SFKF

Lunchwebinar

6 December 2022

NYHETER OM HYPERTONI OCH VASKULÄRT ÅLDRANDE

Peter M Nilsson, MD, PhD, Professor

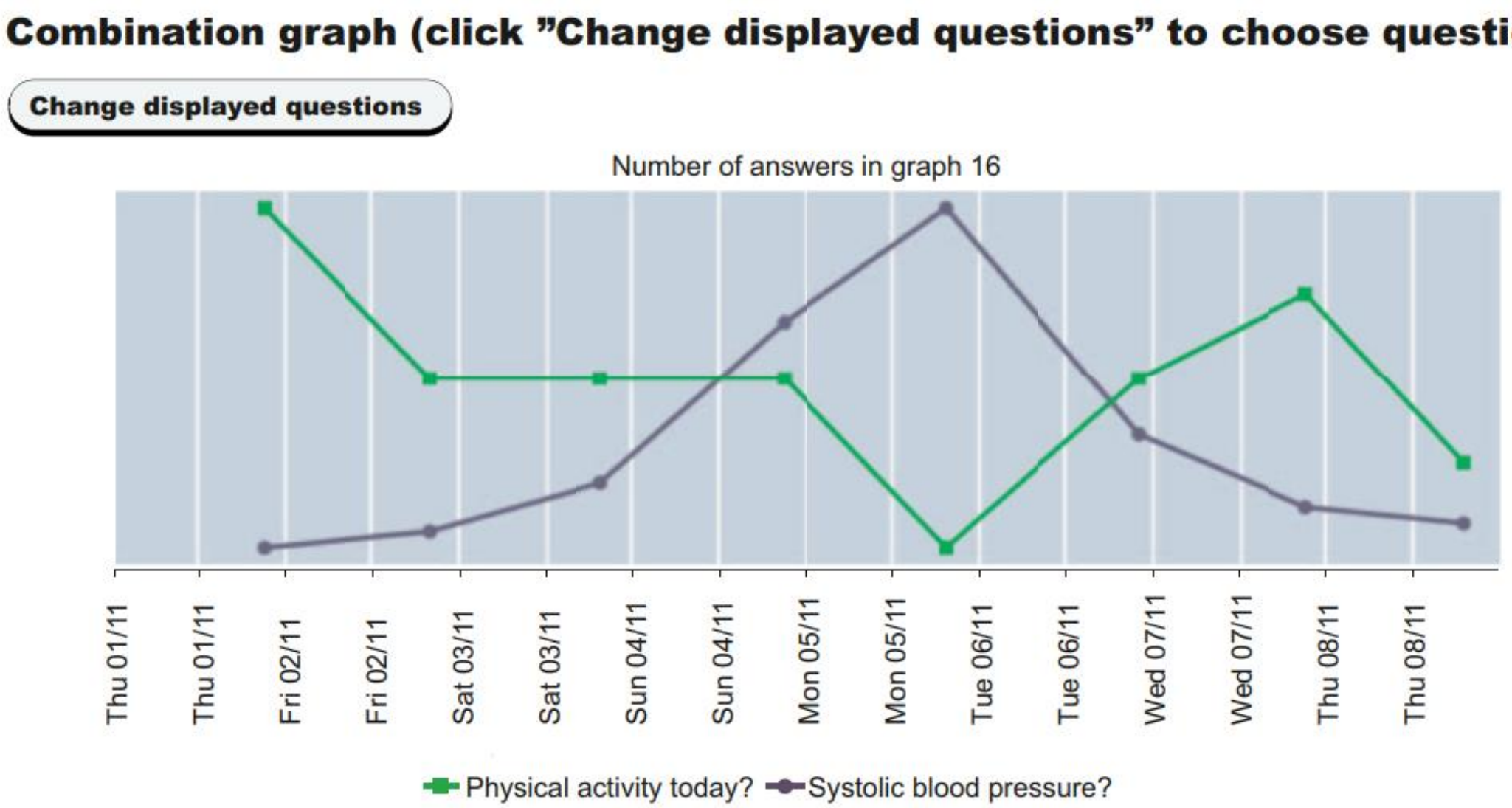
Klinisk Forskningsenhet, VO Internmedicin

Ints. Kliniska vetenskaper, LU, SUS Malmö

Disposition

- Nyheter om hypertoni och tidpunkt för medicinering
- Nyheter om vaskulärt åldrande, artärstyvhet (PWV)
- Programmering tidigt i livet för kardiovaskulär hälsa

PERHIT Study. Recruitment of treated HT patients from Swedish PHC. Home-BP measurements and registration of activities



Andersson U, *et al.* J Hypertens. 2022, Nov online

PERHIT

PERson-centredness in Hypertension management using Information Technology: a randomized controlled trial in primary care

Ulrika Andersson
Lunds universitet

	Visit	Intervention [*n* (%)]	Control [*n* (%)]	*P* value
BP <140/90 mmHg	Baseline	171/482 (35.5)	165/467 (35.3)	0.963
	8 weeks	226/463 (48.8)	181/454 (39.9)	**0.006**
	12 months	208/442 (47.1)	172/420 (41.0)	0.071
SBP <140 mmHg	Baseline	191/482 (39.6)	182/467 (39.0)	0.837
	8 weeks	254/463 (54.9)	198/454 (43.6)	**<0.001**
	12 months	225/442 (50.9)	195/420 (46.4)	0.189
DBP <90 mmHg	Baseline	331/482 (68.7)	299/467 (64.0)	0.130
	8 weeks	331/463 (71.5)	314/454 (69.2)	0.440
	12 months	325/442 (73.5)	299/420 (71.2)	0.443

BP, blood pressure. Bold text indicates significant *P*-values.

A total of **862** HT patients from PHC completed the trial, **442 in the intervention group** and **420 in the control group.** The primary outcome (BP <140/90 mmHg) at 8 weeks was achieved by 48.8% in the intervention group and 39.9% in the control group (P < 0.006).

Andersson U, *et al.* J Hypertens. 2022, Nov online

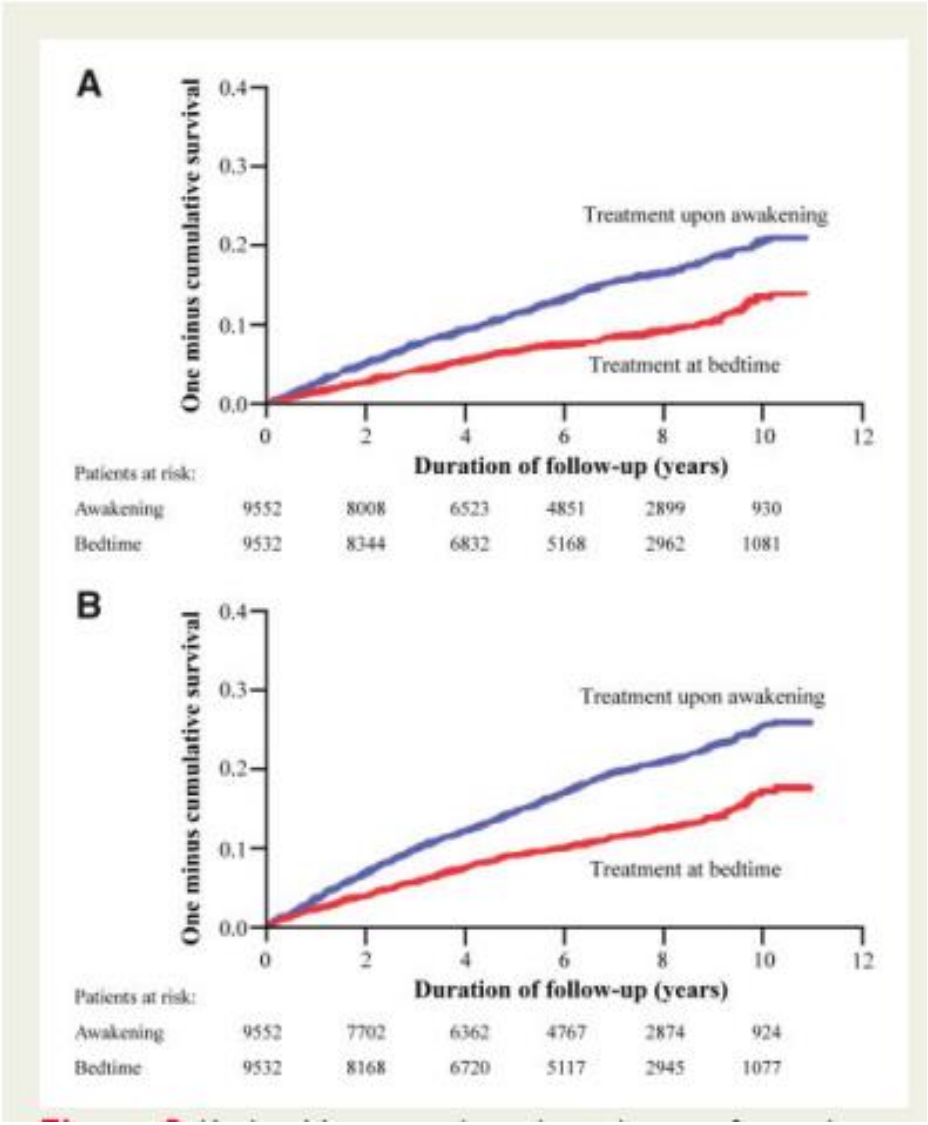
Bedtime hypertension treatment improves cardiovascular risk reduction: the Hygia Chronotherapy Trial

Ramon Hermida
University of Vigo
Spain

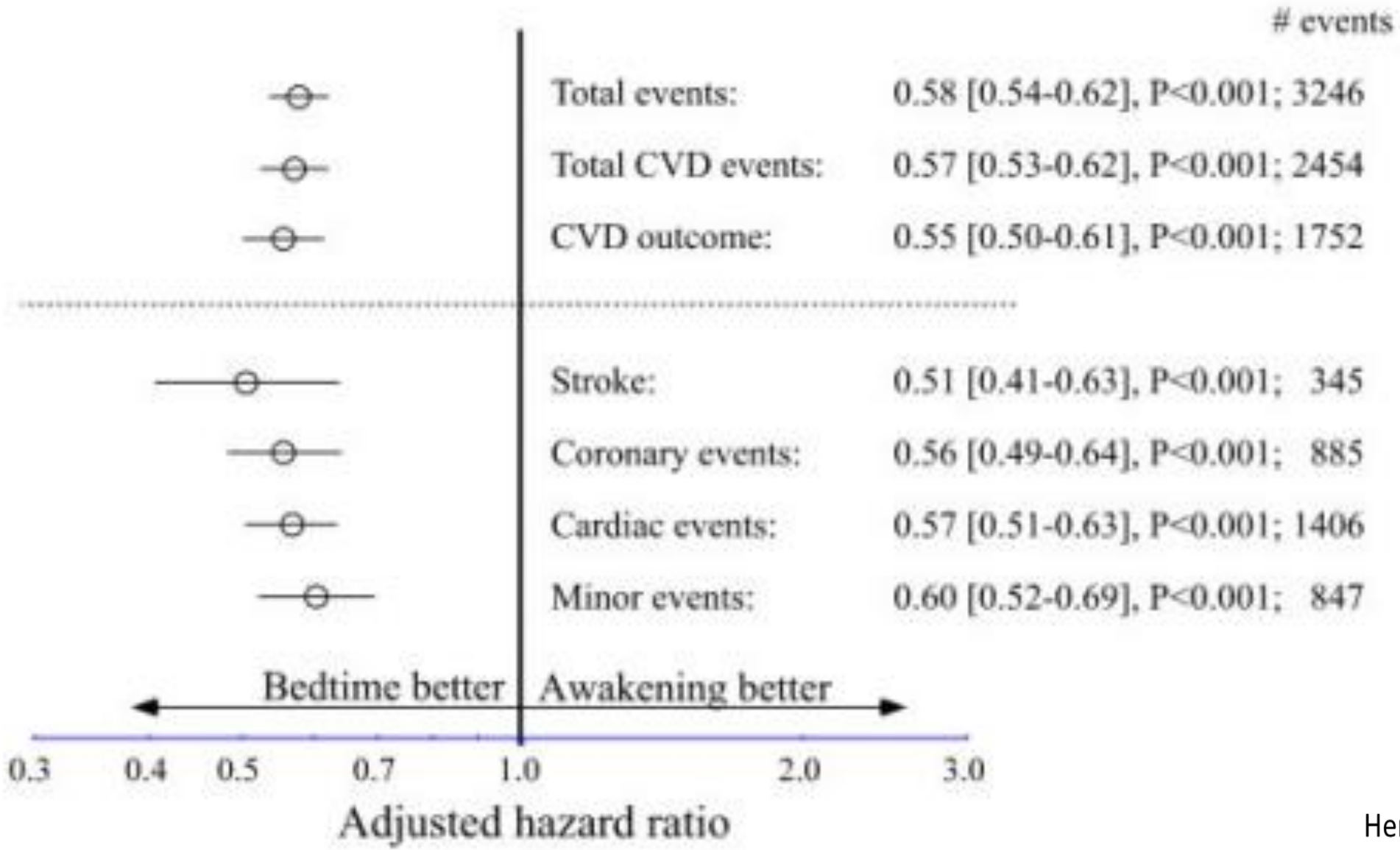
Cardiovascular disease outcome as a function of hypertension treatment-time regimen (either upon **awakening** or at **bedtime)**.

(A) Cardiovascular disease outcome: composite of cardiovascular disease death, myocardial infarction, coronary revascularization, heart failure, and stroke; log-rank: 140.1, P< 0.001.

