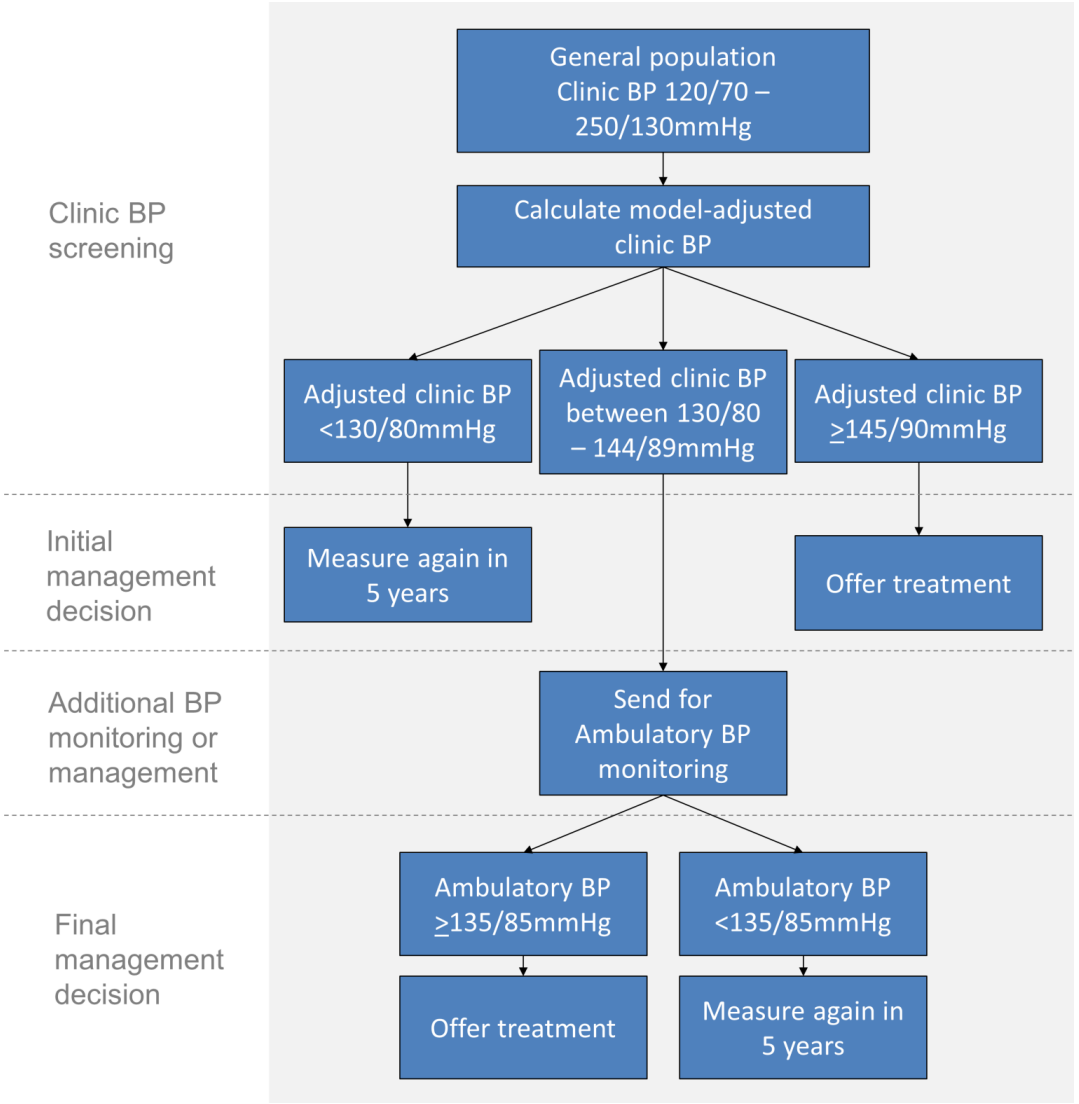


PROOF-BP online calculator



https://sentry.phc.ox.ac.uk/proof-bp/

Proposed Algorithm



How does it compare to existing strategies for diagnosis?

Guideline (year)	Sustained hyper-tensive	Normo-tensive	White coat hyper-tensive	Masked hyper-tensive	Correctly classified	Referral for ABPM
AHA (2005)	625 (57%)	173 (16%)	178 (16%)	124 (11%)	798 (73%)	0 (0%)
CHEP (2014)	642 (58%)	172 (16%)	179 (16%)	107 (10%)	814 (74%)	0 (0%)
ESH (2013)	596 (54%)	203 (18%)	148 (13%)	151 (14%)	799 (73%)	0 (0%)
NICE (2011)	513 (47%)	349 (32%)	2 (0.2%)	236 (21%)	862 (78%)	590 (54%)
PROOF-BP (2015)	720 (65%)	306 (28%)	45 (4%)	29 (3%)	1,026 (93%)	640 (58%)

What about guiding treatment?

Efficacy of self-monitored blood pressure, with or without telemonitoring, for titration of antihypertensive medication (TASMINH4): an unmasked randomised controlled trial

*Richard J McManus, Jonathan Mant, Marloes Franssen, Alecia Nickless, Claire Schwartz, James Hodgkinson, Peter Bradburn, Andrew Farmer, Sabrina Grant, Sheila M Greenfield, Carl Heneghan, Susan Jowett, Una Martin, Siobhan Milner, Mark Monahan, Sam Mort, Emma Ogburn, Rafael Perera-Salazar, Syed Ahmar Shah, Ly-Mee Yu, Lionel Tarassenko, F D Richard Hobbs, on behalf of the TASMINH4 investigators**

Summary

Background Studies evaluating titration of antihypertensive medication using self-monitoring give contradictory findings and the precise place of telemonitoring over self-monitoring alone is unclear. The TASMINH4 trial aimed to assess the efficacy of self-monitored blood pressure, with or without telemonitoring, for antihypertensive titration in primary care, compared with usual care.

