Orthostatic hypotension with supine hypertension

Professor Rose Anne Kenny
Trinity College
Dublin

Orthostatic hypotension with supine hypertension

Definitions

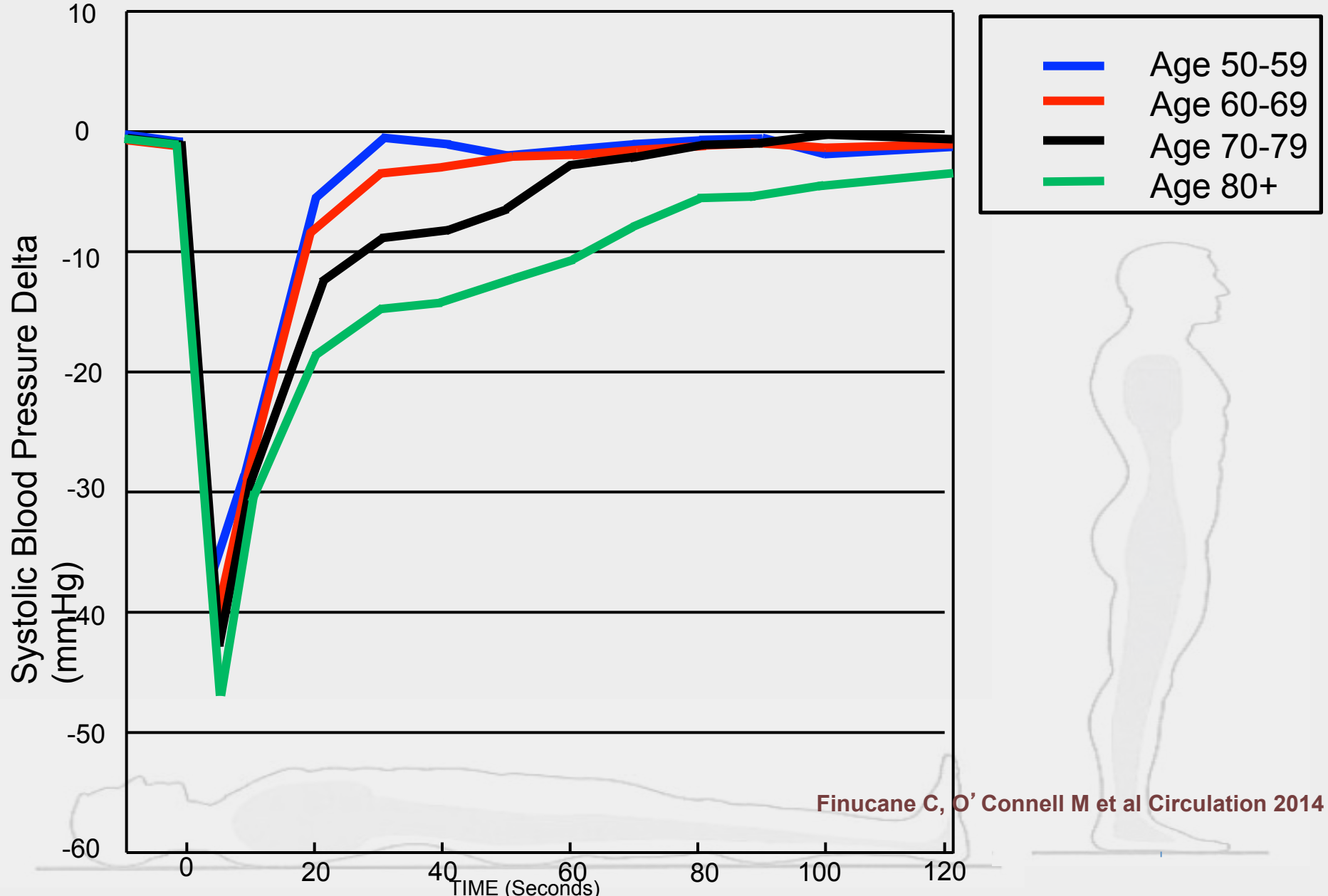
- Orthostatic Hypotension
- Supine Hypertension

Orthostatic hypotension with supine hypertension

Prevalence OH– traditional 20/10mmHg

55% geriatric clinic;
30% home-dwelling elderly;
10.4% to 17.3% isolated systolic hypertension;
42% end-stage renal disease
20% Parkinson Disease