(B) Total cardiovascular disease events: composite of cardiovascular disease death, myocardial infarction, coronary revascularization, heart failure, stroke, angina pectoris, peripheral artery disease, and transient ischaemic attack; log-rank: 174.0, P< 0.001

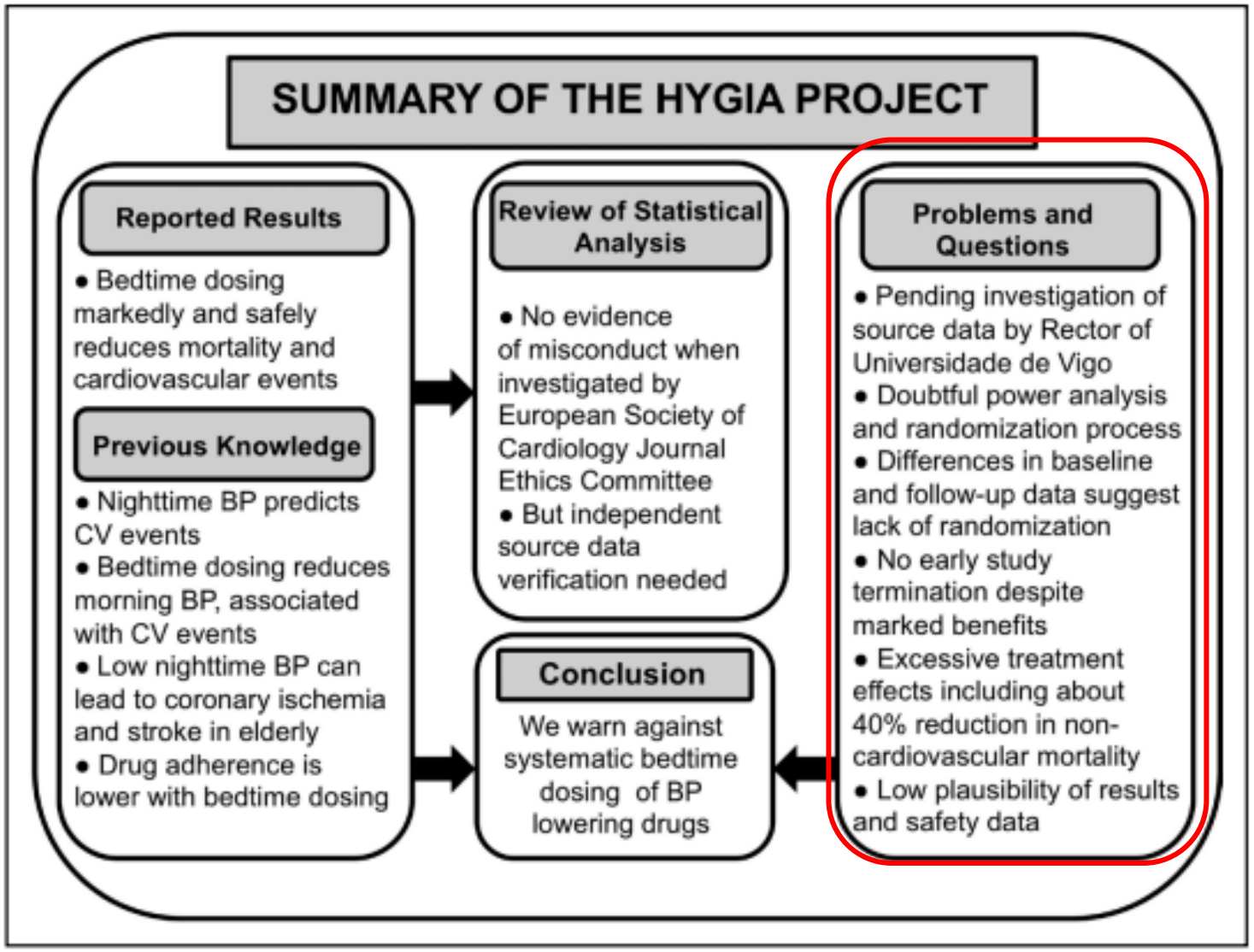


Hermida *et al*
Eur Heart J 2020



Hermida *et al*
Eur Heart J 2020

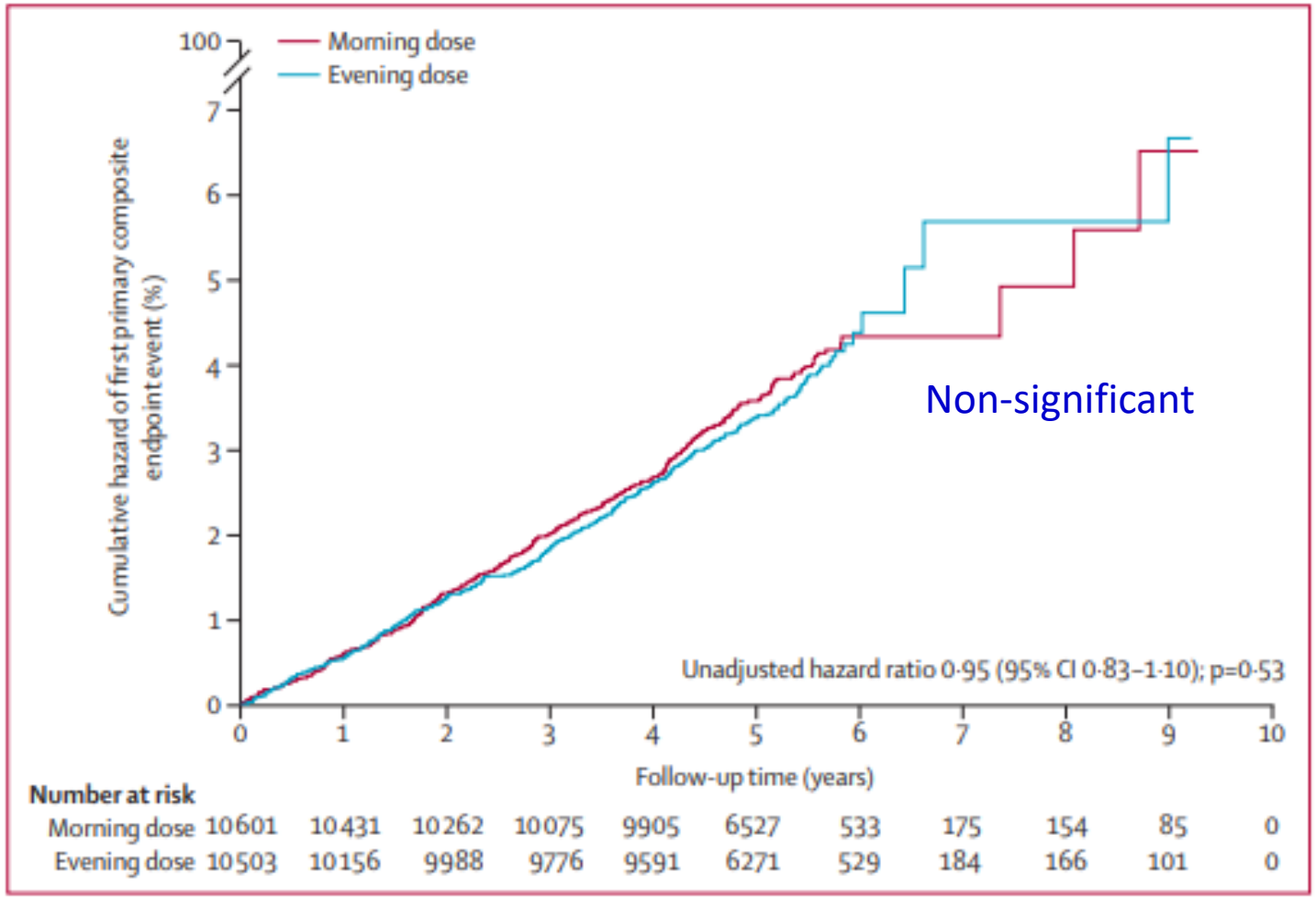
Missing Verification of Source Data in Hypertension Research: The HYGIA PROJECT in Perspective



Mattias Brunström
Umeå universitet

Hypertension. 2021;78:555–558

Cardiovascular outcomes in adults with hypertension with evening versus morning dosing of usual antihypertensives in the UK (TIME study): a prospective, randomised, open-label, blinded-endpoint clinical trial



Mackenzie I, *et al.* Lancet. 2022;400(10361):1417-1425

TIME study:

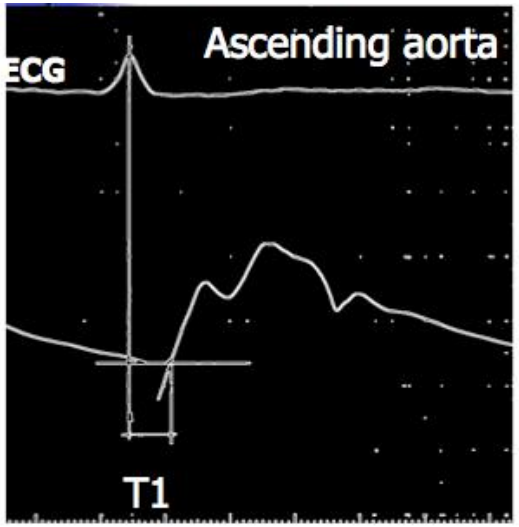
Adverse events

	Evening dosing group (n=9574)*	Morning dosing group (n=10 054)*	Between-group difference (95% CI)†
Dizziness or light-headedness	3511 (36·7%)	4007 (39·9%)	−3·2% (−4·6 to −1·8)
Excessive visits to the toilet during the day or night	3825 (40·0%)	3660 (36·4%)	3·6% (2·2 to 4·9)
Sleep problems	4017 (42·0%)	4125 (41·0%)	0·9% (−0·5 to 2·3)
Upset stomach or indigestion	2639 (27·6%)	3050 (30·3%)	−2·8% (−4·1 to −1·5)
Diarrhoea	1803 (18·8%)	2170 (21·6%)	−2·8% (−3·9 to −1·6)
Feeling generally less well	3079 (32·2%)	3311 (32·9%)	−0·8% (−2·1 to 0·6)
Muscle aches	3724 (38·9%)	4352 (43·3%)	−4·4% (−5·8 to −3·0)
Other (not specified)	2970 (31·0%)	2686 (26·7%)	4·3% (3·0 to 5·6)

Numbers reported are the number of participants who indicated that they had experienced each prespecified symptom. *Number of participants who submitted at least one completed study follow-up form. †Difference in percentage: evening dosing group minus morning dosing group.

***Table 3*: Prespecified adverse events (symptoms) in safety analysis population (n=19 628)**

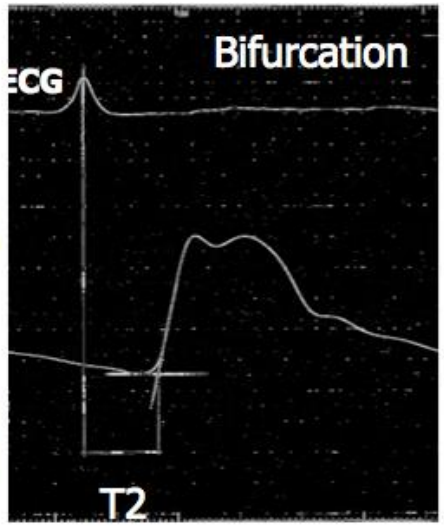
The Gold standard for measuring arterial stiffness: Aortic PWV

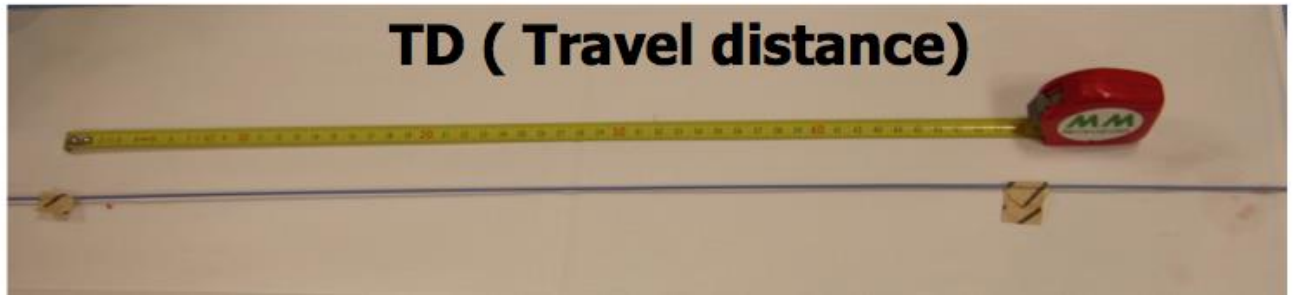


Velocity = TD / TT

TT (Travel time) = T2 – T1

intersecting tangents for footpoints determination





Between observer reproducibility: BlandAltman: Diff. 0.06 m/sec, 95% CI 0.82 / -0.69 m/sec Weber AJH 2007; 20:256
Comparison between manusl and computed TT measurement: 0.9 msec, SD 4.3 msec

Carotid femoral (cf) PWV

European Heart Journal (2006) 27, 2588–2605
doi:10.1093/eurheartj/ehl254

Special article

Expert consensus document on arterial stiffness: methodological issues and clinical applications

Stephane Laurent[1]*, John Cockcroft[2], Luc Van Bortel[3], Pierre Boutouyrie[1], Cristina Giannattasio[4], Daniel Hayoz[5], Bruno Pannier[6], Charalambos Vlachopoulos[7], Ian Wilkinson[8], and Harry Struijker-Boudier[9] on behalf of the European Network for Non-invasive Investigation of Large Arteries

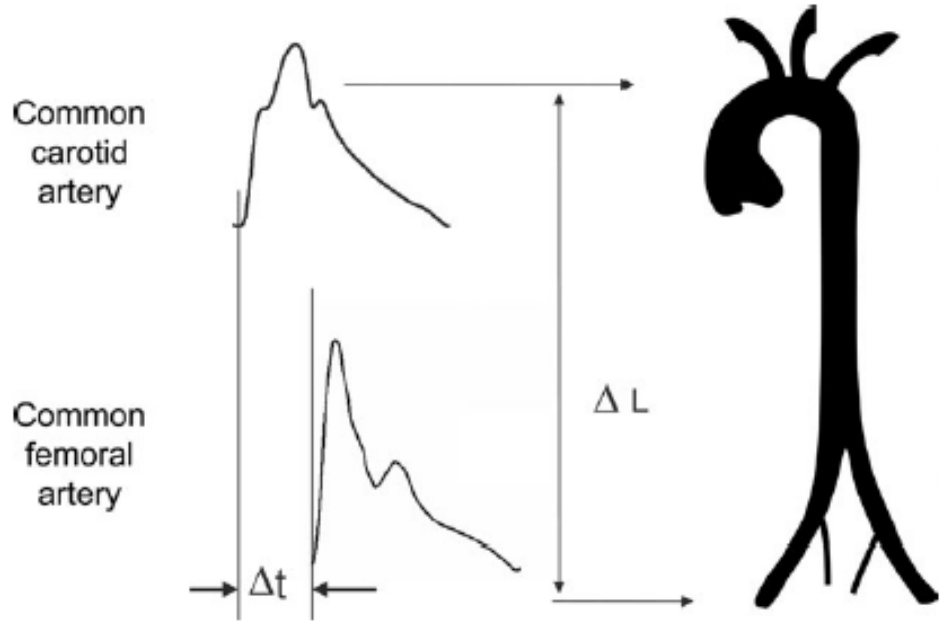
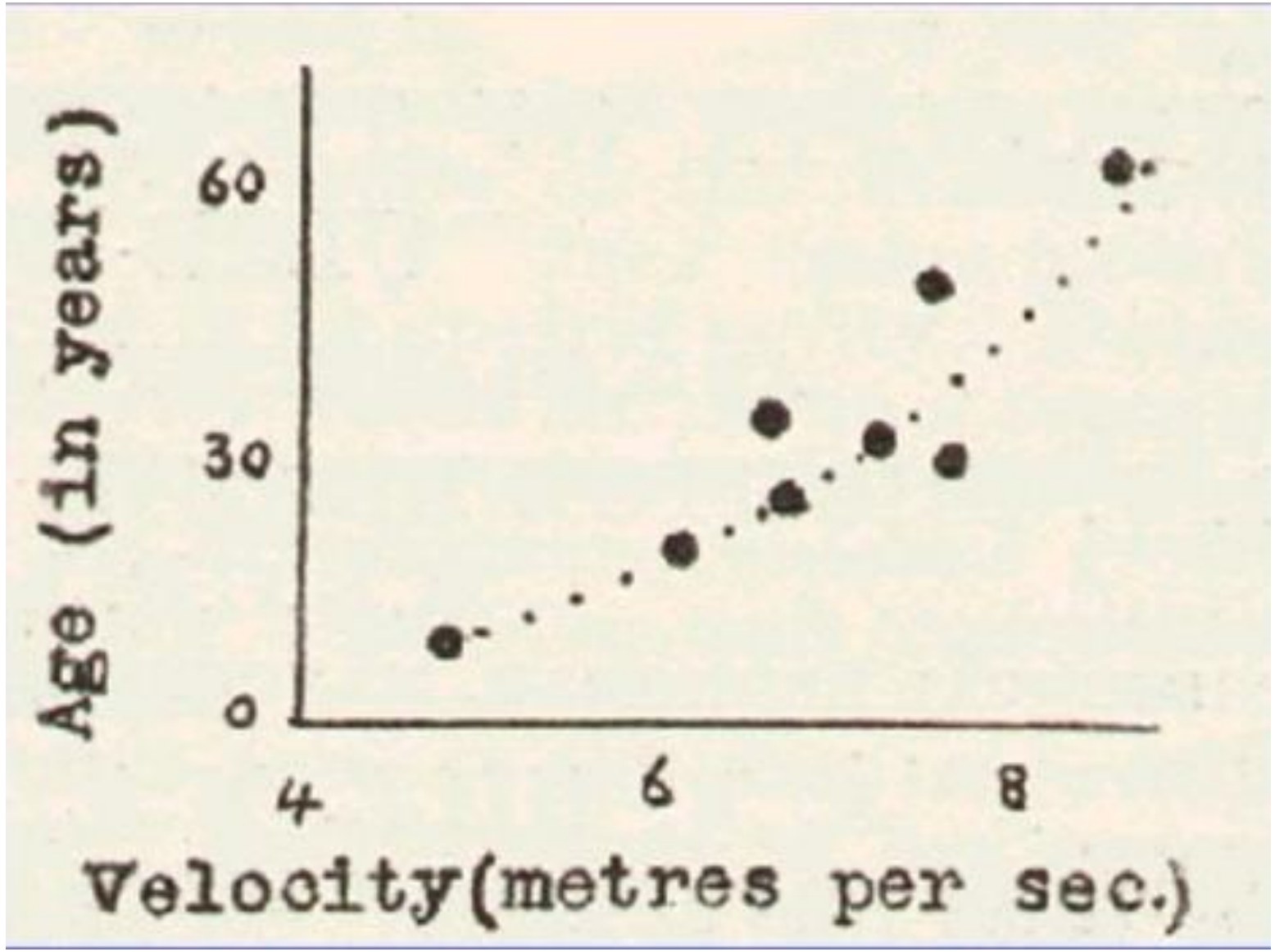