Published Online
February 27, 2018
http://dx.doi.org/10.1016/S0140-6736(18)30309-X

See Online/Comment

TASMINH4 Results

	Baseline	6 months	12 months	6-month adjusted mean difference (95% CI, p value*) *vs* usual care	12-month adjusted mean difference (95% CI, p value*) *vs* usual care
Systolic blood pressure (mm Hg)					
Telemonitoring group	153·2 (14·3); n=389	139·0 (16·8); n=338	136·0 (16·1); n=327	−3·7 (−5·9 to −1·5), p=0·0012	−4·7 (−7·0 to −2·4), p<0·0001
Self-monitoring group	152·9 (13·6); n=391	140·4 (15·7); n=349	137·0 (16·7); n=328	−2·1 (−4·3 to 0·1), p=0·0584	−3·5 (−5·8 to −1·2), p=0·0029
Usual care group	153·1 (14·0); n=393	142·5 (15·4); n=358	140·4 (16·5); n=348	..	..
Diastolic blood pressure (mm Hg)					
Telemonitoring group	85·5 (10·0); n=389	79·8 (9·9); n=338	78·7 (9·7); n=328	−1·2 (−2·4 to −0·01), p=0·0482	−1·3 (−2·5 to −0·02), p=0·0482
Self-monitoring group	85·1 (10·5); n=391	80·3 (10·7); n=349	77·8 (10·1); n=328	−0·1 (−1·3 to 1·07), p=0·8421	−1·5 (−2·7 to −0·2), p=0·0209
Usual care group	86·0 (10·3); n=393	81·1 (10·9); n=358	79·9 (10·7); n=348	..	..

Data are mean (SD), unless otherwise stated. *Significant at p<0·017.

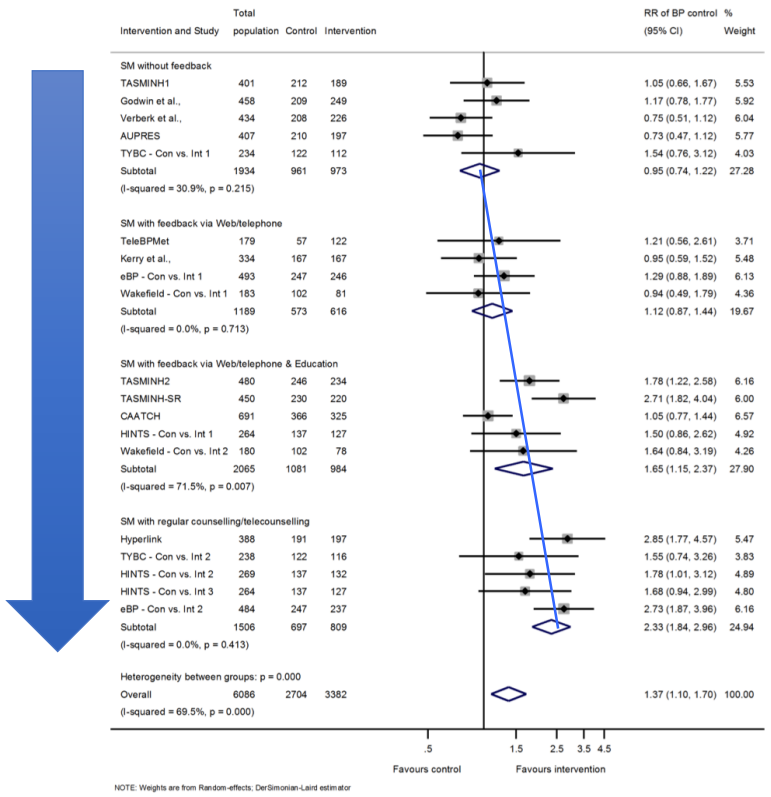
Table 2: **Mean blood pressure at baseline, 6 months, and 12 months for each group**

No differences in adverse events

Self-monitoring & co-interventions

- IPD from 25 trials
- Increasing intensity of co-intervention leads to increased efficacy

BP-SMART collaboration
PLOS medicine 2017



Conclusions – measurement and diagnosis

- Major guidelines now recommend out-of-office measurement for both diagnosis and ongoing management
- Ambulatory monitoring gold standard for diagnosis but not available for/tolerated by all
- Routine clinic BP is not the same as in the trials
- PROOF BP suggests one way of reducing need for ABPM
- Home monitoring now has firm evidence base for ongoing management

What should we be aiming for in treatment?

Targets SBP <140mmHg

Recommendations	Class[a]	Level[b]	Ref.[c]
A SBP goal <140 mmHg:			
a) is recommended in patients at low–moderate CV risk;	I	B	266, 269, 270
b) is recommended in patients with diabetes;	I	A	270, 275, 276
c) should be considered in patients with previous stroke or TIA;	IIa	B	296, 297
d) should be considered in patients with CHD;	IIa	B	141, 265
e) should be considered in patients with diabetic or non-diabetic CKD.	IIa	B	312, 313
In elderly hypertensives less than 80 years old with SBP ≥160 mmHg there is solid evidence to recommend reducing SBP to between 150 and 140 mmHg.	I	A	265
In fit elderly patients less than 80 years old SBP values <140 mmHg may be considered, whereas in the fragile elderly population SBP goals should be adapted to individual tolerability.	IIb	C	-
In individuals older than 80 years and with initial SBP ≥160 mmHg, it is recommended to reduce SBP to between 150 and 140 mmHg provided they are in good physical and mental conditions.	I	B	287

ESH and ESC Guidelines

2013 ESH/ESC Guidelines for the management of arterial hypertension

BP Goal for Patients With Hypertension 130/80mmHg

COR	LOE	Recommendations for BP Goal for Patients With Hypertension
I	SBP: B-R[SR]	For adults with confirmed hypertension and known CVD or 10-year ASCVD event risk of 10% or higher a BP target of less than 130/80 mm Hg is recommended.
	DBP: C-EO	
IIb	SBP: B-NR	For adults with confirmed hypertension, without additional markers of increased CVD risk, a BP target of less than 130/80 mm Hg may be reasonable.
	DBP: C-EO	

Whelton PK, et al.
2017 High Blood Pressure Clinical Practice Guideline: Executive Summary

2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

A Randomized Trial of Intensive versus Standard Blood-Pressure Control

The SPRINT Research Group*

ABSTRACT

BACKGROUND

The most appropriate targets for systolic blood pressure to reduce cardiovascular morbidity and mortality among persons without diabetes remain uncertain.

METHODS

We randomly assigned 9361 persons with a systolic blood pressure of 130 mm Hg or higher and an increased cardiovascular risk, but without diabetes, to a systolic blood-pressure target of less than 120 mm Hg (intensive treatment) or a target of less than 140 mm Hg (standard treatment). The primary composite outcome was myocardial infarction, other acute coronary syndromes, stroke, heart failure, or death from cardiovascular causes.