Age Dependence of Systolic Blood Pressure Delta (mmHg) Response to Standing



Finucane C, O' Connell M et al Circulation 2014

Orthostatic hypotension with supine hypertension

All-cause mortality *RR 1.64*

5-year incident CHD *RR 2.0*

CHD mortality RR *2.9*

Chronic hemodialysis RR *2.04*

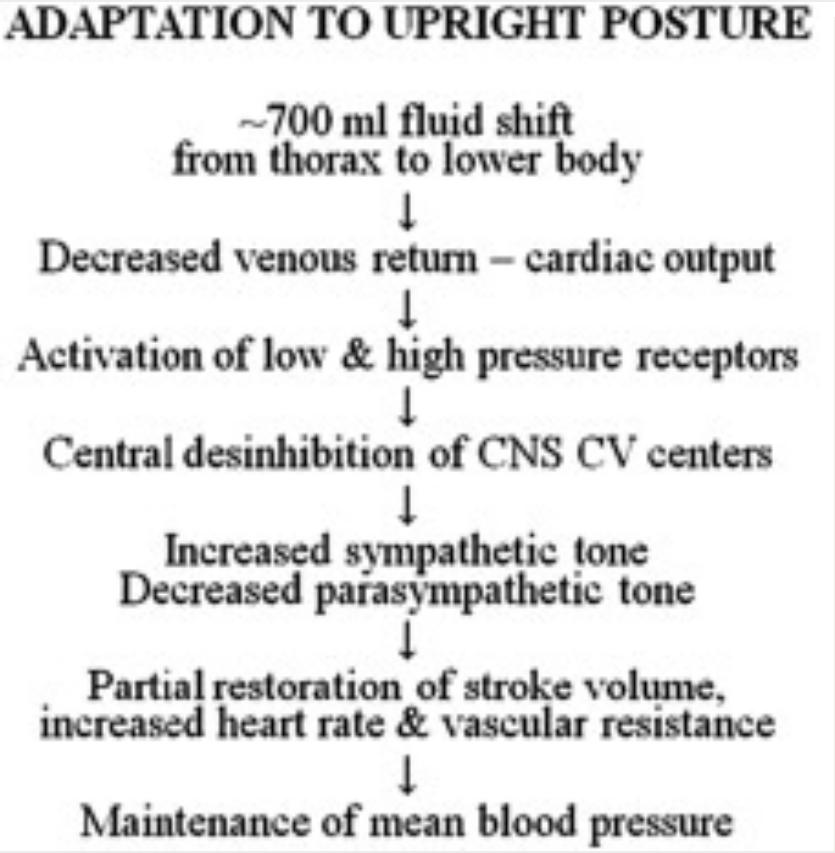


Figure 1. Left panel shows the normal response to upright posture. Patients with orthostatic hypotension (OH) are unable to compensate for the posture-induced changes in venous return to the heart. The right panel shows a continuous blood pressure (BP) tracing...J Amer Soc Hypert 2013

Elderly individuals have decreased baroreflex sensitivity, with diminished heart rate responses[15] and impaired α_1-adrenergic vasoconstriction.[16]