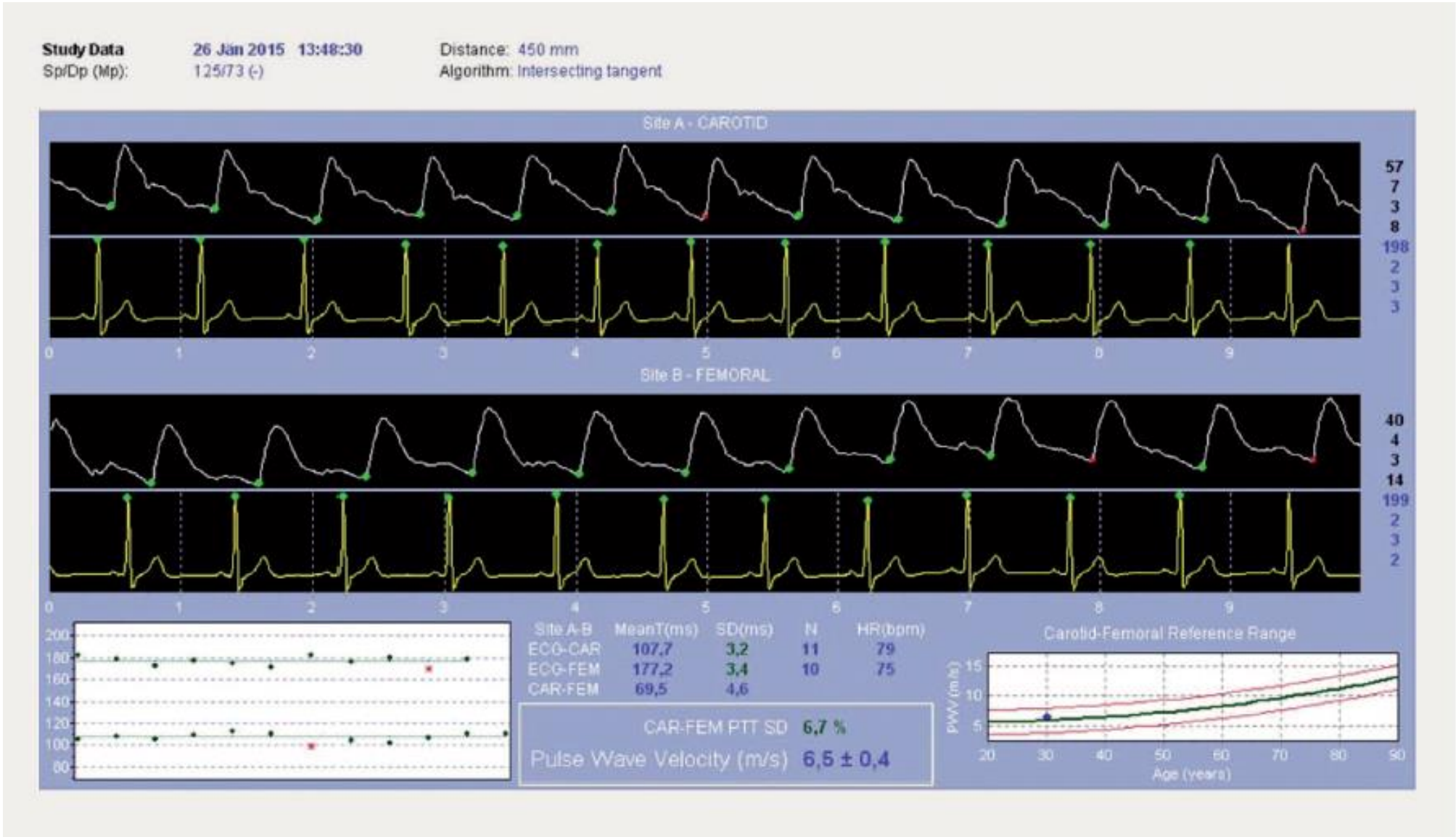
Figure 1 Measurement of carotid-femoral PWV with the foot to foot method.

$$PWV = \sqrt{\frac{E_{inc} \cdot h}{2r\rho}}$$

Moens Korteweg equation

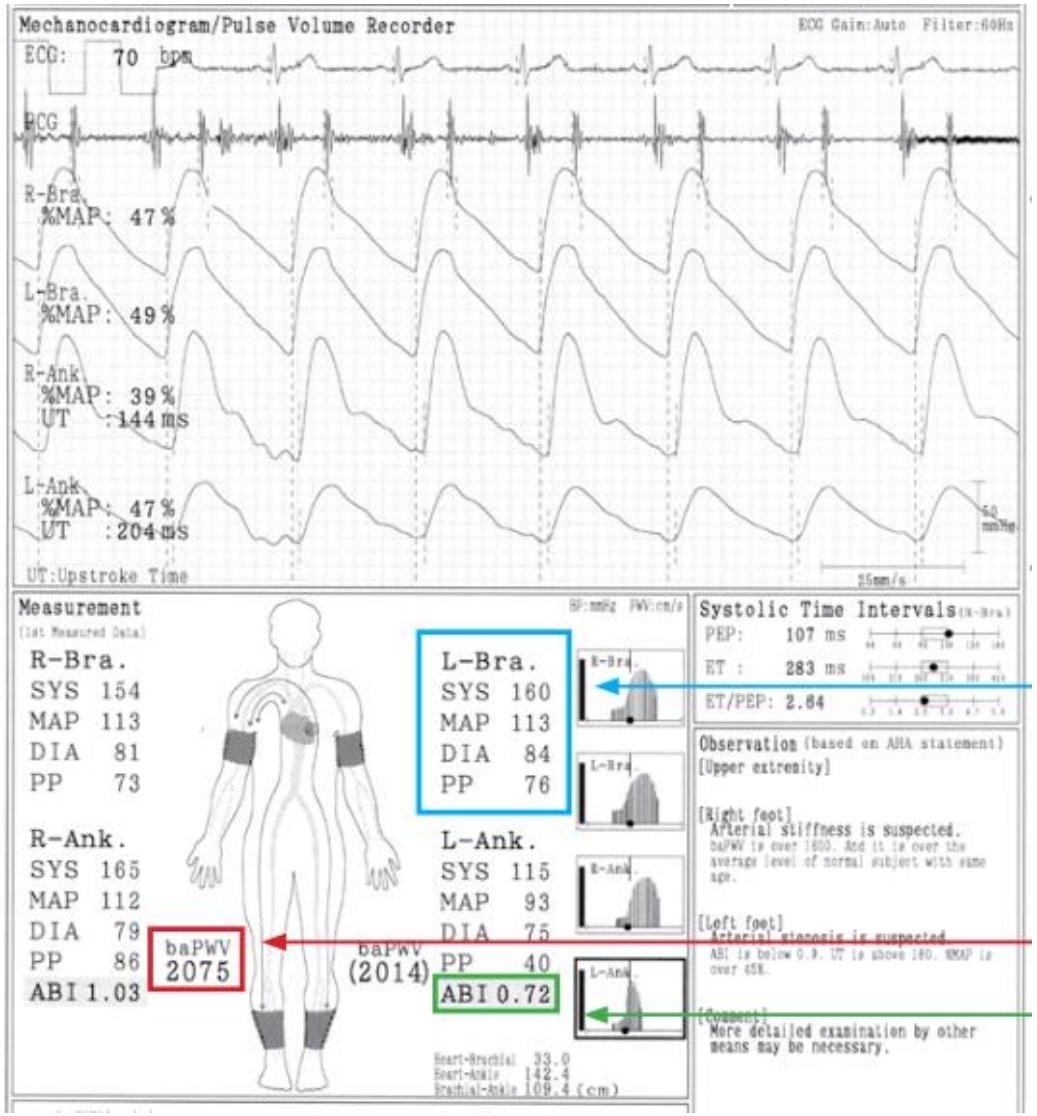


Bramwell & Hill, Lancet 1922



Medicographia. 2015;37:391-398

Brachial ankle PWV



omronhealthcare.com.au/pdf2/17588_VP1000_Brochure_d.pdf

Large-Artery Stiffness in Health and Disease

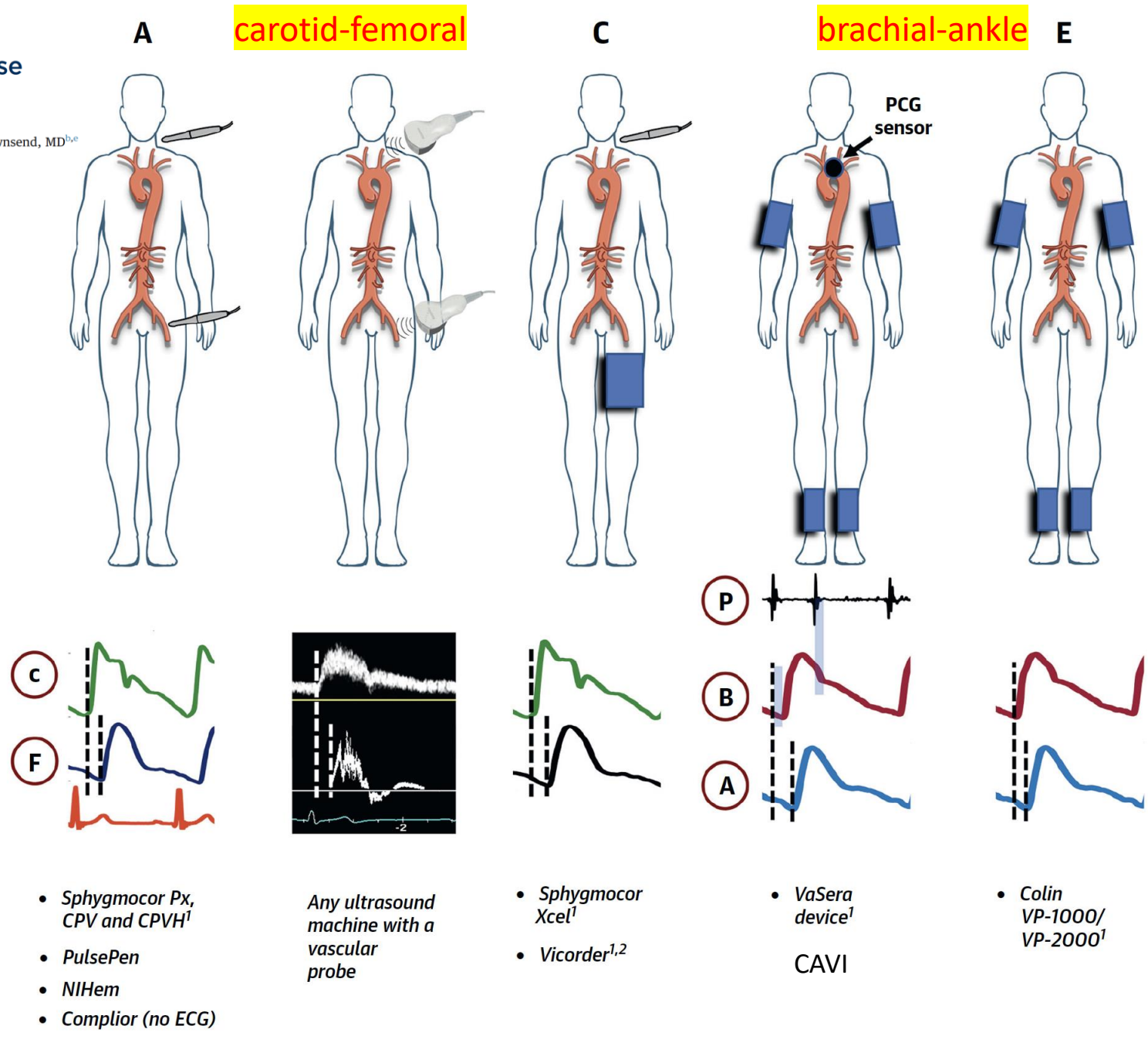
JACC State-of-the-Art Review

Julio A. Chirinos, MD, PhD,[a,b] Patrick Segers, PhD,[c] Timothy Hughes, PhD,[d] Raymond Townsend, MD[b,e]

JACC VOL. 74, NO. 9, 2019

SEPTEMBER 3, 2019:1237–63

FIGURE 10 Methods of Measurement of Carotid-Femoral PWV, CAVI, and ba-PWV by Various Devices



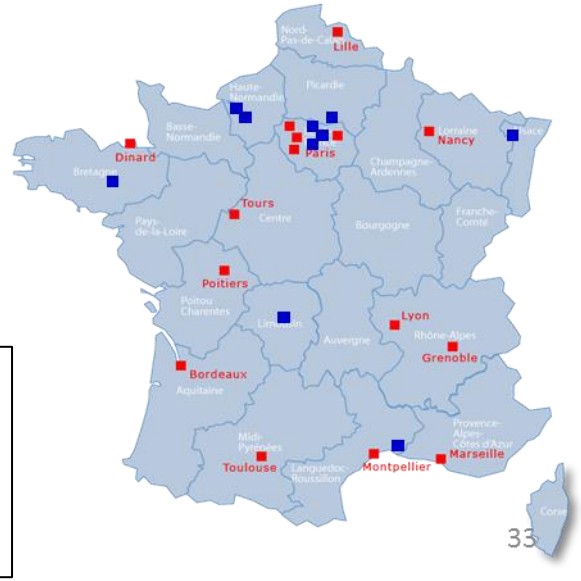
The SPARTE study 2011-2021

Stéphane LAURENT, MD, PhD, FESC
Emeritus Professor of Pharmacology at Paris University
Paris Cardiovascular Research Center (P.A.R.C.C.) INSERM U970

Strategy for Preventing cardiovascular complications based on ARTErial stiffness

First randomized clinical trial aiming at demonstrating that arterial stiffness is a surrogate end-point

25 centers in France



Population

Hypertensive patients 55-75 yrs

Moderate to very high CV risk (fatal and non fatal CVD)