The members of the writing committee (Jackson T. Wright, Jr., M.D., Ph.D., Jeff D. Williamson, M.D., M.H.S., Paul K. Whelton, M.D., Joni K. Snyder, R.N., B.S.N., M.A., Kaycee M. Sink, M.D., M.A.S., Michael V. Rocco, M.D., M.S.C.E., David M. Reboussin, Ph.D., Mahboob Rahman, M.D., Suzanne Oparil, M.D., Cora E. Lewis, M.D., M.S.P.H., Paul L. Kimmel, M.D., Karen C. Johnson, M.D., M.P.H., David C. Goff, Jr., M.D., Ph.D., Lawrence J. Fine, M.D., Dr.P.H., Jeffrey A. Cutler, M.D., M.P.H., William C. Cush-

NEJM 2015

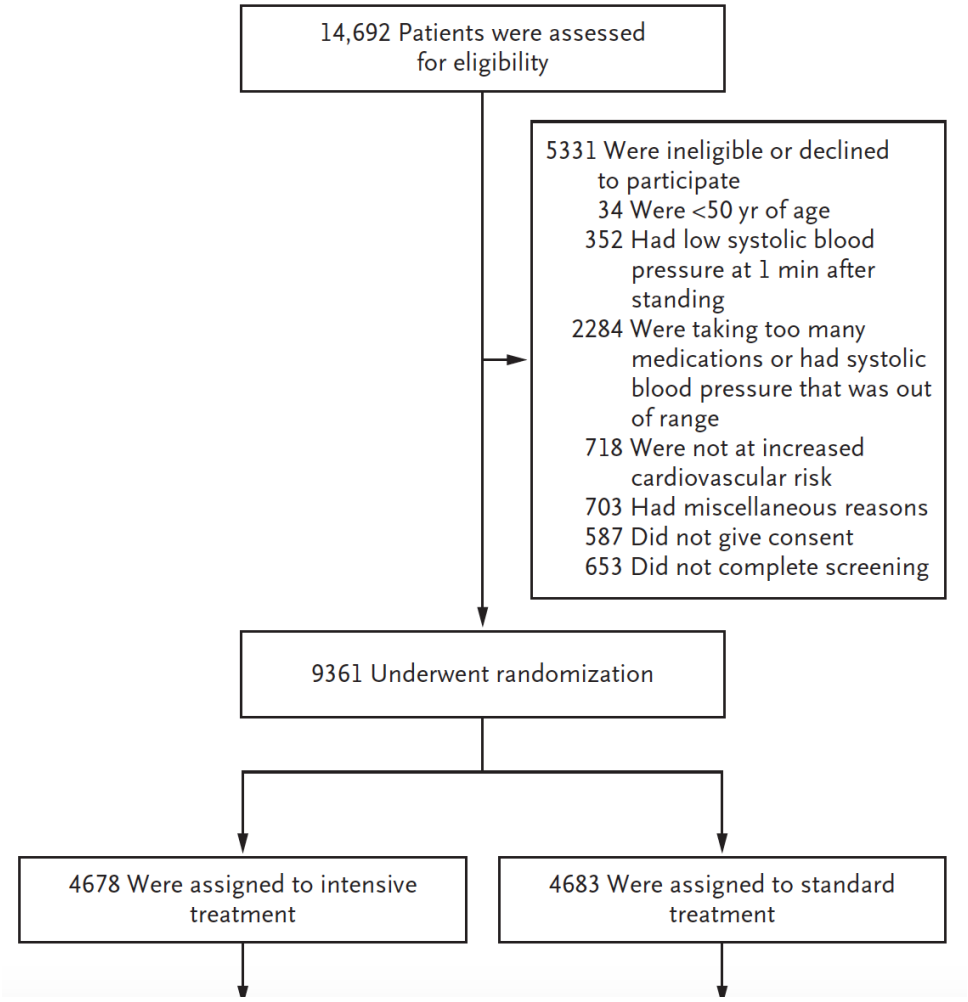
Inclusion & Exclusion

INCLUDED

- Age of at least 50 years,
- SBP 130 to 180 mm Hg (medications <4)
- AND increased risk CVD
  - Clinical or subclinical CVD
  - CKD (eGFR 20 – 60)
  - 10-year CVD risk ≥15%
  - Age ≥75 years

EXCLUDED:

- Diabetes mellitus or prior stroke



Targets

- SBP <120mmHg vs <140mmHg
- Forced UP and DOWN titration to target
- (If SBP <130 once or <135 twice then up titrated in 140mmHg group)

Outcomes

PRIMARY

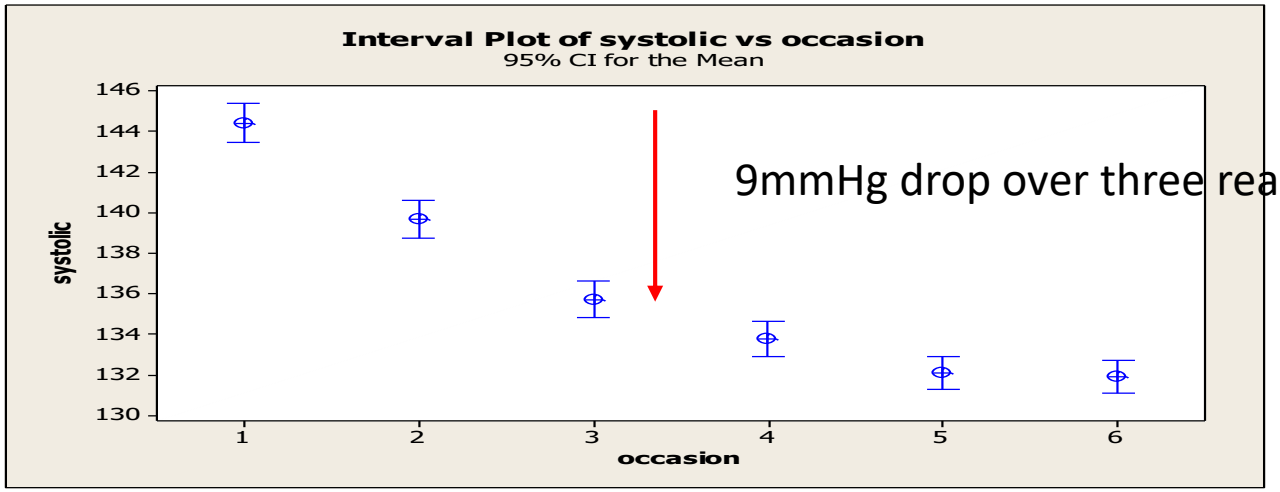
- Composite outcome of myocardial infarction, acute coronary syndrome, stroke, acute heart failure,
  or death from cardiovascular causes.