ADAPTATION TO UPRIGHT POSTURE

~700 ml fluid shift
from thorax to lower body

↓

Decreased venous return – cardiac output

↓

Activation of low & high pressure receptors

↓

Central desinhibition of CNS CV centers

↓

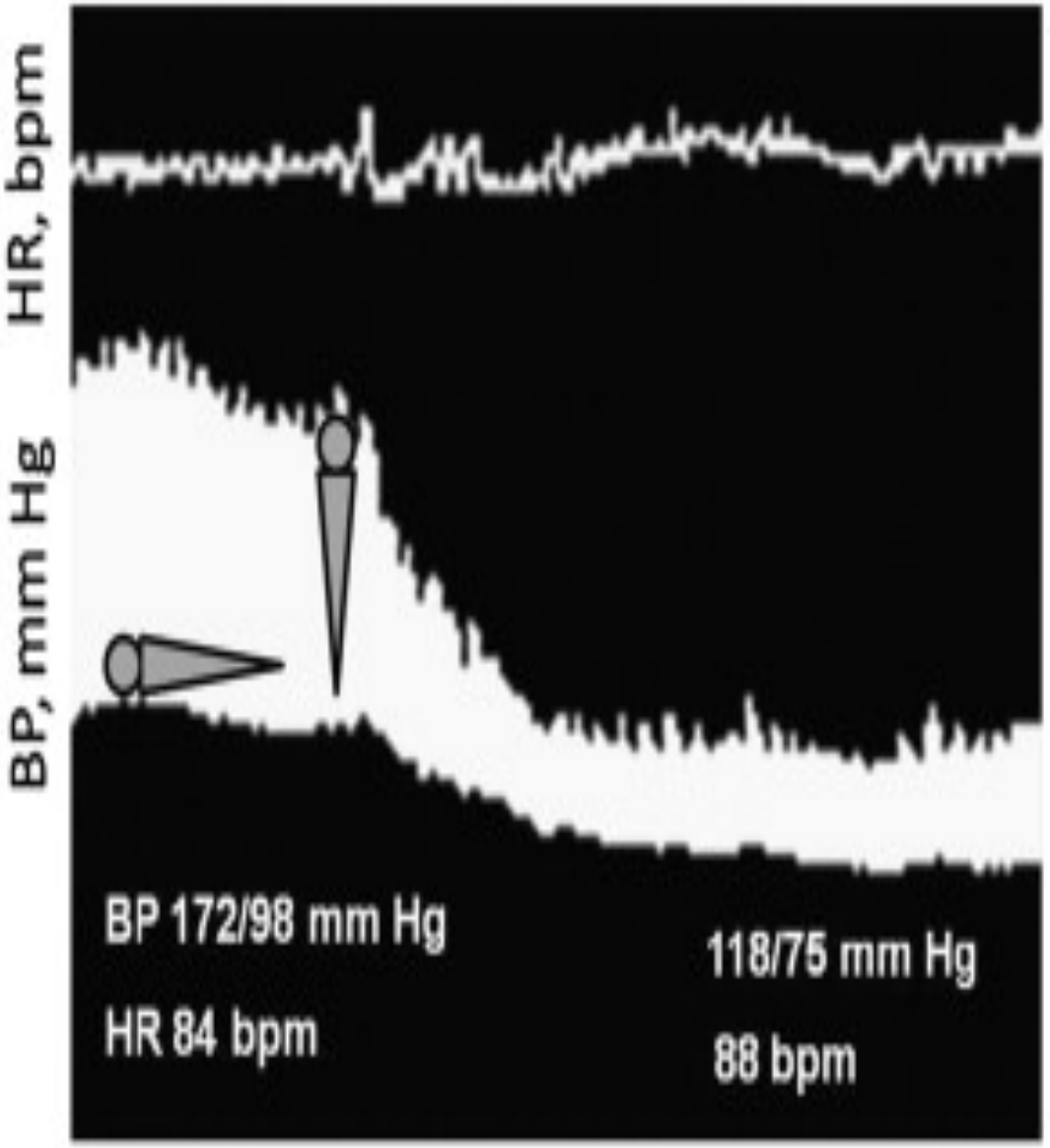
Increased sympathetic tone
Decreased parasympathetic tone

↓

Partial restoration of stroke volume,
increased heart rate & vascular resistance

↓

Maintenance of mean blood pressure