SPARTE study: primary hypothesis

Strategy for Preventing cardiovascular complications based on ARTErial stiffness

A therapeutic strategy aiming at

implementing the international guidelines

+ normalising BP

+ normalising arterial stiffness

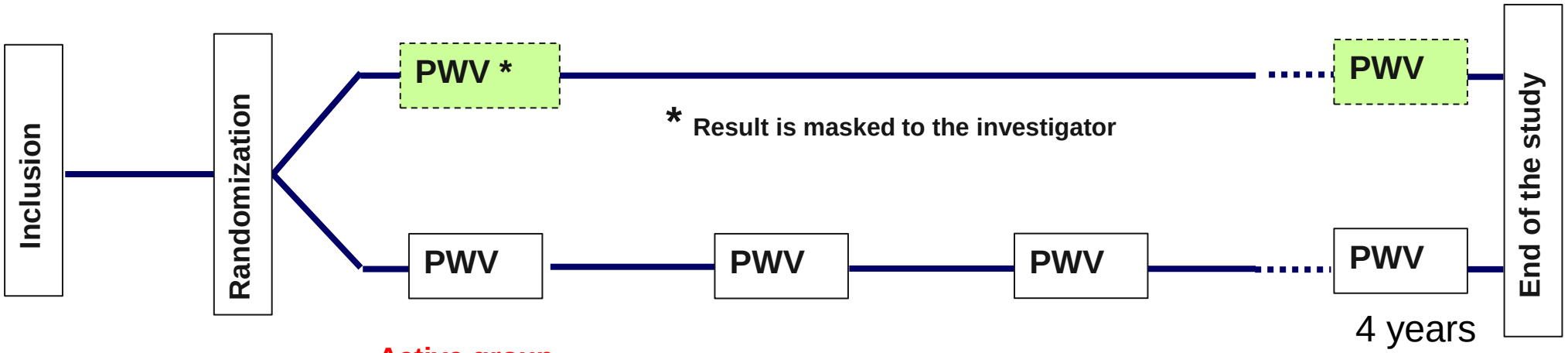
…reduces CV and renal events to a significantly greater extent

than the sole implementation of international guidelines

The SPARTE study: a PROBE design

Laurent et al. Hypertension 2012
Laurent et al. Art Res 2020

Control group, PWV measured at M0, M24, and M48



Active group

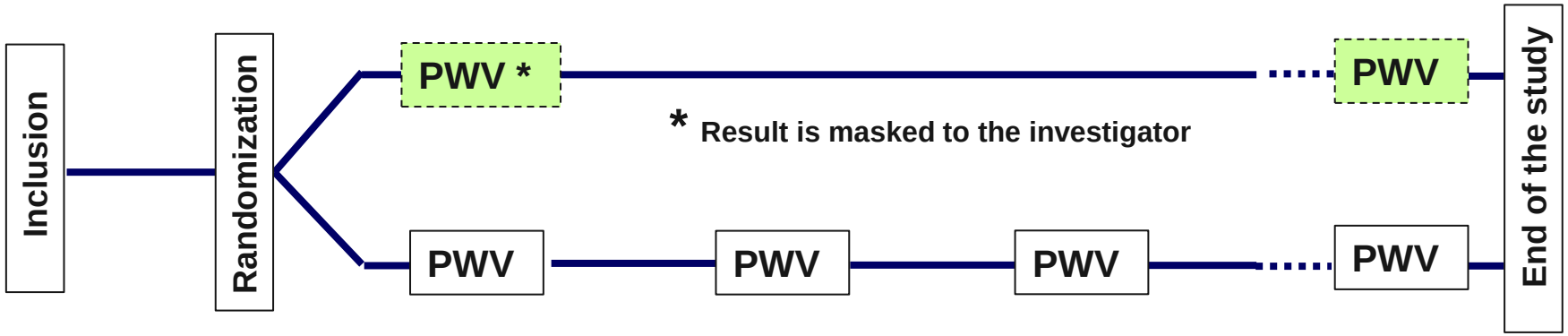
- **PWV measured every 6 months**
- **Objective: PWV < 10 m/s**

Blinded endpoint: cardiovascular events

The SPARTE study: a PROBE design

Laurent et al. Hypertension 2012
Laurent et al. Art Res 2020

Control group, PWV measured at M0, M24, and M48



Active group

- PWV measured every 6 months
- Objective: PWV < 10 m/s
- **Specific therapeutic strategy**

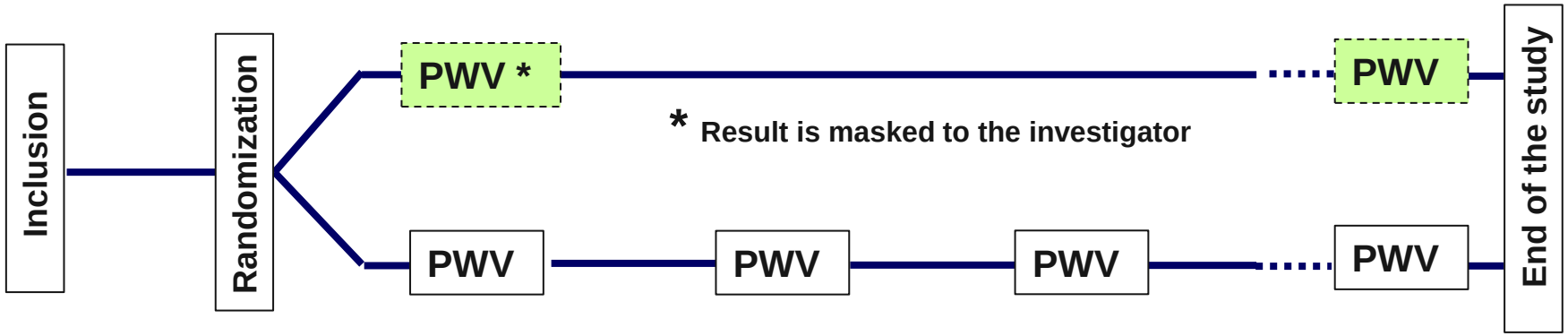
- **High recommended dose of ACEI or ARB**
- **CCB + ARB or CCB + ACEI combinations**
- **Triple combinations RASI + CCB + DIU**
- **Aldosterone antagonists**
- **Vasodilating BB**

Blinded endpoint: cardiovascular events

The SPARTE study: a PROBE design

Laurent et al. Hypertension 2012
Laurent et al. Art Res 2020

Control group, PWV measured at M0, M24, and M48



Active group

- PWV measured every 6 months
- Objective: PWV < 10 m/s
- Specific therapeutic strategy
- **ABPM at M0, M6 and M48**

Blinded endpoint: cardiovascular events

The SPARTE study: number of patients to be included

Selected population: moderate to very high CV risk (fatal and non fatal CVD) > 20% at 10 years

Combined end-point

Stroke + CHD (MI, PCI, CABG) + PAD (PCI, bypass surgery, amputation) + CHF hospitalization + aortic dissection + doubling of serum creatinine + dialysis + sudden death

Incidence of combined CV events
10% per year

Effect of the therapeutic strategy
20% reduction in the active group

Duration of the study: 4 years

Nb of patients: 750 patients per group

Nb of composite events during 4 years follow-up.

	Events	Events			Risk
nb per group	**Control**	**Active**	**Δ (Co-Ac)**	**Power**	**Alpha**
250	100	80	20	0.46	0.05
500	200	160	40	0.75	0.05
750	**300**	**240**	**60**	**0.90**	**0.05**
1000	400	320	80	0.96	0.05
1250	500	400	100	0.98	0.05
1500	600	480	120	0.99	0.05

OPEN ACCESS

RESEARCH ARTICLE

PDF/EPUB

ORIGINAL ARTICLE

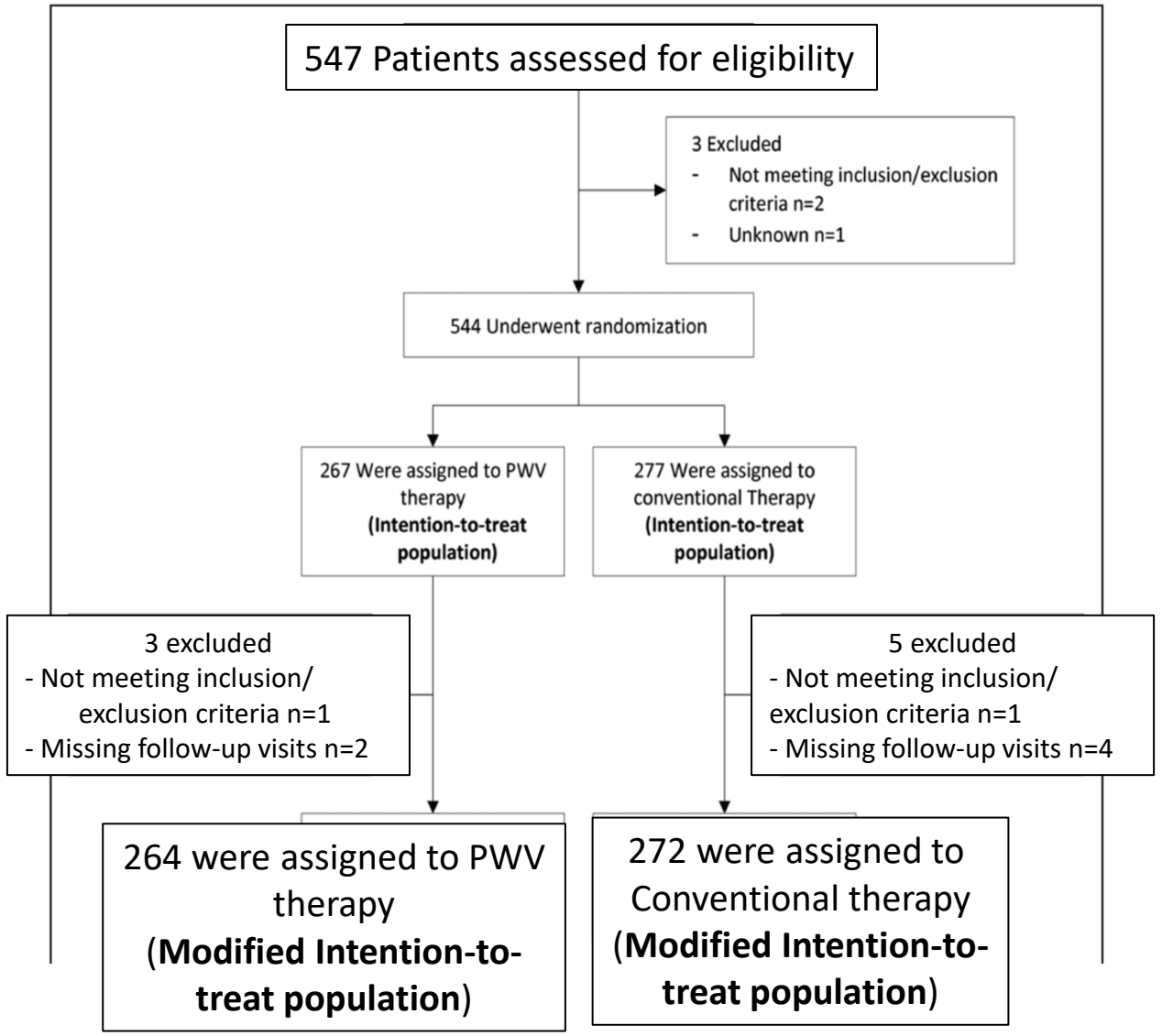
Laurent et al. Hypertension 2021; 78:983-995

SPARTE Study

Normalization of Arterial Stiffness and Cardiovascular Events in Patients With Hypertension at Medium to Very High Risk

Stephane Laurent, Gilles Chatellier, Michel Azizi, David Calvet, Gabriel Choukroun, Nicolas Danchin, Pascal Delsart, Xavier Girerd, Philippe Gosse, Hakim Khettab, Gerard London, Jean-Jacques Mourad, Bruno Pannier, Helena Pereira, Dominique Stephan, Paul Valensi, Pedro Cunha, Krzysztof Narkiewicz, Rosa-Maria Bruno, Pierre Boutouyrie, on behalf of SPARTE Investigators*

Flow chart


547 Patients assessed for eligibility
3 Excluded
- Not meeting inclusion/exclusion criteria n=2
- Unknown n=1
544 Underwent randomization
267 Were assigned to PWV therapy (Intention-to-treat population)
277 Were assigned to conventional Therapy (Intention-to-treat population)
3 excluded
- Not meeting inclusion/ exclusion criteria n=1
- Missing follow-up visits n=2
5 excluded
- Not meeting inclusion/ exclusion criteria n=1
- Missing follow-up visits n=4
264 were assigned to PWV therapy (Modified Intention-to-treat population)
272 were assigned to Conventional therapy (Modified Intention-to-treat population)

Baseline characteristics

Characteristic	PWV group (n=264)	Conventional group (n=272)
Criterion for increased cardiovascular risk, n (%)		
Age, y	65.0 (6.0)	65.2 (5.5)
ESH-ESC cardiovascular risk		
Medium cardiovascular risk	34 (12.8%)	38 (14.0%)
High cardiovascular risk	157 (59.5%)	160 (58.8%)
Very high cardiovascular risk	73 (27.7%)	74 (27.2%)
Type 2 diabetes, n (%)	96 (36.4%)	102 (37.5%)
Dyslipidemia, n (%)	218 (82.9%)	224 (82.4%)
Cardiovascular disease, n (%)	66 (25.0%)	60 (22.1%)
Smokers, current (%)	26 (9.8%)	28 (10.5%)
Female sex, n (%)	102 (38.6%)	97 (35.7%)