SECONDARYS included

- Individual components of primary outcome,
- Death from any cause, and the composite of the primary outcome
- or Death from any cause
- Harms

Blood Pressure Measurement

- Automated Clinic BP measurement
- Three readings mostly unattended
- Mean of all three
- Participant rested for 5 minutes



Follow-up

Planned

- 2 years recruitment, 6 years max FU

What happened?

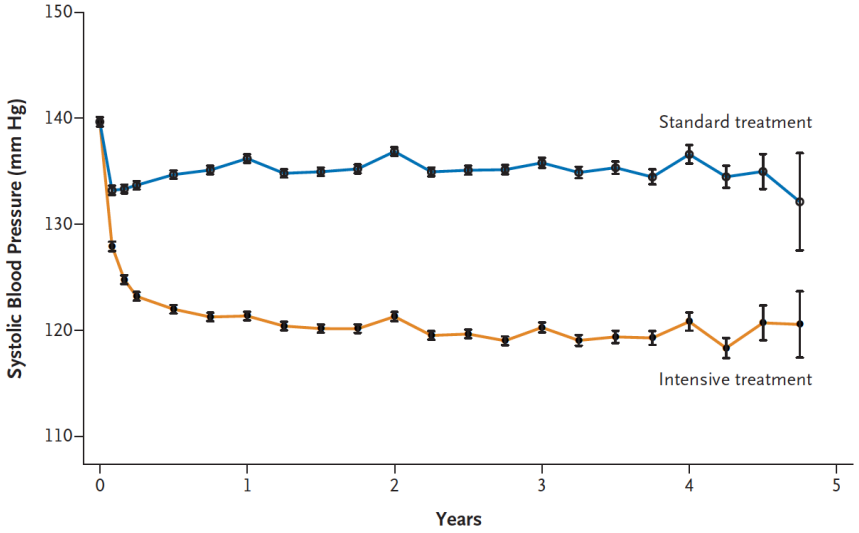
- Trial terminated early
- Median FU 3.6/5 years

How do they compare to your patients?

Characteristic	Intensive Treatment (N = 4678)	Standard Treatment (N = 4683)
Criterion for increased cardiovascular risk — no. (%)†		
Age ≥75 yr	1317 (28.2)	1319 (28.2)
Chronic kidney disease‡	1330 (28.4)	1316 (28.1)
Cardiovascular disease	940 (20.1)	937 (20.0)
Clinical	779 (16.7)	783 (16.7)
Subclinical	247 (5.3)	246 (5.3)
Framingham 10-yr cardiovascular disease risk score ≥15%	2870 (61.4)	2867 (61.2)
Female sex — no. (%)	1684 (36.0)	1648 (35.2)
Age — yr		
Overall	67.9±9.4	67.9±9.5
Among those ≥75 yr of age	79.8±3.9	79.9±4.1
Race or ethnic group — no. (%)§		
Non-Hispanic black	1379 (29.5)	1423 (30.4)
Hispanic	503 (10.8)	481 (10.3)
Non-Hispanic white	2698 (57.7)	2701 (57.7)
Other	98 (2.1)	78 (1.7)
Black race§¶	1454 (31.1)	1493 (31.9)
Baseline blood pressure — mm Hg		
Systolic	139.7±15.8	139.7±15.4
Diastolic	78.2±11.9	78.0±12.0

10% not on anti HT Rx at baseline

Results



Outcome	Intensive Treatment		Standard Treatment		Hazard Ratio (95% CI)	P Value
	no. of patients (%)	*% per year*	*no. of patients (%)*	*% per year*		
All participants	**(N = 4678)**		**(N = 4683)**			
Primary outcome†	243 (5.2)	1.65	319 (6.8)	2.19	0.75 (0.64–0.89)	<0.001
Secondary outcomes						
Myocardial infarction	97 (2.1)	0.65	116 (2.5)	0.78	0.83 (0.64–1.09)	0.19
Acute coronary syndrome	40 (0.9)	0.27	40 (0.9)	0.27	1.00 (0.64–1.55)	0.99
Stroke	62 (1.3)	0.41	70 (1.5)	0.47	0.89 (0.63–1.25)	0.50
Heart failure	62 (1.3)	0.41	100 (2.1)	0.67	0.62 (0.45–0.84)	0.002
Death from cardiovascular causes	37 (0.8)	0.25	65 (1.4)	0.43	0.57 (0.38–0.85)	0.005
Death from any cause	155 (3.3)	1.03	210 (4.5)	1.40	0.73 (0.60–0.90)	0.003
Primary outcome or death	332 (7.1)	2.25	423 (9.0)	2.90	0.78 (0.67–0.90)	<0.001