Elderly individuals have decreased baroreflex sensitivity, with diminished heart rate responses[15] and impaired α_1-adrenergic vasoconstriction.[16]

Orthostatic hypotension with supine hypertension

Supine hypertension occurs commonly in *chronic autonomic failure*

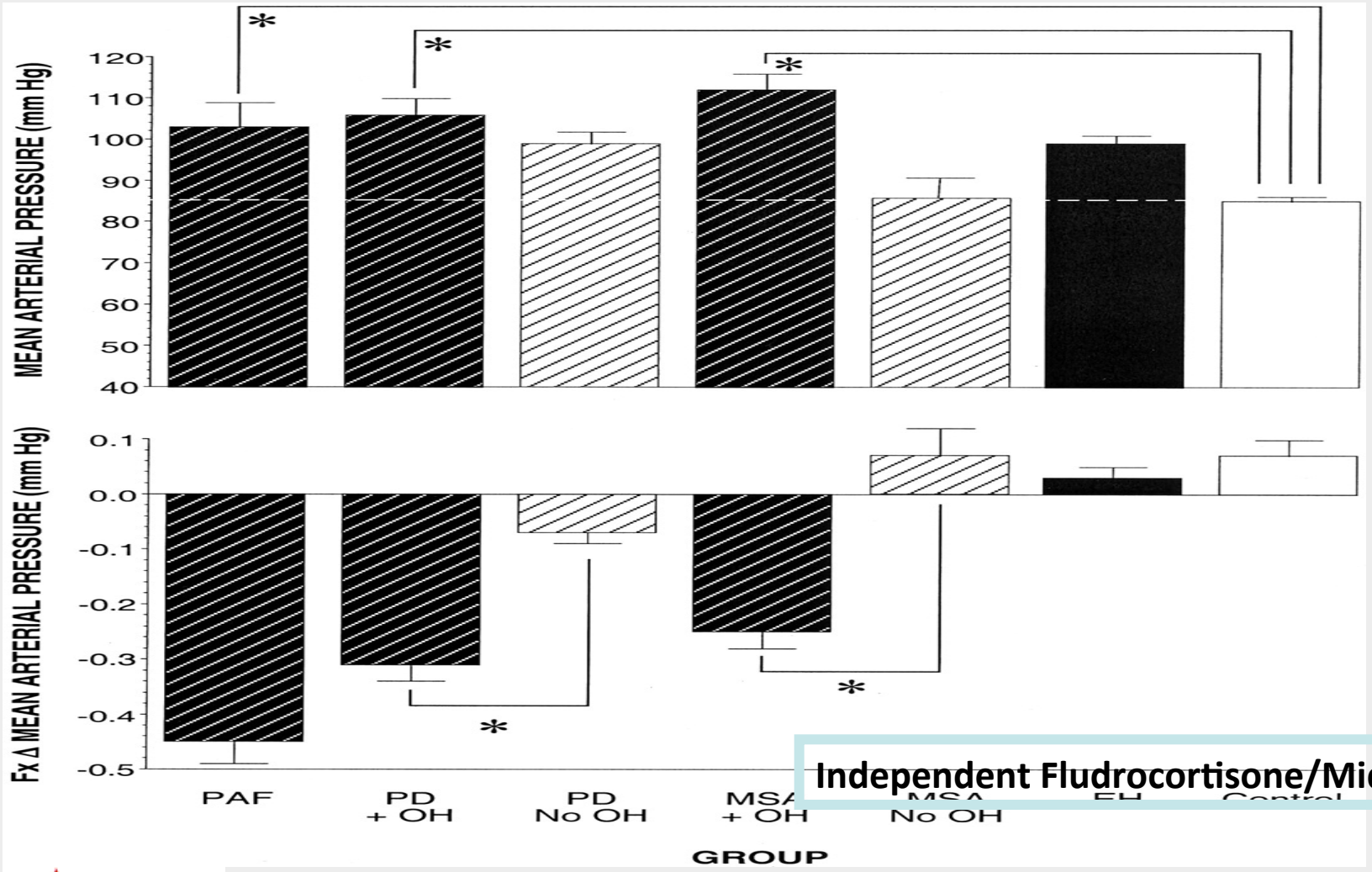
- Primary Chronic autonomic failure
- Multiple System Atrophy
- Autonomic Failure in Parkinson's disease