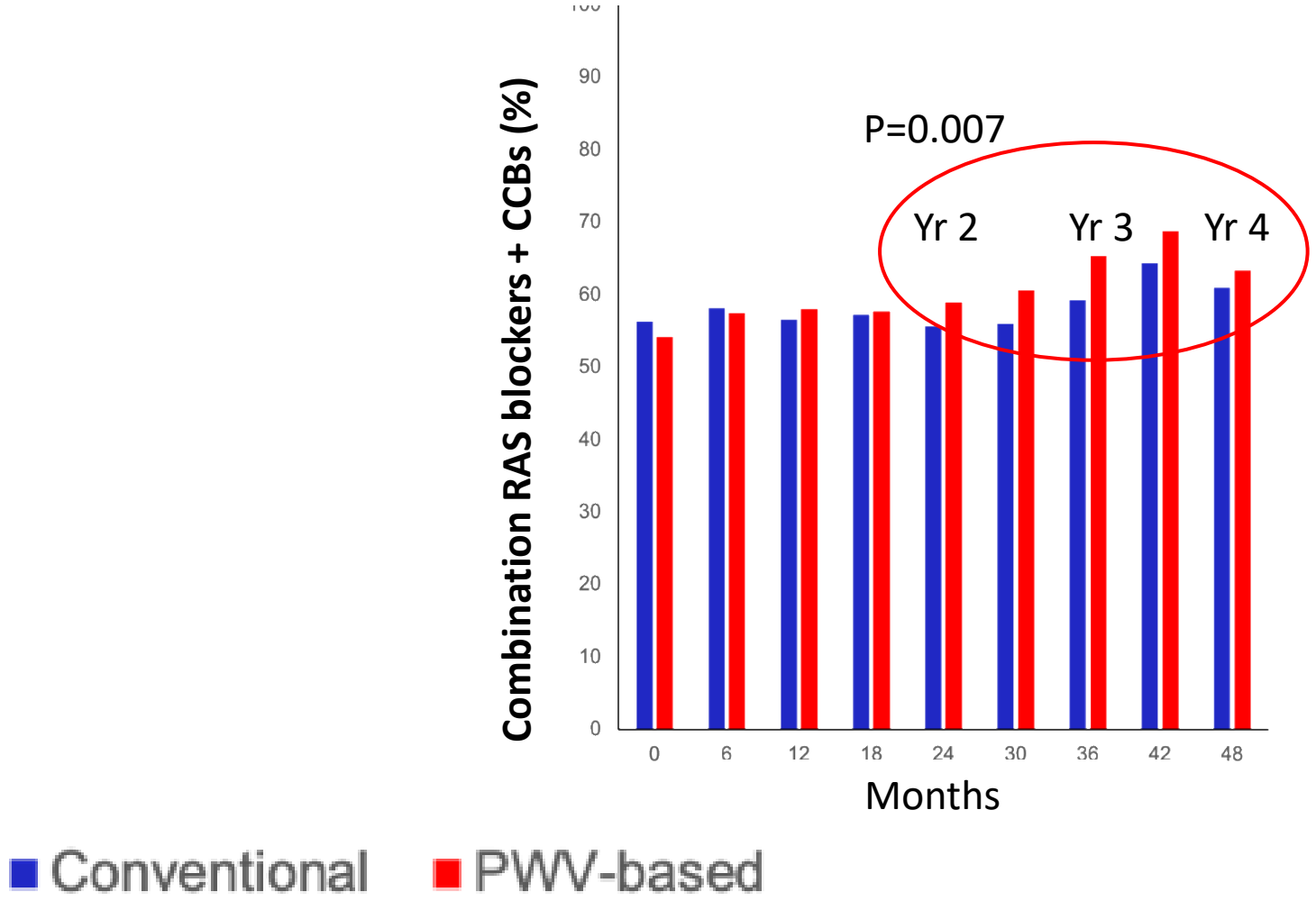
Baseline characteristics

Characteristic	PWV group (n=264)	Conventional group (n=272)
Baseline office blood pressure		
Systolic, mm Hg	133.6 (17.1)	134.2 (15.5)
Diastolic, mm Hg	76.4 (10.4)	77.5 (10.4)
SBP <140 mm Hg and DBP <90 mm Hg, n (%)	177 (67.0%)	182 (67.2%)
Ambulatory blood pressure monitoring		
Day SBP, mm Hg	134.9 (12.8)	133.0 (11.5)
Day DBP, mm Hg	79.6 (9.1)	78.4 (8.5)
Pulse wave velocity, m/s	9.9 (2.3)	10.0 (2.5)
Pulse wave velocity >10 m/s, n (%)	107 (42.0%)	106 (41.4%)
Central blood pressure		
Central SBP, mm Hg	126.6 (16.2)	128.1 (16.4)
Central DBP, mm Hg	77.6 (11.2)	78.0 (10.3)
Central PP, mm Hg	49.4 (12.5)	50.1 (13.4)

Baseline characteristics

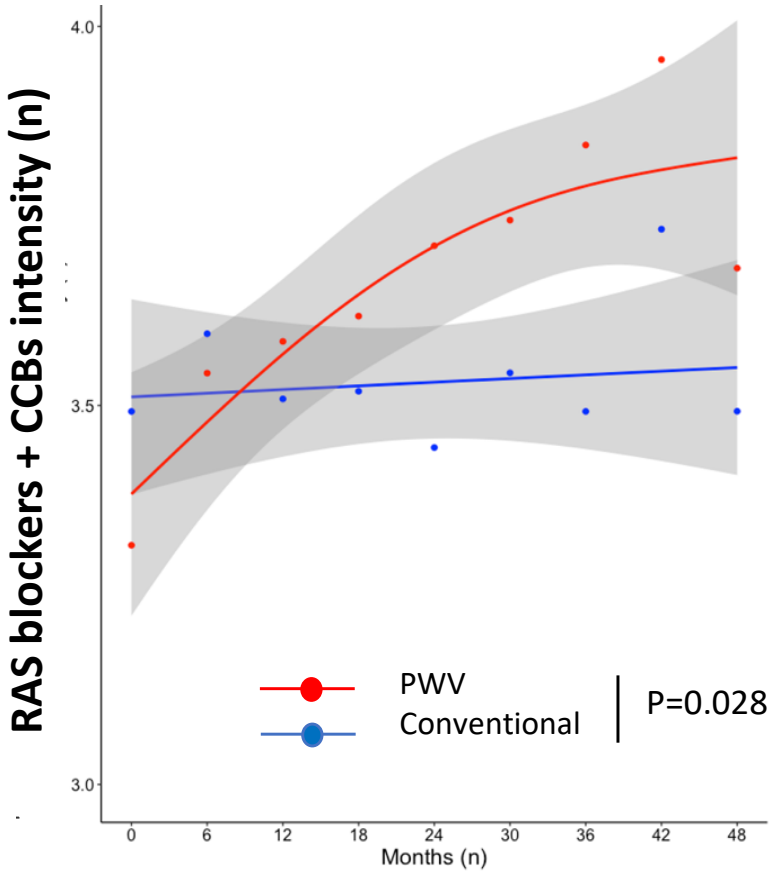
Characteristic	PWV group (n=264)	Conventional group (n=272)
Use of antihypertensive agents, n (%)	261 (99.6%)	270 (99.3%)
Use of diuretics, n (%)	144 (54.5%)	153 (56.3%)
Use of ACE inhibitor, n (%)	87 (33.0%)	89 (32.7%)
Use of ARB, n (%)	152 (57.6%)	153 (56.3%)
Use of CCB, n (%)	154 (58.3%)	171 (62.9%)
Use of betablockers, n (%)	84 (31.8%)	79 (29.0%)
Use of lipid-lowering agents, n (%)	189 (72.1%)	183 (67.3%)
Lipid-lowering agents, n/patient	1.1 (0.3)	1.1 (0.3)
Use of antidiabetic agents, n (%)	90 (34.4%)	99 (36.7%)
Antidiabetic agents, n/patient	1.9 (0.9)	1.8 (0.8)
Use of antiplatelet agents, n (%)	138 (53.3%)	134 (49.4%)

More RASb + CCB combinations in the PWV group

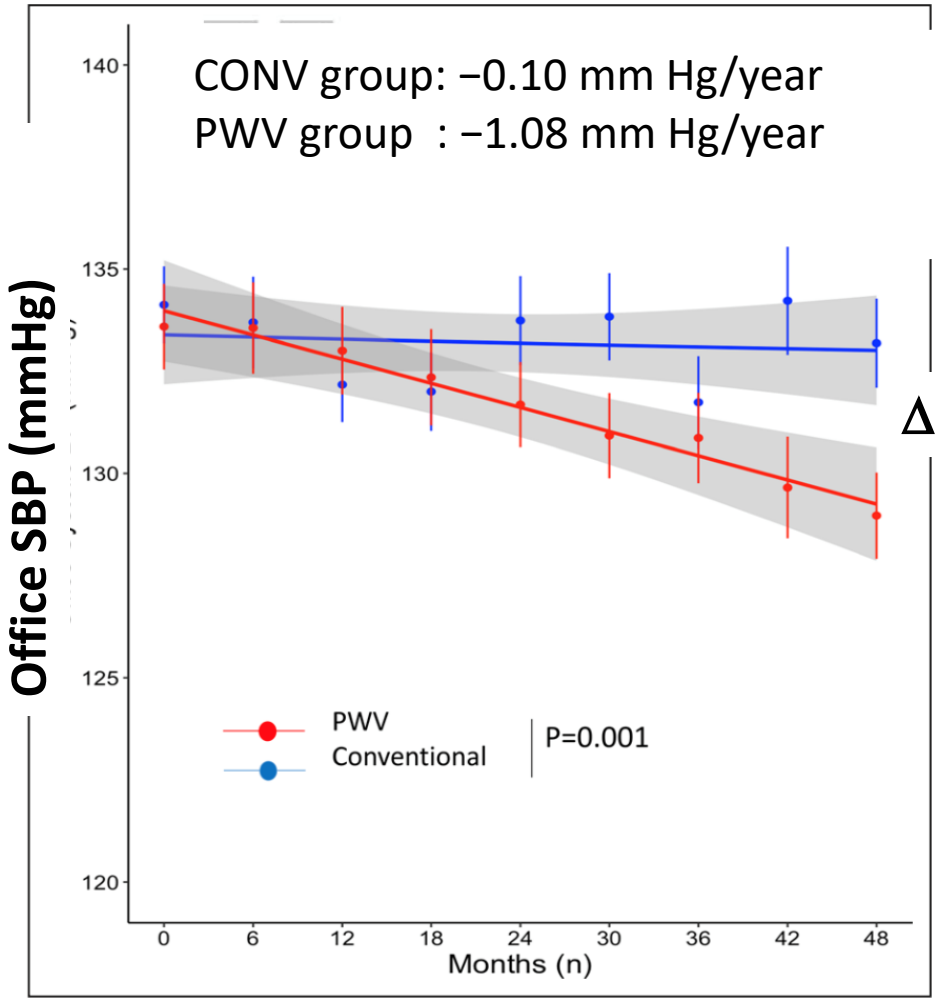


Higher doses within the RASb + CCB combinations in the PWV group

Treatment intensity score was calculated by assigning to each administered drug a coefficient indicating the dosage (1=low, 2=average, 3=high).



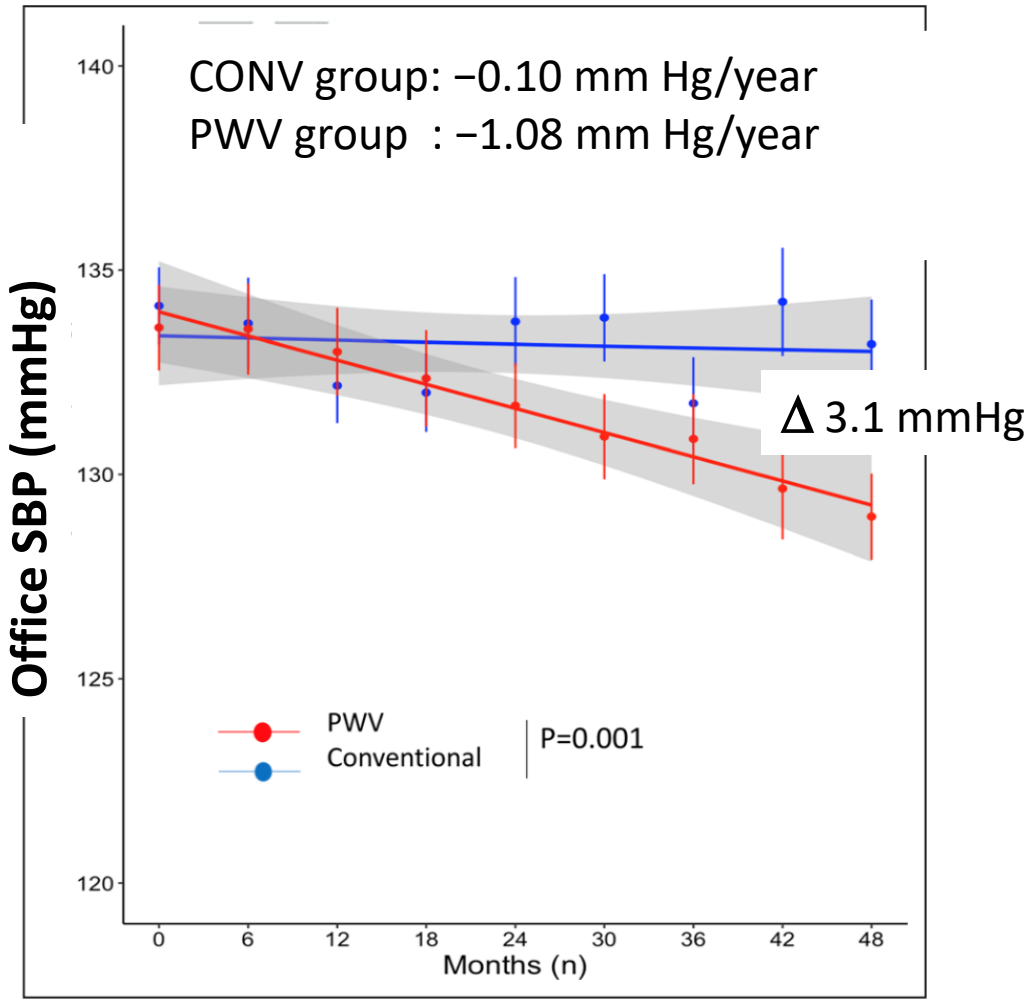
Office BP was reduced to a greater extent in the PWV group…