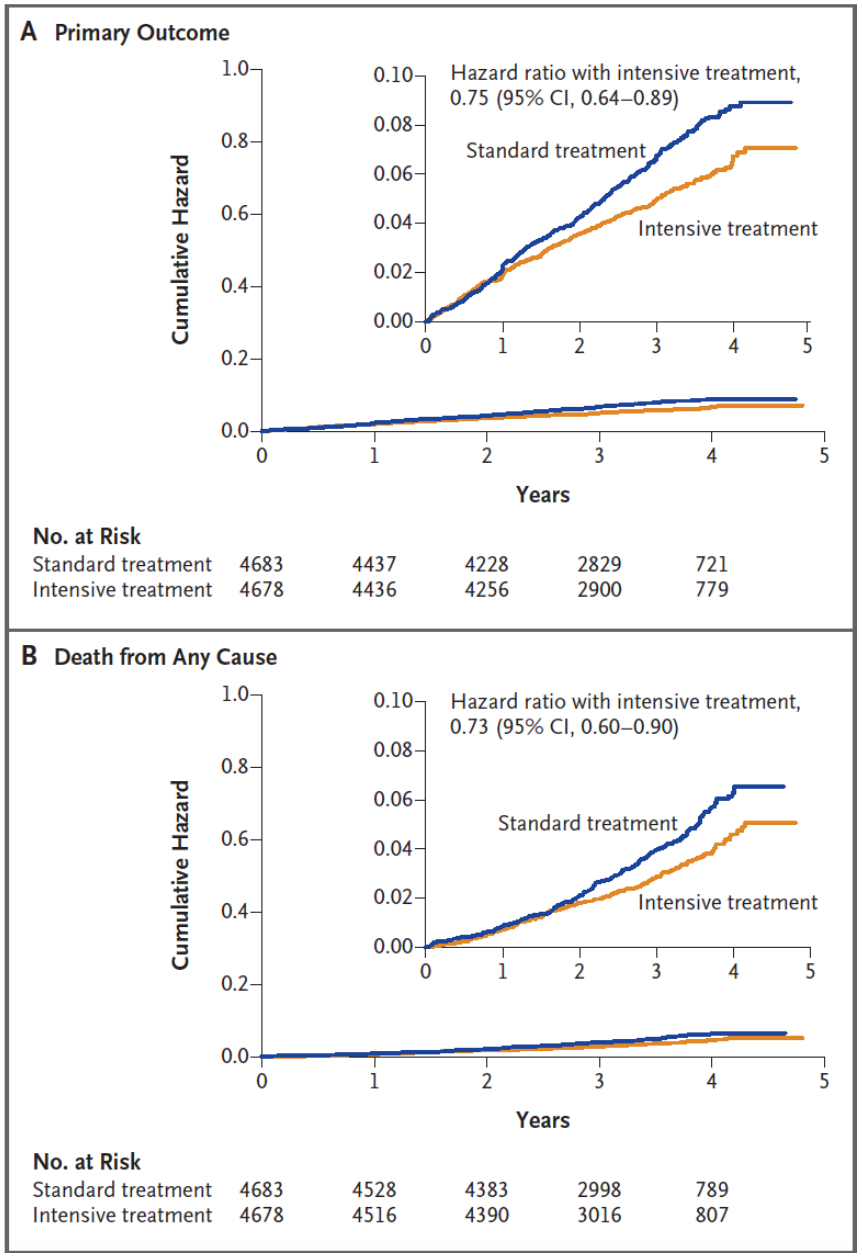
NNT

Primary

- 61
- Separation @1yr

Death any cause

- 90
- Separation @2yrs



Outcomes over 75

	Intensive Treatment		Standard Treatment			
	No. With Outcome Events (n = 1317)[a]	% (95% CI) With Outcome Events/y	No. With Outcome Events (n = 1319)[a]	% (95% CI) With Outcome Events/y	HR (95% CI)[b]	*P* Value
All participants						
Cardiovascular disease primary outcome[c]	102	2.59 (2.13-3.14)	148	3.85 (3.28-4.53)	0.66 (0.51-0.85)	.001
Myocardial infarction (MI)[d]	37	0.92 (0.67-1.27)	53	1.34 (1.02-1.75)	0.69 (0.45-1.05)	.09
ACS not resulting in MI[d]	17	0.42 (0.26-0.68)	17	0.42 (0.26-0.68)	1.03 (0.52-2.04)	.94
Stroke[d]	27	0.67 (0.46-0.97)	34	0.85 (0.61-1.19)	0.72 (0.43-1.21)	.22
Heart failure[d]	35	0.86 (0.62-1.20)	56	1.41 (1.09-1.83)	0.62 (0.40-0.95)	.03
Cardiovascular disease death[d]	18	0.44 (0.28-0.70)	29	0.72 (0.50-1.03)	0.60 (0.33-1.09)	.09
Nonfatal MI	37	0.92 (0.67-1.27)	53	1.34 (1.02-1.75)	0.69 (0.45-1.05)	.09
Nonfatal stroke	25	0.62 (0.42-0.91)	33	0.83 (0.59-1.16)	0.68 (0.40-1.15)	.15
Nonfatal heart failure	35	0.86 (0.62-1.20)	55	1.39 (1.06-1.81)	0.63 (0.40-0.96)	.03
All-cause mortality	73	1.78 (1.41-2.24)	107	2.63 (2.17-3.18)	0.67 (0.49-0.91)	.009
Primary outcome plus all-cause mortality	144	3.64 (3.09-4.29)	205	5.31 (4.63-6.09)	0.68 (0.54-0.84)	<.001

Renal outcomes similar to all participants

Adverse Events

Variable	Intensive Treatment (N = 4678)	Standard Treatment (N = 4683)	Hazard Ratio	P Value
	no. of patients (%)			
Serious adverse event*	1793 (38.3)	1736 (37.1)	1.04	0.25
Conditions of interest				
Serious adverse event only				
Hypotension	110 (2.4)	66 (1.4)	1.67	0.001
Syncope	107 (2.3)	80 (1.7)	1.33	0.05
Bradycardia	87 (1.9)	73 (1.6)	1.19	0.28
Electrolyte abnormality	144 (3.1)	107 (2.3)	1.35	0.02
Injurious fall†	105 (2.2)	110 (2.3)	0.95	0.71
Acute kidney injury or acute renal failure‡	193 (4.1)	117 (2.5)	1.66	<0.001
Emergency department visit or serious adverse event				
Hypotension	158 (3.4)	93 (2.0)	1.70	<0.001
Syncope	163 (3.5)	113 (2.4)	1.44	0.003
Bradycardia	104 (2.2)	83 (1.8)	1.25	0.13
Electrolyte abnormality	177 (3.8)	129 (2.8)	1.38	0.006
Injurious fall†	334 (7.1)	332 (7.1)	1.00	0.97
Acute kidney injury or acute renal failure‡	204 (4.4)	120 (2.6)	1.71	<0.001

Adverse Events (2)

Variable	Intensive Treatment (N = 4678)	Standard Treatment (N = 4683)	Hazard Ratio	P Value
	no. of patients (%)			
Monitored clinical events				
Adverse laboratory measure§				
Serum sodium <130 mmol/liter	180 (3.8)	100 (2.1)	1.76	<0.001
Serum sodium >150 mmol/liter	6 (0.1)	0		0.02
Serum potassium <3.0 mmol/liter	114 (2.4)	74 (1.6)	1.50	0.006
Serum potassium >5.5 mmol/liter	176 (3.8)	171 (3.7)	1.00	0.97
Orthostatic hypotension¶				
Alone	777 (16.6)	857 (18.3)	0.88	0.01
With dizziness	62 (1.3)	71 (1.5)	0.85	0.35