Orthostatic hypotension with supine hypertension

- In **PAF, MSA, or PD**, is there an association between supine hypertension and OH?

- If so, does **fludrocortisone** treatment explain this association?

Figure 2. Mean±SEM values for (top) mean arterial pressure and (bottom) fractional change (FxΔ) in mean arterial pressure during orthostasis in patient groups with PAF, PD+OH, PD without OH, MSA+OH, MSA PD without OH, essential hypertension (EH), and control normotensives without OH. *Significant group difference.



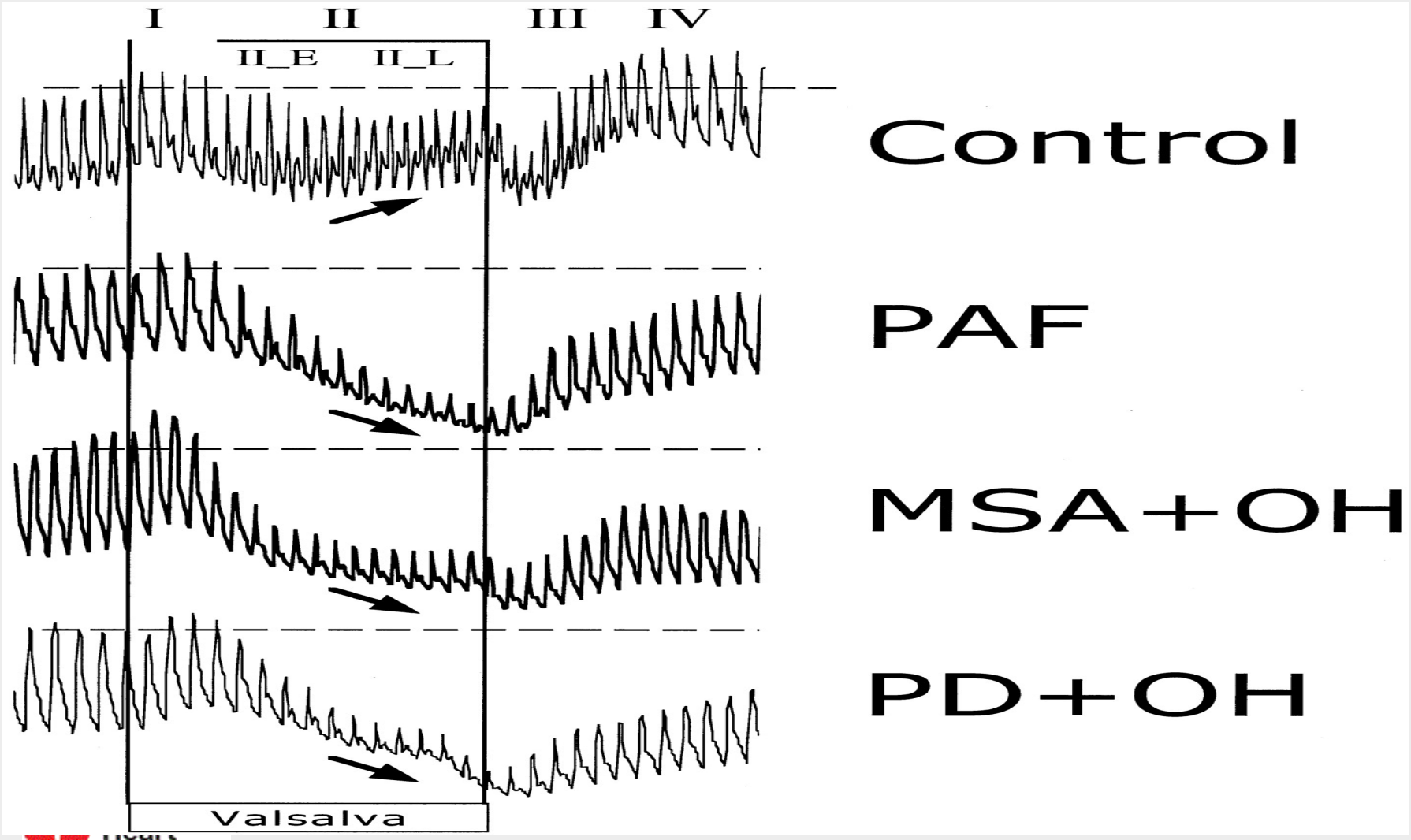
Independent Fludrocortisone/Midodrine

David S. Goldstein et al. Hypertension. 2003;42:136-142

Orthostatic hypotension with supine hypertension