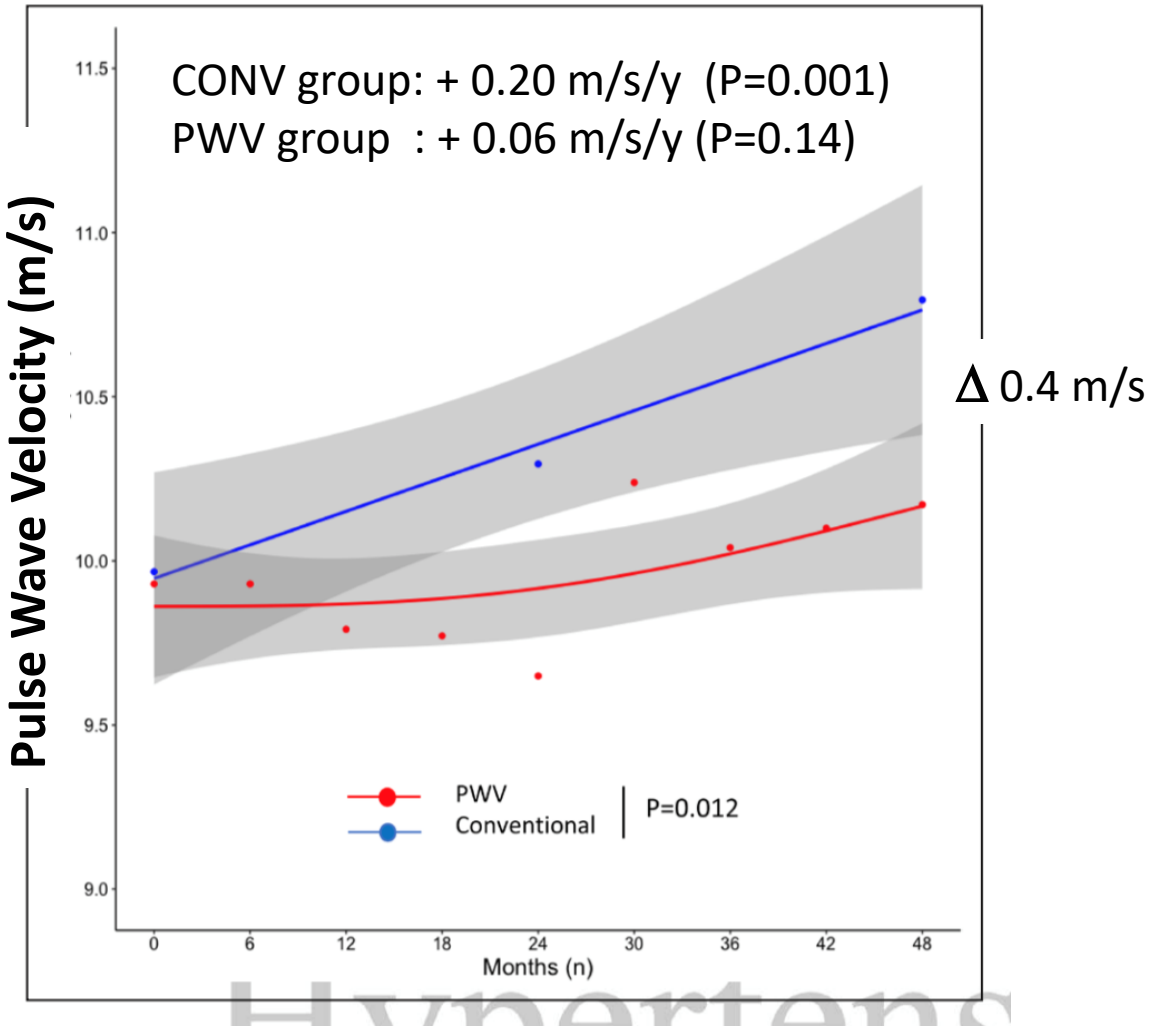


Δ 3.1 mmHg

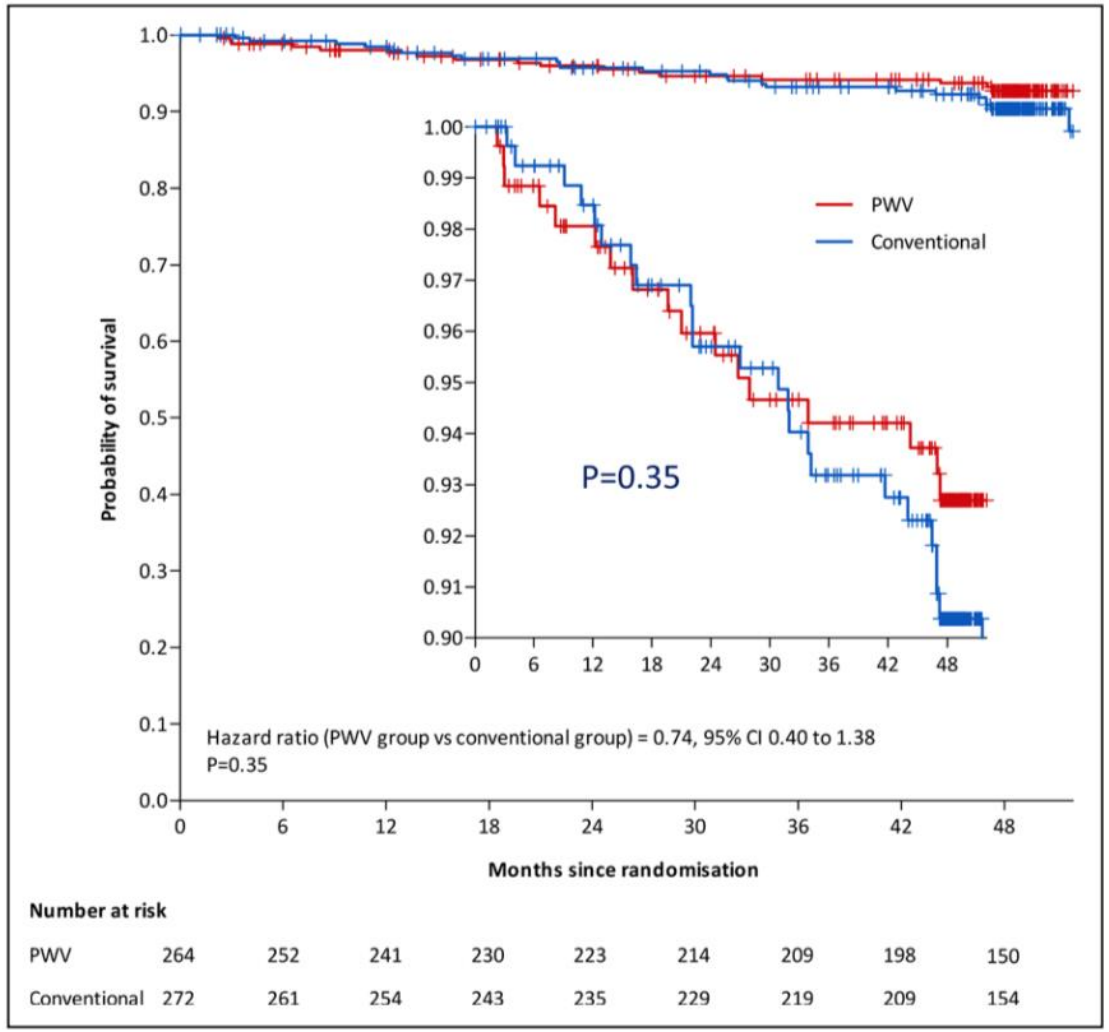
Similar results
- with office DBP,
- with SBP and DBP at ABPM

Office BP was reduced to a greater extent in the PWV group…
… and PWV did not raise





Primary end-point: no significant difference between PWV and CONV groups



Stroke + CHD (MI, PCI, CABG)

+ PAD (PCI, bypass surgery, amputation)

+ CHF hospitalization + aortic dissection

+ doubling of serum creatinine

+ dialysis + sudden death

HR 0.74 (0.40-1.38)
P=0.35

PWV, n=17
CONV, n=24

Discussion

- Lack of sufficient statistical power
  - 3 times less inclusion than initially planed
  - 2.5 to 5 times less yearly incidence of primary end-point

    (Cardio-SIS, ACCORD and STENO2)
  - twice less CVD (SCORE or FRS)
    - Cohort effect
    - Close follow-up in hypertension centers

Discussion

- Lack of sufficient statistical power
  - 3 times less inclusion than initially planed
  - 2.5 to 5 times less yearly incidence of primary end-point (Cardio-SIS, ACCORD and STENO2)
  - twice less CVD (SCORE or FRS)
    - Cohort effect
    - Close follow-up in hypertension centers
- Intensification of treatment : 2018 ESH-ESC Guidelines
- Further reduction of BP is possible in already controlled HT
- Targeting BP to 130-139 / 80-85 mmHg is not sufficient. PWV meas. is needed

Destiffening drugs : old ones and new ones

- Anti-hypertensive drugs

- **Anti-diabetic drugs**
- **Lipid lowering drugs**
- **Anti-inflammatory drugs**
- **Anti-platelet agents**

…

All new drug should benefit from a RCT on its effects on arterial stiffness …

… with long enough follow-up (> 6 months)

… and adjustment on BP

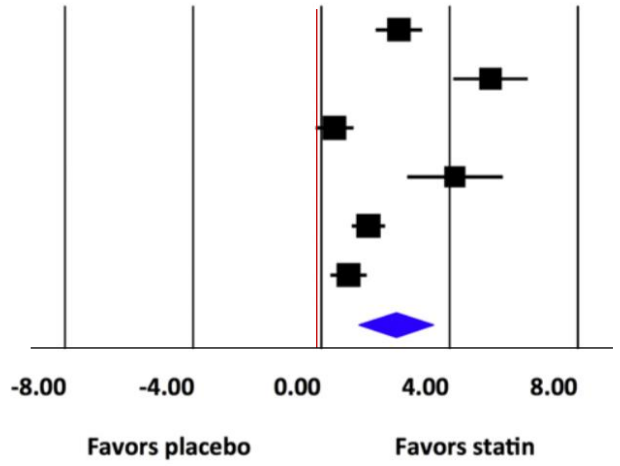
Effects of statin therapy on arterial stiffness: A systematic review and meta-analysis of RCTs

Sikarin Upala [a,b], Kamonkiat Wirunsawanya [c], Veeravich Jaruvongvanich [c,d], Anawin Sanguankeo

6 RCTs, n=303, FU 1-6 M
PWV
Mean age 48

Upala et al. Int J Cardiol 2016

Study name	Std diff in means	Lower limit	Upper limit	p-Value	Relative weight
Kanaki 2013	2.417	1.688	3.146	0.000	17.22
Lunder 2011	5.275	4.102	6.448	0.000	15.54
Oh 2014	0.412	-0.184	1.009	0.175	17.62
Orr 2009	4.165	2.670	5.661	0.000	14.14
Pirro 2007	1.468	0.940	1.996	0.000	17.80
Wallace 2010	0.847	0.268	1.425	0.004	17.67
	2.309	1.149	3.468	0.000	



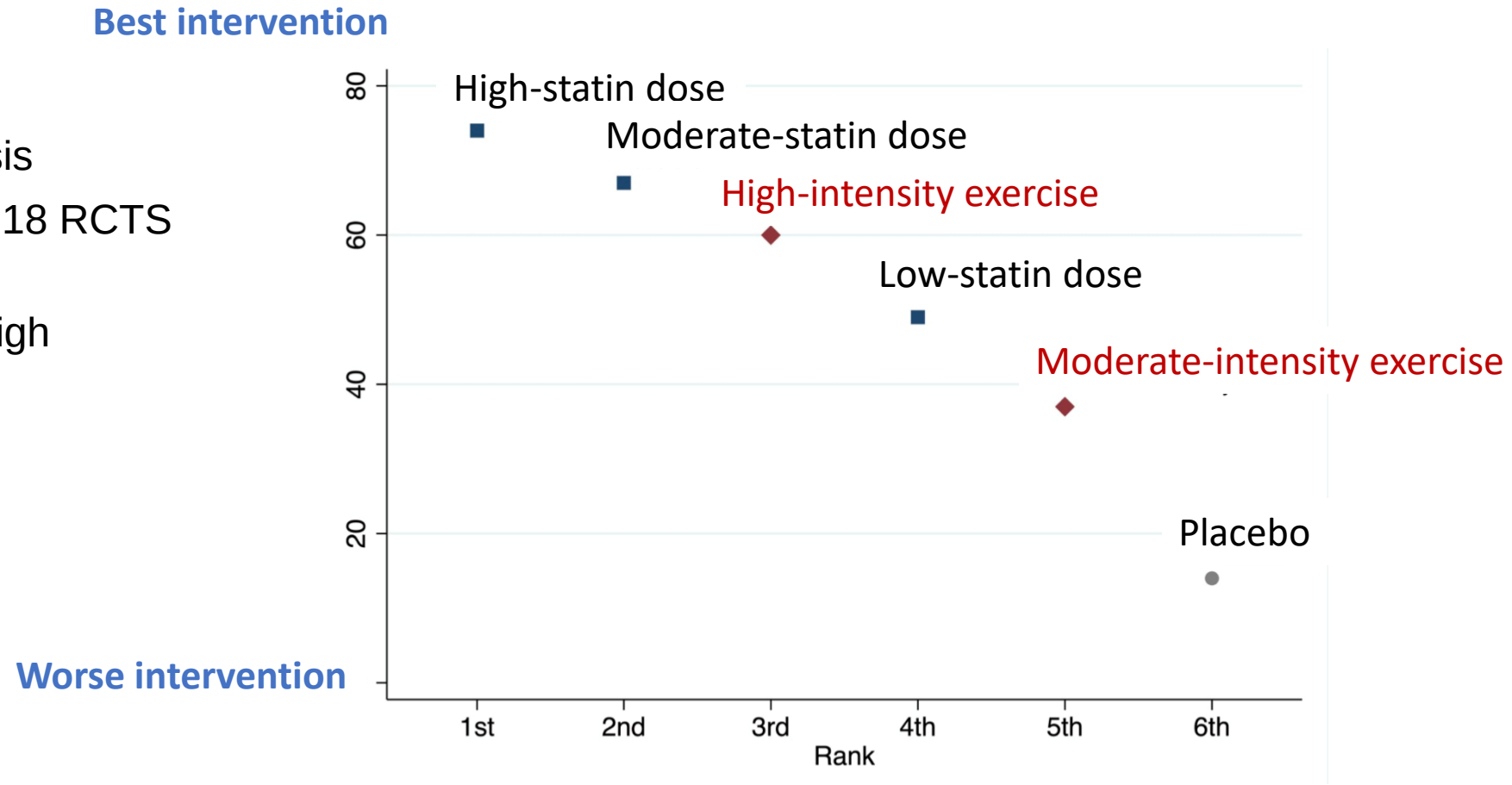
- 2.3 m/s PWV (-1.15 to -3.43) # 15 years of ageing*

*. Cross-sectionnal studies

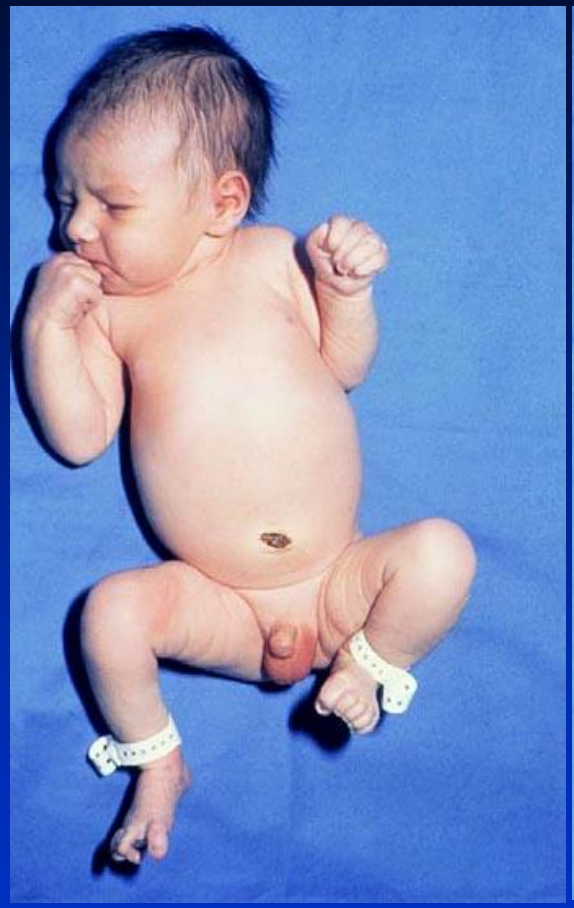
Comparative effect of physical exercise versus statins on improving arterial stiffness in patients with high cardiometabolic risk: A network meta-analysis

Cevaro-Retondo I et al. Plos Medicine 2021

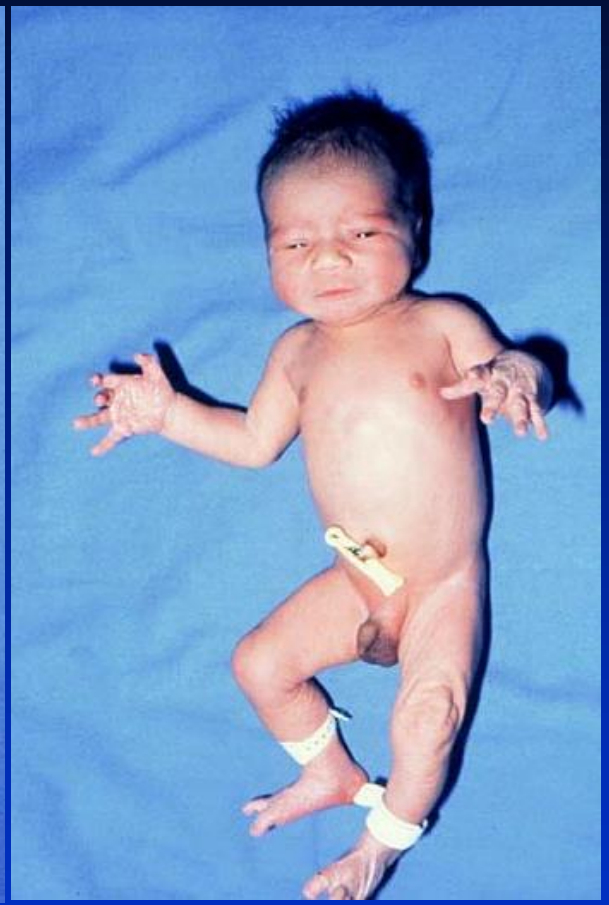
- Network meta-analysis
- 22 studies, including 18 RCTS and 4 non RCT
- 1,307 patients with high cardiometabolic risk
- cf-PWV
- Score of intervention



Birth weight and risk of adult disease



8.5 lbs



5.5 lbs

Low Birth Weight (LBW) ⟶

- hypertension
- type 2 diabetes
- hyperlipidaemia
- insulin resistance
- metabolic syndrome
- vascular dysfunction
- coronary heart disease (CHD)

High Birth Weight (HBW) ⟶

- obesity
- type 2 diabetes
- cardiovascular risk

LBW: caused by (1) impaired fetal growth, or (2) preterm delivery

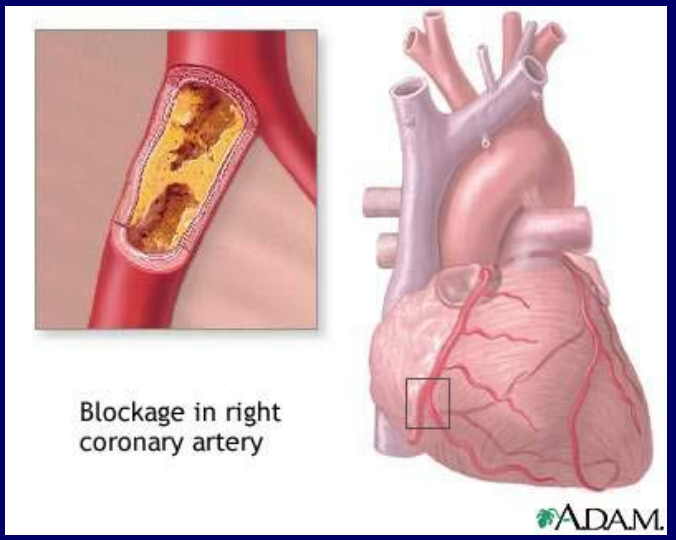
HBW: caused by (1) maternal obesity, or (2) gestational diabetes

Programming

A specific stimulus that during a critical time period might cause permanent changes in the organism

Vascular Function & Structure in Children Born too Small or too Early *Mechanisms*

Early Mechanisms?