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

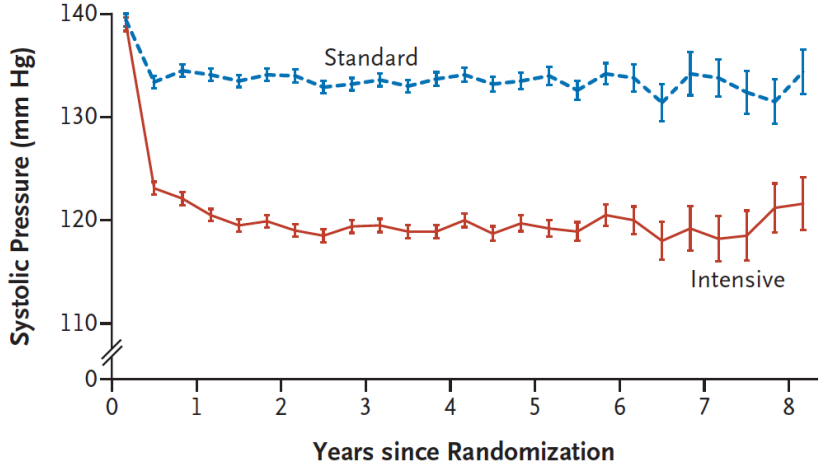
Effects of Intensive Blood-Pressure Control in Type 2 Diabetes Mellitus

The ACCORD Study Group*

Essentially SPRINT in type 2 Diabetes

NEJM 2010

Outcomes



Outcome	Intensive Therapy (N=2363)		Standard Therapy (N=2371)		Hazard Ratio (95% CI)	P Value
	no. of events	*%/yr*	*no. of events*	*%/yr*		
Primary outcome*	208	1.87	237	2.09	0.88 (0.73–1.06)	0.20
Prespecified secondary outcomes						
Nonfatal myocardial infarction	126	1.13	146	1.28	0.87 (0.68–1.10)	0.25
Stroke						
Any	36	0.32	62	0.53	0.59 (0.39–0.89)	0.01
Nonfatal	34	0.30	55	0.47	0.63 (0.41–0.96)	0.03
Death						
From any cause	150	1.28	144	1.19	1.07 (0.85–1.35)	0.55
From cardiovascular cause	60	0.52	58	0.49	1.06 (0.74–1.52)	0.74

Primary = nonfatal myocardial infarction, nonfatal stroke, or death from cardiovascular causes. The mean follow-up was 4.7 years.

Harms

Variable	Intensive Therapy (N=2362)	Standard Therapy (N=2371)	P Value
Serious adverse events — no. (%)†			
Event attributed to blood-pressure medications	77 (3.3)	30 (1.27)	<0.001
Hypotension	17 (0.7)	1 (0.04)	<0.001
Syncope	12 (0.5)	5 (0.21)	0.10
Bradycardia or arrhythmia	12 (0.5)	3 (0.13)	0.02
Hyperkalemia	9 (0.4)	1 (0.04)	0.01
Angioedema	6 (0.3)	4 (0.17)	0.55
Renal failure	5 (0.2)	1 (0.04)	0.12
End-stage renal disease or need for dialysis	59 (2.5)	58 (2.4)	0.93
Symptoms affecting quality of life — no./total no. (%)‡			
Hives or swelling	44/501 (8.8)	41/468 (8.8)	1.00
Dizziness when standing	217/501 (44.3)	188/467 (40.3)	0.36

Blood-pressure targets in patients with recent lacunar stroke: the SPS3 randomised trial

*The SPS3 Study Group**

Summary

Background Lowering of blood pressure prevents stroke but optimum target levels to prevent recurrent stroke are unknown. We investigated the effects of different blood-pressure targets on the rate of recurrent stroke in patients with recent lacunar stroke.

Methods In this randomised open-label trial, eligible patients lived in North America, Latin America, and Spain and had recent, MRI-defined symptomatic lacunar infarctions. Patients were recruited between March, 2003, and April, 2011, and randomly assigned, according to a two-by-two multifactorial design, to a systolic-blood-pressure target of 130–149 mm Hg or less than 130 mm Hg. The primary endpoint was reduction in all stroke (including ischaemic strokes and intracranial haemorrhages). Analysis was done by intention to treat. This study is registered with ClinicalTrials.gov, number NCT 00059306.

Lancet 2013; 382: 507–15

Published Online
May 29, 2013
http://dx.doi.org/10.1016/S0140-6736(13)60852-1

This online publication has been corrected. The corrected version first appeared at thelancet.com on August 9, 2013

See Comment page 482

*Members listed at end of paper

Correspondence to:

SPS3

Lancet 2013

Inclusion / exclusion

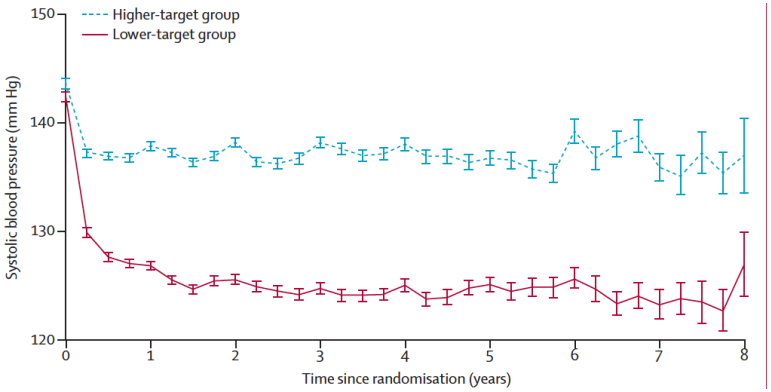
- ≥30 years
- Normotensive or hypertensive,
- Recent symptomatic, MRI-confirmed lacunar stroke,
- **Without**: Carotid Artery stenosis, disabling stroke, haemorrhage or cortical stroke

Targets

SBP 130–149 mm Hg vs <130 mm Hg.