Do patients with OH have disruption of baroreflexes?

Figure 1. Blood pressure responses to the Valsalva maneuver in a control patient and in patients with OH associated with PAF, MSA, and PD. Note the progressive fall in blood pressure in the late portion of Phase II (Phase II_L) and the lack of "overshoot" in blood pressure above baseline in Phase IV in patients with OH.



Association. David S. Goldstein et al. Hypertension. 2003;42:136-142

Orthostatic hypotension with supine hypertension

Do patients with OH have disruption of baroreflexes?

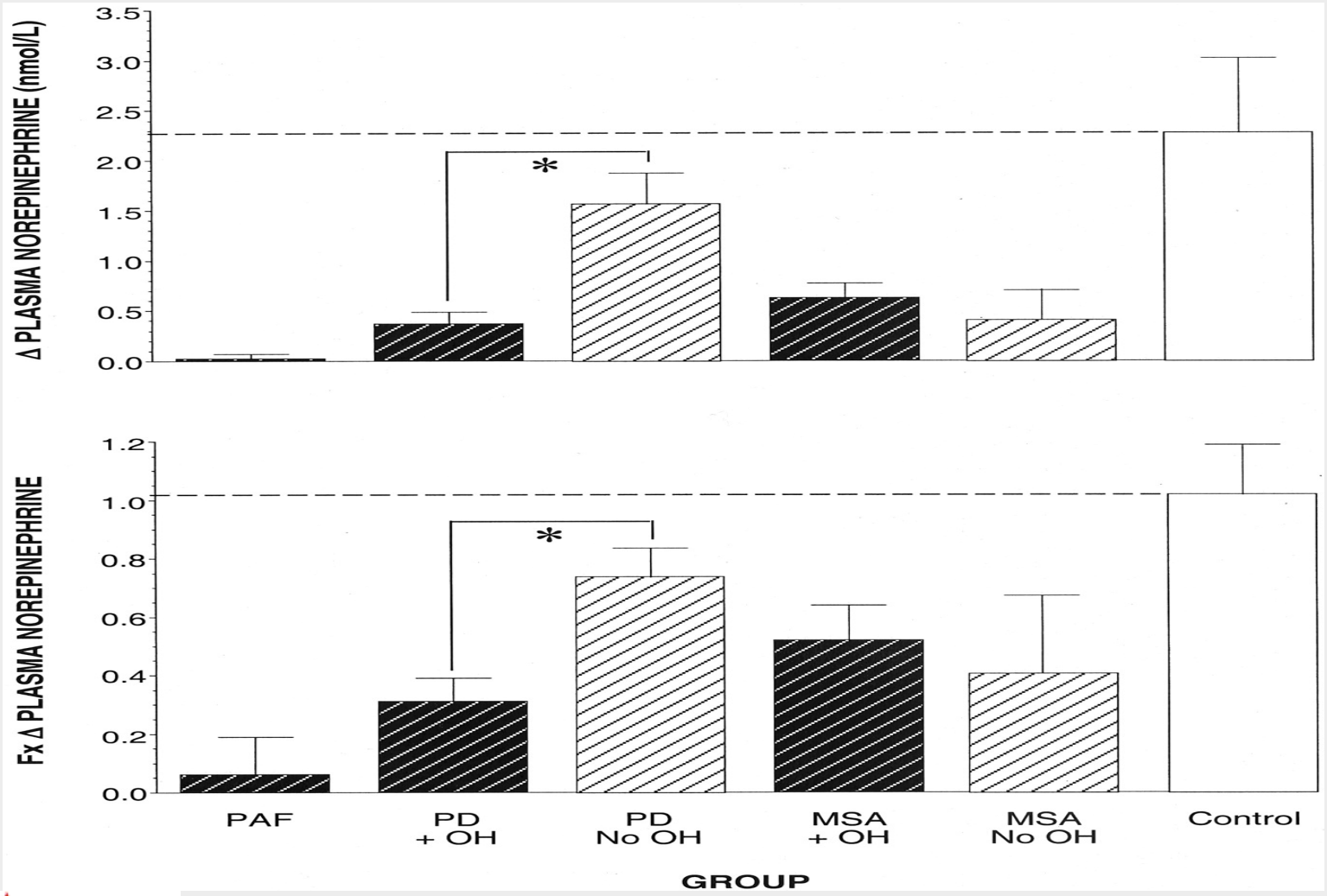
- ***94% OH*** (Phases II_L & IV Valsalva maneuver)
- ***23% no* OH**