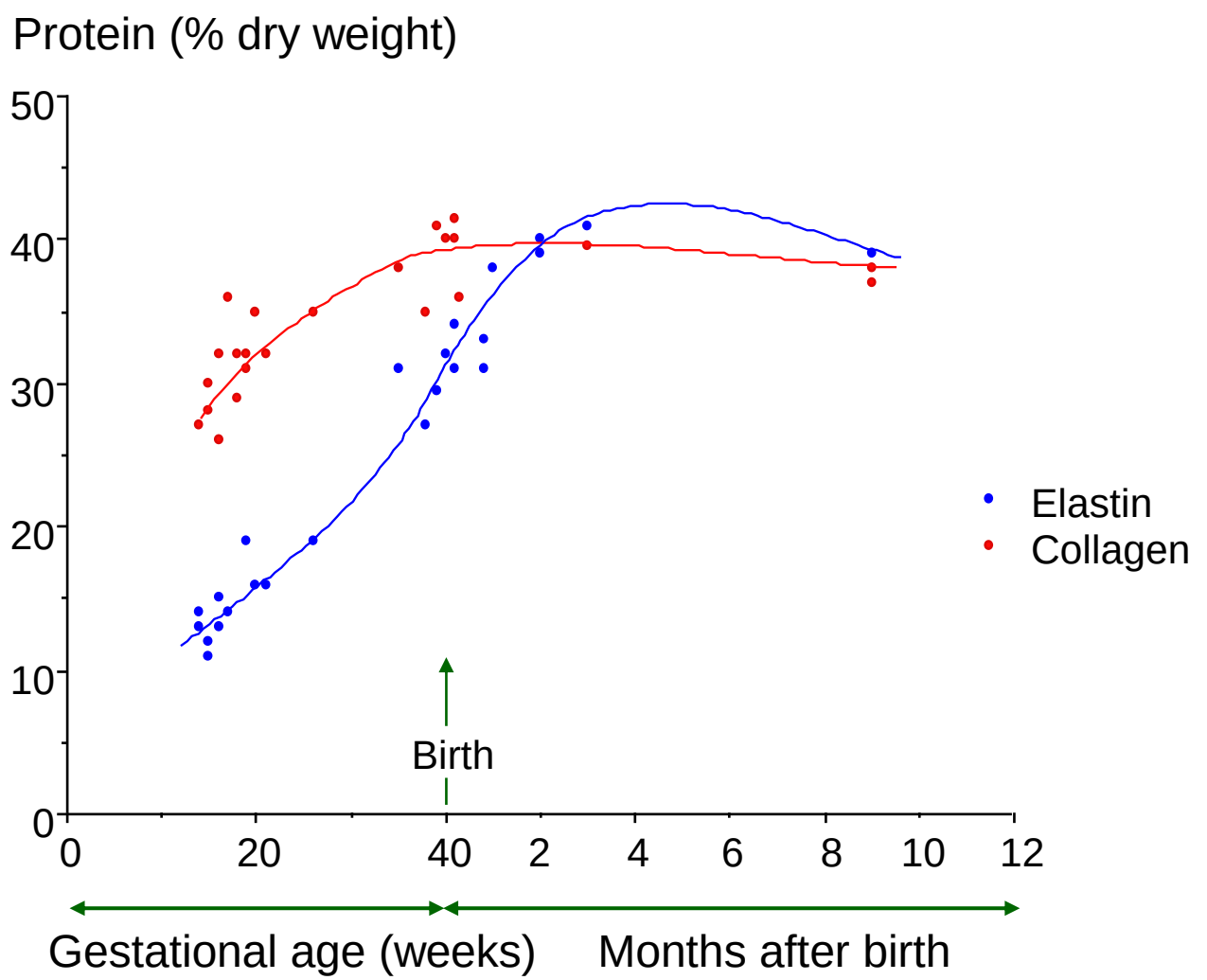


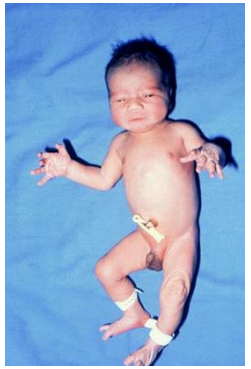
Capillary rarefication

Less elastin content of arterial wall

Increased heart rate

Impaired synthesis of elastin in walls of aorta and large conduit arteries during early development as an initiating event in pathogenesis of systemic hypertension

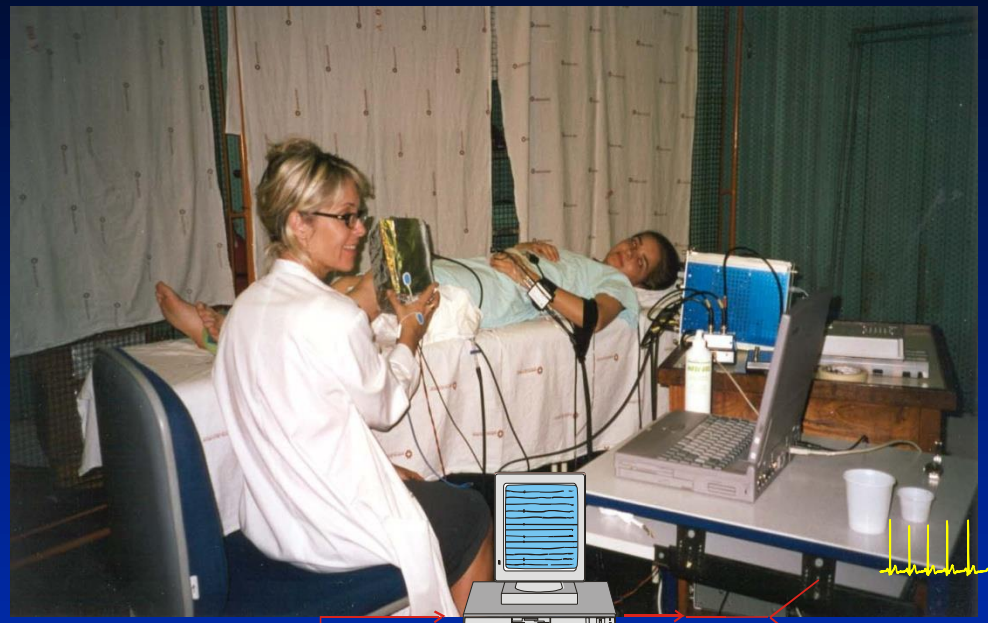


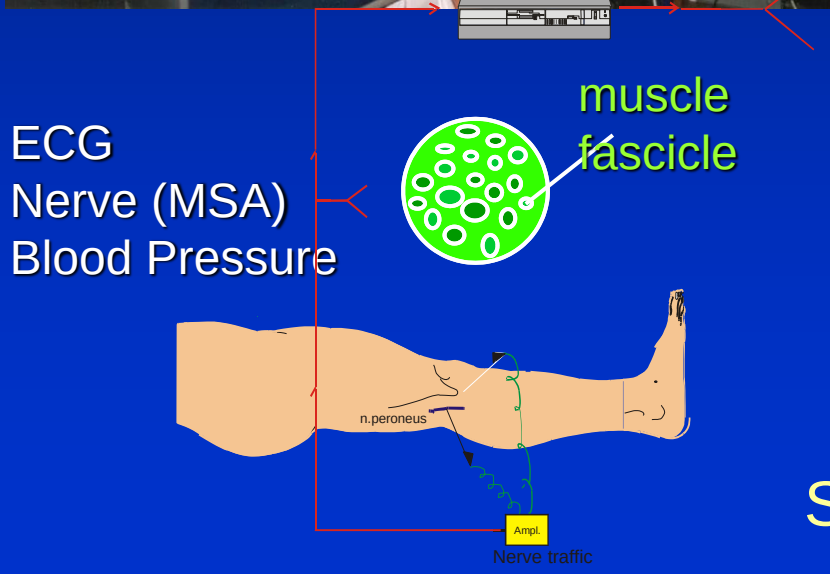


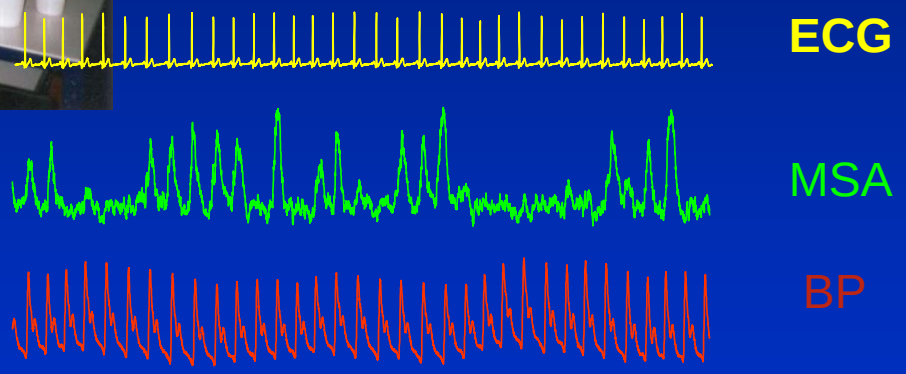
Berry CL, *et al. J Pathology.* 1972; 108: 265-274.

The Microneurographic Technique

(Vallbo & Hagbarth, **1967**, *Electroencephalogr. Clin*. Neurophysiol.)

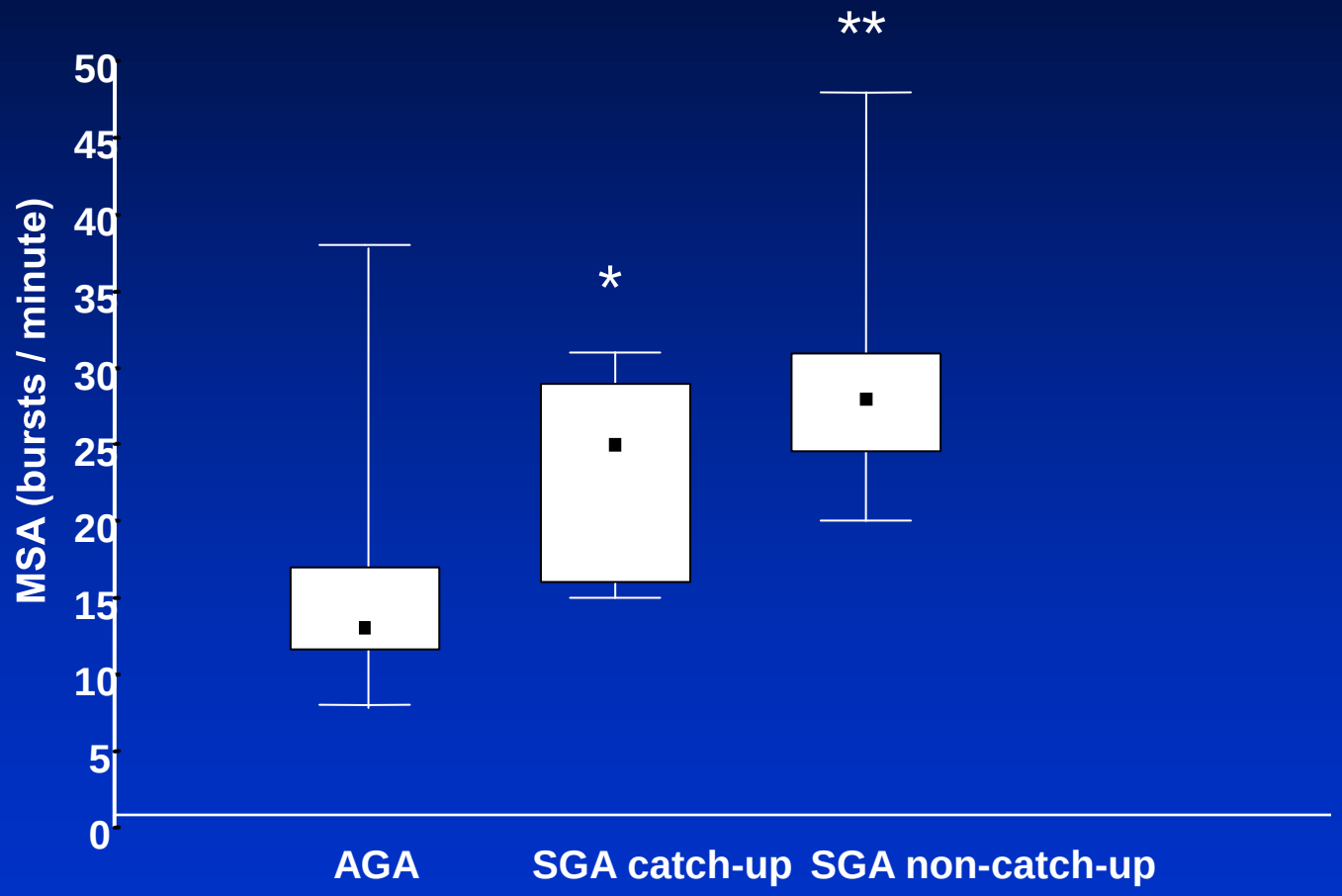






Sympathetic Nervous Activation

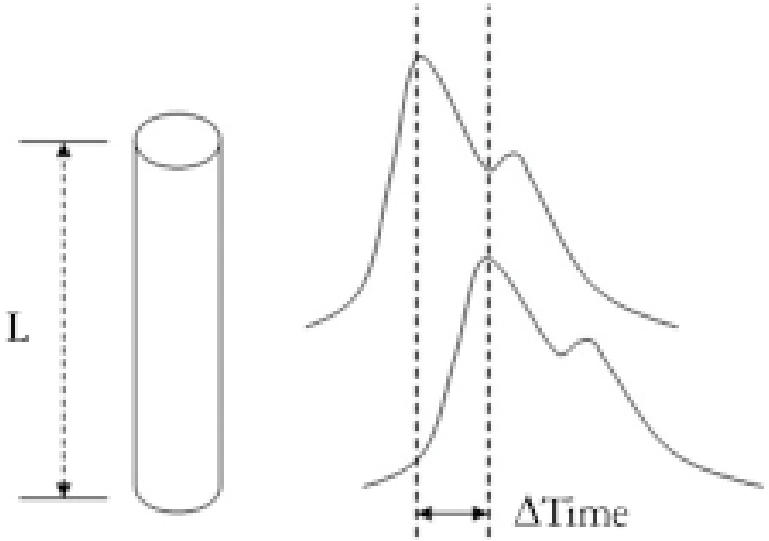
Sympathetic nerve activity is increased in young adults born SGA as compared to young individuals born AGA