- Forced UP and DOWN titration to target
- Third as many participants (3020)

Outcomes



	Higher-target group (n=1519)		Lower-target group (n=1501)		Hazard ratio (95% CI)	p value
	Number of patients	Rate (% per patient-year)	Number of patients	Rate (% per patient-year)		
Stroke						
All stroke	152	2·77%	125	2·25%	0·81 (0·64–1·03)	0·08
Ischaemic stroke or unknown	131	2·4%	112	2·0%	0·84 (0·66–1·09)	0·19
Intracranial haemorrhage						
All	21*	0·38%	13†	0·23%	0·61 (0·31–1·22)	0·16
Myocardial infarction	40	0·70%	36	0·62%	0·88 (0·56–1·39)	0·59
Major vascular event*	188	3·46%	160	2·91%	0·84 (0·68–1·04)	0·10
Deaths						
All	101	1·74%	106	1·80%	1·03 (0·79–1·35)	0·82

Harms

	Higher-target group (n=1519)		Lower-target group (n=1501)		Hazard ratio (95% CI)	p value
	Number of patients	Rate (% per patient-year)	Number of patients	Rate (% per patient-year)		
All	15	0·26	23	0·40	1·53 (0·80–2·93)	0·20
Orthostatic syncope	5	0·09	11	0·19	2·18 (0·76–6·27)	0·14
Stroke associated with hypotension	1	0·02	2	0·03	2·00 (0·18–22·09)	0·57
Myocardial infarction	0	0	0	0	NA	NA
Fall with injury	0	0	3	0·052	NA	NA
Other	11	0·19	9	0·15	0·82 (0·34–1·97)	0·65

HOPE3

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 MAY 26, 2016 VOL. 374 NO. 21

Blood-Pressure Lowering in Intermediate-Risk Persons without Cardiovascular Disease

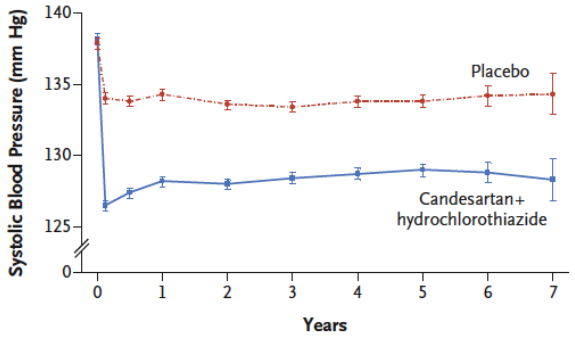
Eva M. Lonn, M.D., Jackie Bosch, Ph.D., Patricio López-Jaramillo, M.D., Ph.D., Jun Zhu, M.D., Lisheng Liu, M.D., Prem Pais, M.D., Rafael Diaz, M.D., Denis Xavier, M.D., Karen Sliwa, M.D., Ph.D., Antonio Dans, M.D., Alvaro Avezum, M.D., Ph.D., Leopoldo S. Piegas, M.D., Ph.D., Katalin Keltai, M.D., Ph.D., Matyas Keltai, M.D., Ph.D., Irina Chazova, M.D., Ph.D., Ron J.G. Peters, M.D., Ph.D., Claes Held, M.D., Ph.D., Khalid Yusoff, M.D., Basil S. Lewis, M.D., Petr Jansky, M.D., Alexander Parkhomenko, M.D., Ph.D., Kamlesh Khunti, M.D., Ph.D., William D. Toff, M.D., Christopher M. Reid, Ph.D., John Varigos, B.Sc., Lawrence A. Leiter, M.D., Dora I. Molina, M.D., Robert McKelvie, M.D., Ph.D., Janice Pogue, Ph.D.,* Joanne Wilkinson, B.A., Hyejung Jung, M.Sc., Gilles Dagenais, M.D., and Salim Yusuf, M.B., B.S., D.Phil., for the HOPE-3 Investigators†

Methods

- N= 12,703; intermediate risk without CVD
- Men aged ≥55, women ≥65
- Plus at least one of: raised hip/waist ratio, low HDL, smoker, dysglycaemia, FH premature CVD, CKD3
- No clear indication for antiHT Rx or statins
- Intervention ARB/Thiazide (candesartan/HCZ)
- Co-primary MACE; Median follow-up 5.6 yrs

Results

Characteristic	Candesartan + Hydrochlorothiazide (N = 6356)	Placebo (N = 6349)
Age — yr	65.7±6.4	65.8±6.4
Female sex — no. (%)	2910 (45.8)	2964 (46.7)
Cardiovascular risk factor — no. (%)		
Elevated waist-to-hip ratio	5511 (86.7)	5523 (87.0)
Recent or current smoking	1782 (28.0)	1742 (27.4)
Low concentration of HDL cholesterol	2297 (36.1)	2291 (36.1)
Impaired fasting glucose or impaired glucose tolerance	799 (12.6)	817 (12.9)
Early diabetes mellitus	386 (6.1)	345 (5.4)
Family history of premature coronary heart disease	1668 (26.2)	1667 (26.3)
Early renal dysfunction	184 (2.9)	166 (2.6)
Hypertension	2398 (37.7)	2416 (38.1)
Blood pressure — mm Hg		
Systolic	138.2±14.7	137.9±14.8
Diastolic	82.0±9.4	81.8±9.3



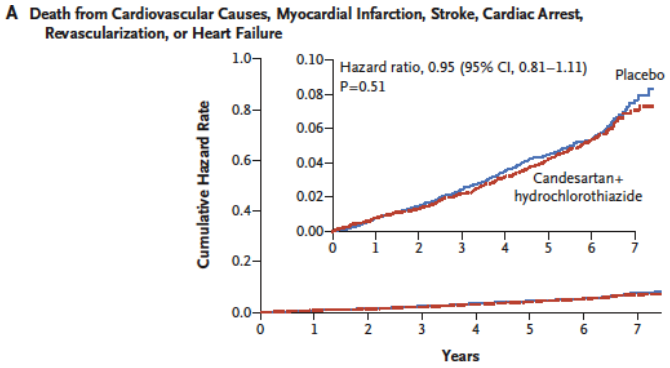
No. at Risk

Candesartan+hydrochlorothiazide	6356	5907	5667	5446	5213	3862	1437	350
Placebo	6347	5879	5623	5442	5186	3822	1424	334

Figure 1. Systolic Blood Pressure over the Course of the Trial, According to Trial Group.

I bars represent 95% confidence intervals.