(χ^2=42, P<0.0001)

Baroreflex-cardiovagal gain ms/mm Hg

- ***0.74±0.10* OH**
- ***3.13±0.72 no* OH** P=0.0002

Figure 5. Mean±SEM absolute (top) and fractional (bottom) changes in plasma NE levels during orthostasis in patient groups with PAF, PD+OH, PD without OH, MSA+OH, MSA without OH, essential hypertension (EH), and control normotensives without OH. *Significant group difference.



David S. Goldstein et al. Hypertension. 2003;42:136-142

Orthostatic hypotension with supine hypertension

NE impaired

- 71% patients with OH,
- 33% no OH

(χ^2=13, P=0.0003)

Thus OH - abnormal blood pressure pattern characteristic of *sympathetic neurocirculatory* failure and deficient, *sympathetically mediated NE* release during orthostasis.

Romero-Ortuno et al. BMC Geriatrics 2013, 13:73
http://www.biomedcentral.com/1471-2318/13/73

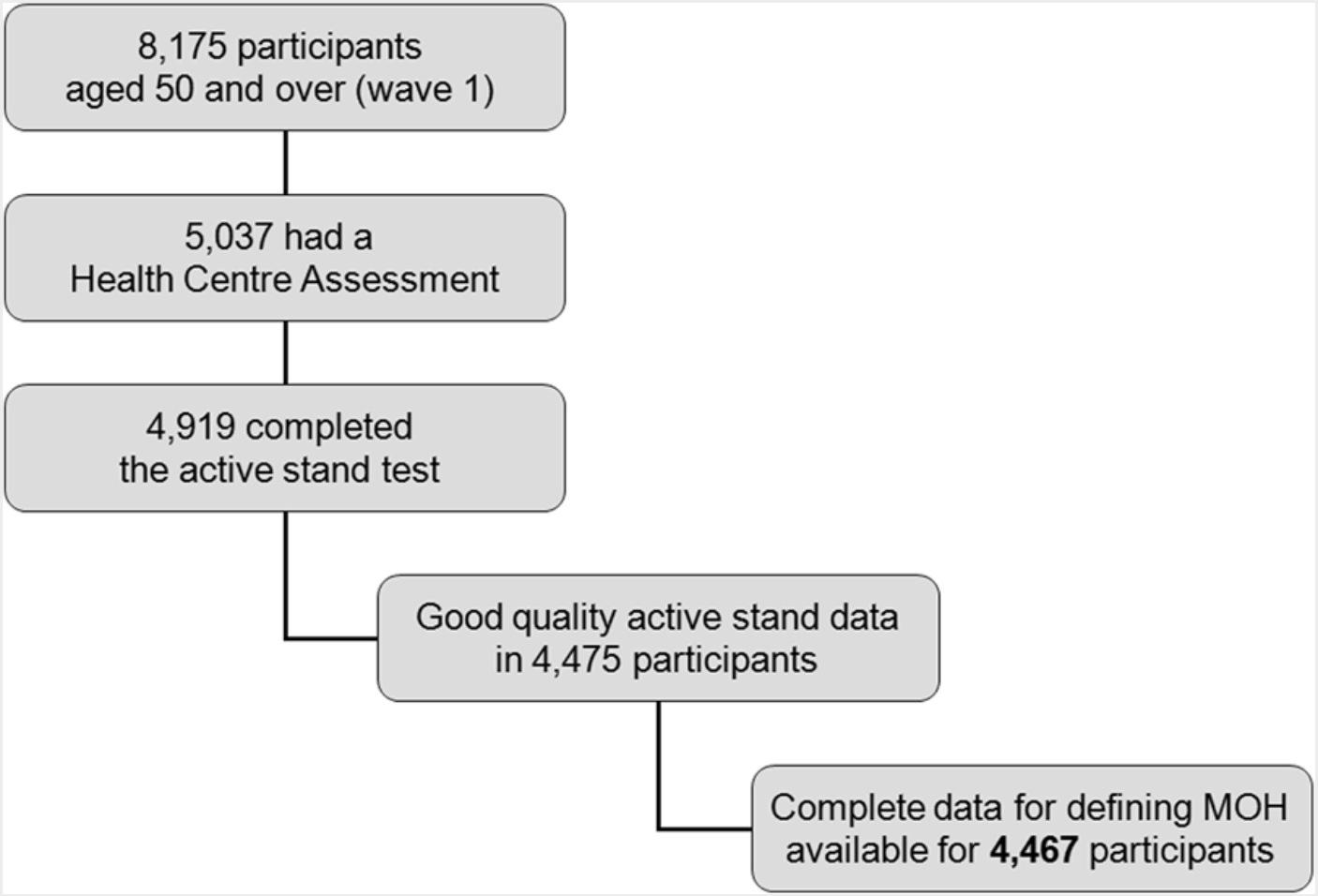
BMC Geriatrics

RESEARCH ARTICLE Open Access

Insights into the clinical management of the syndrome of supine hypertension – orthostatic hypotension (SH-OH): The Irish Longitudinal Study on Ageing (TILDA)

Roman Romero-Ortuno*, Matthew DL O'Connell, Ciaran Finucane, Christopher Soraghan, Chie Wei Fan and Rose Anne Kenny

Orthostatic hypotension with supine hypertension



BMC Geriatrics 2013

Morphological OH patterns

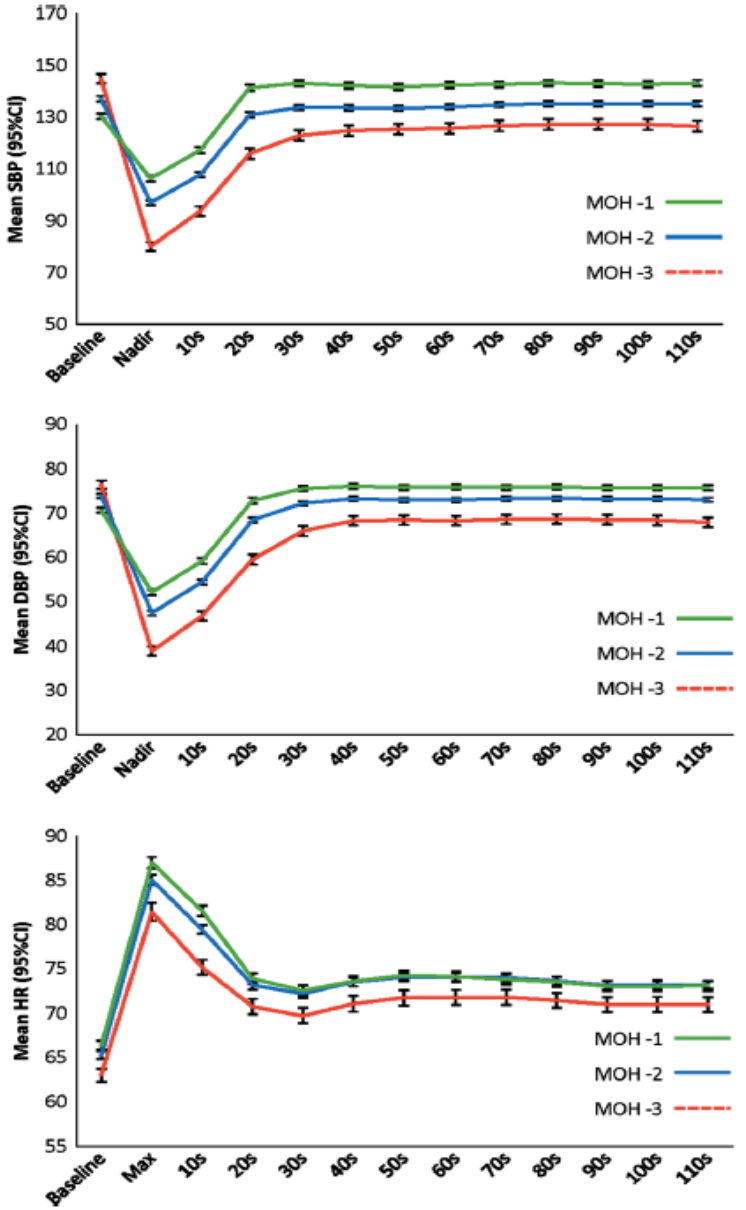


Figure 2 MOH phenotypes (visual description of SBP, DBP and HR behaviour).