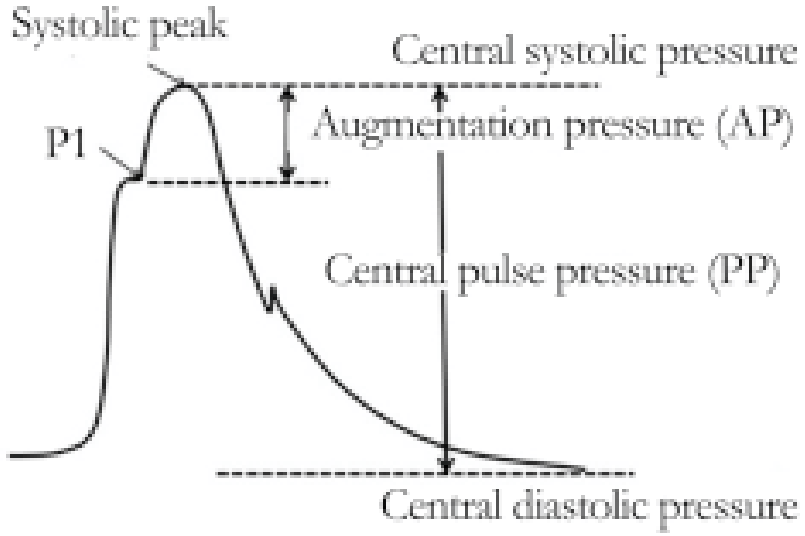


AGA: Appropriate for Gestational Age
SGA: Small for Gestational Age

Sverrisdóttir YB, *et al.* 2006

Pulse wave velocity (PWV) and Augmentation Index (Aix)





$$PWV\ (m/sec) = L / \Delta Time$$

$$AIx\ (\%) = AP/central\ PP \times 100\ (\%)$$

Shim, Chi Young. Arterial-Cardiac Interaction: The Concept and Implications. Journal of Cardiovascular Ultrasound 2011

The Impact of Being Born Preterm or Small for Gestational Age on Early Vascular Aging in Adolescents

Katharina Stock, MD[1], Anna Schmid, MD[1], Elke Griesmaier, MD, PhD[1], Nina Gande, MD[1], Christoph Hochmayr, MD[1], Michael Knoflach, MD[2], Ursula Kiechl-Kohlendorfer, MD, MSc[1], and the Early Vascular Aging (EVA) Study Group*

Perof. Ursula Kiechl-Kohlendorfer
University of Innsbruck, Austria

Table II. Unadjusted characteristics of the study cohort and subgroups

Characteristics	Study cohort			Subgroups				
				Term-AGA	Term-SGA		*P* value	
	Term (n = 847)	Preterm (n = 83)	*P* value, Term vs Preterm	Term-AGA (n = 755)	Term-SGA (n = 92)	Preterm-AGA (n = 81)	Term-AGA vs Term-SGA	Term-AGA vs Preterm-AGA
Perinatal characteristics								
Gestational age, wk, mean (SD)	39.8 (1.2)	34.8 (2.2)	<.001*	39.8 (1.2)	40.2 (1.3)	34.8 (2.3)	.002*	<.001*
Birth weight, g, mean (SD)	3359 (445)	2486 (651)	<.001*	3434 (398)	2734 (295)	2512 (635)	<.001*	<.001*
MAP, mmHg, mean (SD)	89 (7)	91 (8)	.005†	89 (7)	87 (8)	91 (8)	.100†	.008†
cIMT max, mm, mean (SD)	0.429 (0.056)	0.421 (0.054)	.198*	0.430 (0.057)	0.421 (0.046)	0.421 (0.054)	.261*	.163*
cIMT mean, mm, mean (SD)	0.381 (0.048)	0.372 (0.046)	.099†	0.382 (0.048)	0.377 (0.044)	0.372 (0.046)	.312†	.079†
PWV, m/s, mean (SD)	6.13 (1.18)	6.07 (0.91)	.824*	6.07 (1.09)	6.67 (1.73)	6.10 (0.91)	.011*	.756*

PWV, m/s	6.13	6.07	0.8	6.07	6.67	6.10	0.011	0.8

N= 930 adolescents, mean **16 years**
AGA: Appropriate for Gestational Age
SGA: Small for Gestational Age

Stock K, *et al.* J Pediatr 2018; 201:49-54.

Arterial health during early childhood following abnormal fetal growth

Rasmus F.W. Olander[1,2*], Johnny K.M. Sundholm[1,2], Sanna Suonsyrjä[1,2] and Taisto Sarkola[1,2]

Dr. Rasmus Olander
University of Helsinki

N = 90 (SGA, N=23, LGA, N=19, AGA N=48), mean age 5.8 years

Dependent	Adjusted R^2	Model *p*-value	Predictor	β	SE	B	*p*-value
Carotid-femoral PWV (m/s)	0.224	<0.001	Birth weight, Z-score	0.024	0.031	0.083	0.444
C-f PWV			Height (cm)	0.043	0.016	0.300	0.010
Complior			MAP (mmHg)	0.032	0.014	0.258	0.025
			Heart rate (bpm)	0.011	0.007	0.175	0.112

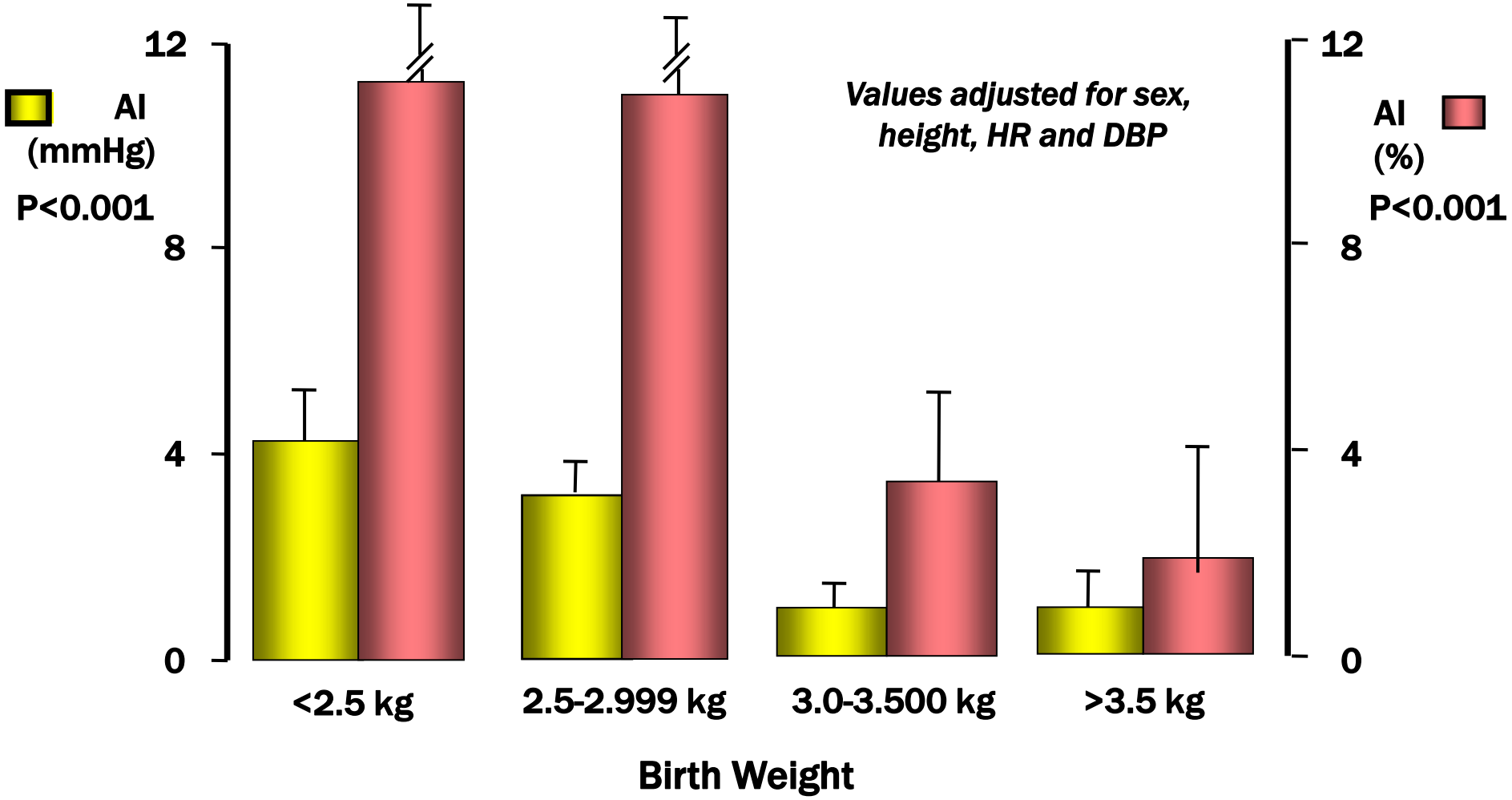
We report *no abnormalities* in arterial health, including PWV and BP, nor in adiposity, blood glucose or lipids during early childhood following abnormal fetal growth.

…but Aix was NOT measured!

Olander *et al.* BMC Pediatrics (2022) 22:40.

Prof. Empar Lurbe
Valencia, Spain

Augmentation Index (Aix) grouped by birth weight



Lurbe E et al. Hypertension 2003;41:646-650

Dr. Johannes Sperling
Lund University

Does early life programming influence arterial stiffness and central hemodynamics in adulthood?

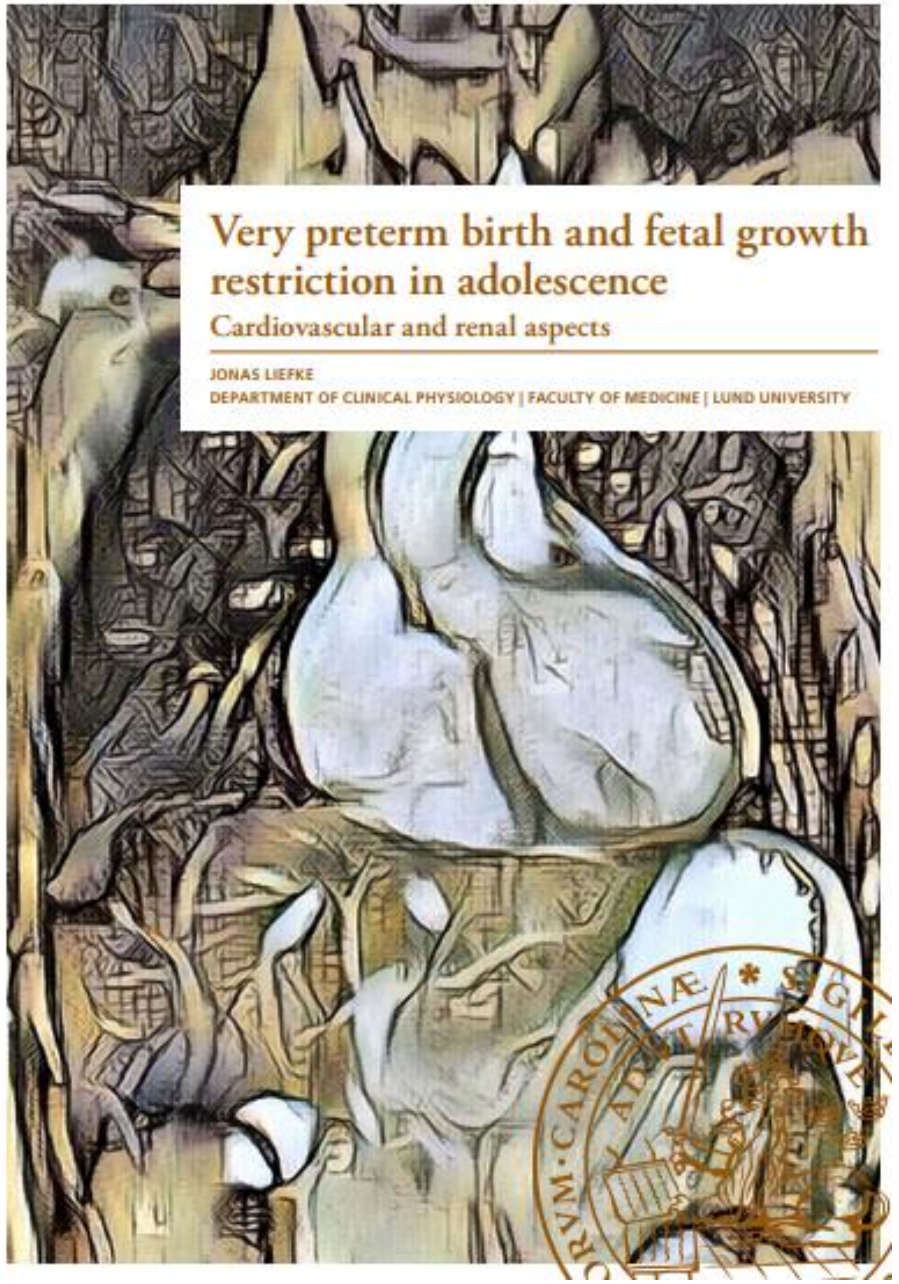
Multiple regression – dependent variable Augmentation Index in relation to BW in different age groups

	Age 18-27 (n=620)			*Age 27-44 (n=623)*			*Age 63-84 (n=326)*		
	Model 1	**Model 2**	**Model 3**	**Model 1**	**Model 2**	**Model 3**	**Model 1**	**Model 2**	**Model 3**
	ß	ß	ß	ß	ß	ß	ß	ß	ß
Early life									
Birth Weight (gram)	**-0.06**	**-0.08**	**-0.08**	**-0.16***	**-0.12***	**-0.12***	**-0.15***	**-0.11***	**-0.11***
Gestational Age (weeks)	0.05	0.08	0.09	0.1*	0.07	0.07	0.02	-0.002	-0.01
Adult data									
Glucose (mmol/l)	0.02	-0.02	-0.02	0.004	-0.01	-0.01	0.03	0.06	0.06

Model 1: Age, sex and gestational age
Model 2: + MAP, HR, smoking, anti-hypertensive treatment and BMI.
Model 3: + glucose.
P<0.05 is considered significant. *Significant association.

Sperling J, Nilsson PM. *J Hypertens.* 2020;38(3):481-488.

Jonas Liefke, doktorand,
Klin Fys, Lund
Disputation den 7/12 2022



Summary

- In the **TIME study,** final evidence was shown that the timing of intake of antihypertensive drugs (morning vs. bedtime) does not matter for risk of CVD events, thus the patient can choose what is most practical for the individual
- In the **SPARTE study**, a stratgy to control arterial stiffness (PWV) was partly supported as compared to usual care based on guidelines, but a larger study is needed for evaluation of protection from developing CVD events
- **Early life programming** (prematurity, fetal growth, birth weight) provides new insights into the the early influences on vascular structure and function, leading to increased risk in adult life