Primary Outcomes



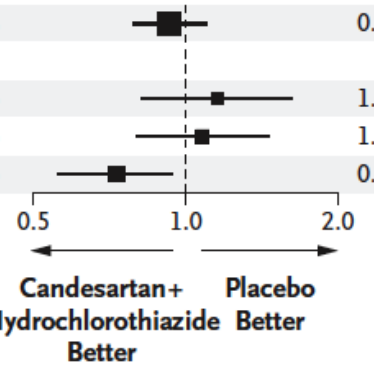
Outcome	Candesartan + Hydrochlorothiazide (N = 6356)	Placebo (N = 6349)	Hazard Ratio (95% CI)	P Value
Coprimary outcomes — no. (%)				
First coprimary outcome	260 (4.1)	279 (4.4)	0.93 (0.79–1.10)	0.40
Second coprimary outcome	312 (4.9)	328 (5.2)	0.95 (0.81–1.11)	0.51
Secondary outcomes — no. (%)				
First secondary outcome†	335 (5.3)	364 (5.7)	0.92 (0.79–1.06)	0.26
Fatal or nonfatal stroke	75 (1.2)	94 (1.5)	0.80 (0.59–1.08)	0.14

- **First coprimary**: composite of cardiovascular death, nonfatal myocardial infarction or nonfatal stroke;
- **Second coprimary**: composite of cardiovascular death, nonfatal myocardial infarction, nonfatal stroke, resuscitated cardiac arrest, heart failure, or revascularization;
- **First secondary:** composite of cardiovascular death, nonfatal myocardial infarction, nonfatal stroke, resuscitated cardiac arrest, heart failure, revascularization, or angina with objective evidence of ischemia.

HOPE3 Subgroups

A First Coprimary Outcome

Subgroup	Mean Systolic Blood Pressure	Difference in Blood Pressure	Candesartan+ Hydrochlorothiazide	Placebo	Hazard Ratio (95% CI)	P Value for Trend
	mm Hg		*no. of events/total no. of participants (%)*			
Overall	138.1	6.0/3.0	260/6356 (4.1)	279/6349 (4.4)	0.93 (0.79–1.10)	—
Systolic blood pressure						0.02
≤131.5 mm Hg	122.2	6.1/3.1	70/2080 (3.4)	62/2122 (2.9)	1.16 (0.82–1.63)	
131.6–143.5 mm Hg	137.6	5.6/2.7	87/2120 (4.1)	81/2141 (3.8)	1.08 (0.80–1.46)	
>143.5 mm Hg	154.1	5.8/3.0	103/2156 (4.8)	136/2084 (6.5)	0.73 (0.56–0.94)	



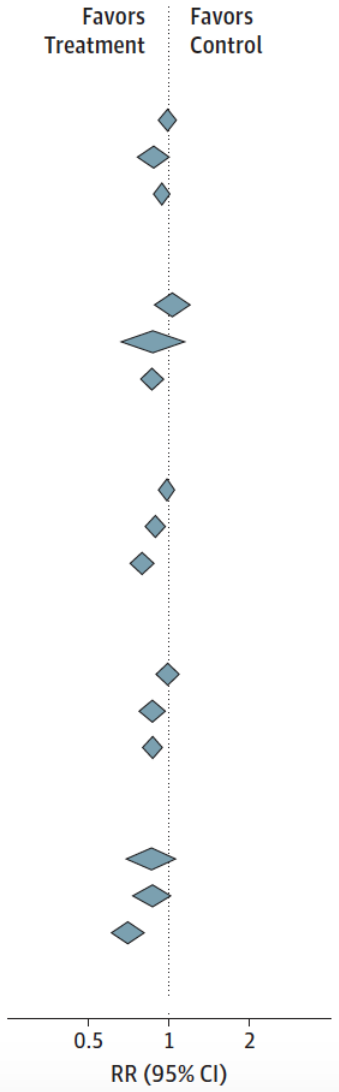
Mean, 154.1± 8.9 mm Hg

How can we make sense of this?

Brunstrom SR JAMA 2017

PRIMARY PREVENTION

Baseline SBP, mm Hg	No. of Events/ Participants/Trials	RR (95% CI)	Heterogeneity I^2 Value, %
All-cause mortality			
<140	4897/68816/16	0.98 (0.90-1.06)	11.6
140-159	2731/41049/15	0.87 (0.75-1.00)	43.2
≥160	4361/79900/18	0.93 (0.87-1.00)	17.0
SBP interaction, $P = .18$			
Cardiovascular mortality			
<140	2633/66480/12	1.03 (0.87-1.20)	43.4
140-159	1465/42587/15	0.86 (0.65-1.14)	57.9
≥160	2290/78789/17	0.85 (0.77-0.95)	18.0
SBP interaction, $P = .02$			
Major cardiovascular events			
<140	7354/67928/13	0.97 (0.90-1.04)	30.6
140-159	3951/43489/16	0.88 (0.80-0.96)	31.0
≥160	4627/77733/16	0.78 (0.70-0.87)	53.8
SBP interaction, $P = .004$			
Coronary heart disease			
<140	1618/62617/11	0.98 (0.88-1.09)	0.0
140-159	1369/42543/14	0.86 (0.76-0.96)	0.0
≥160	2018/78617/17	0.86 (0.78-0.94)	0.0
SBP interaction, $P = .13$			
Stroke			
<140	1775/62751/11	0.85 (0.68-1.06)	54.1
140-159	1429/41641/13	0.86 (0.72-1.01)	21.4
≥160	1929/79900/18	0.69 (0.60-0.80)	47.3
SBP interaction, $P = .16$			



Conundrums & Conclusions

- SPRINT results clear:
  - 130/80mmHg threshold but 90% already Rxd
  - Consistent benefit across subgroups
  - If anything older & frailer groups did better
  - AOBP measurement
- Consistent point estimates with ACCORD & SPS3 which may have been underpowered
- HOPE 3 suggests treatment below 140/90mmHg in intermediate risk not helpful
- Brunstrom‘s Systematic Review does not support treatment below 140/90mmHg for primary prevention

Bottom line

Summary

- Hypertension thresholds largely arbitrary based on risk and evidence of benefit
- Out of office measurement now recommended for diagnosis and management of hypertension
- You don't need to do an ABPM on everyone and
  Home monitoring now has evidence base for long term FU
- SPRINT shows intensive treatment can work but leaves many unanswered questions
- HOPE3 suggests current thresholds for treatment appropriate in primary prevention
- New US guidelines redefine hypertension and treatment targets but European response to them awaited (2018 ESH/ESC conferences)

What do you think?

NUFFIELD DEPARTMENT OF
PRIMARY CARE
HEALTH SCIENCES

UNIVERSITY OF
OXFORD

What's the evidence, why do guidelines differ, and what should the GP do?

Richard McManus

Barcelona 2018