1 small drop/fast over-recovery

2 medium drop/slow recovery

3 large drop/non-recovery

18% MOH 1
28% MOH 2
44% MOH 3

Predict MOH-3 (SHP OH)

- ***Antidepressants***

  (OR = 1.99, 95% CI: 1.50 – 2.64, P < 0.001)
- ***beta blockers***

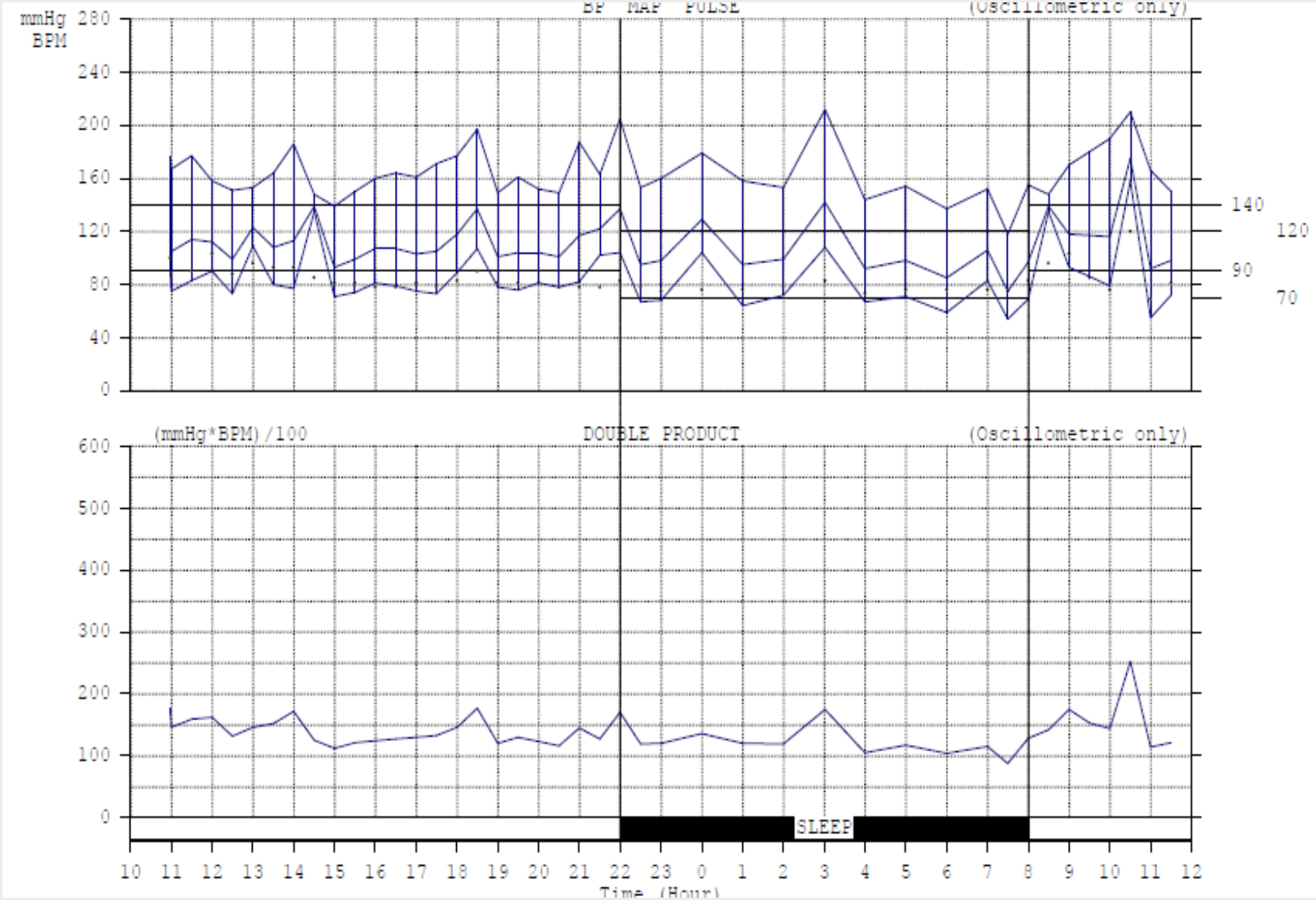
  (OR = 1.60, 95% CI: 1.26 – 2.04, P < 0.001).
- ***MOH-3*** was an independent predictor of ***OI***

  (OR = 1.47, 95% CI: 1.25 – 1.73, P < 0.001),
- ***OI*** falls/blackouts

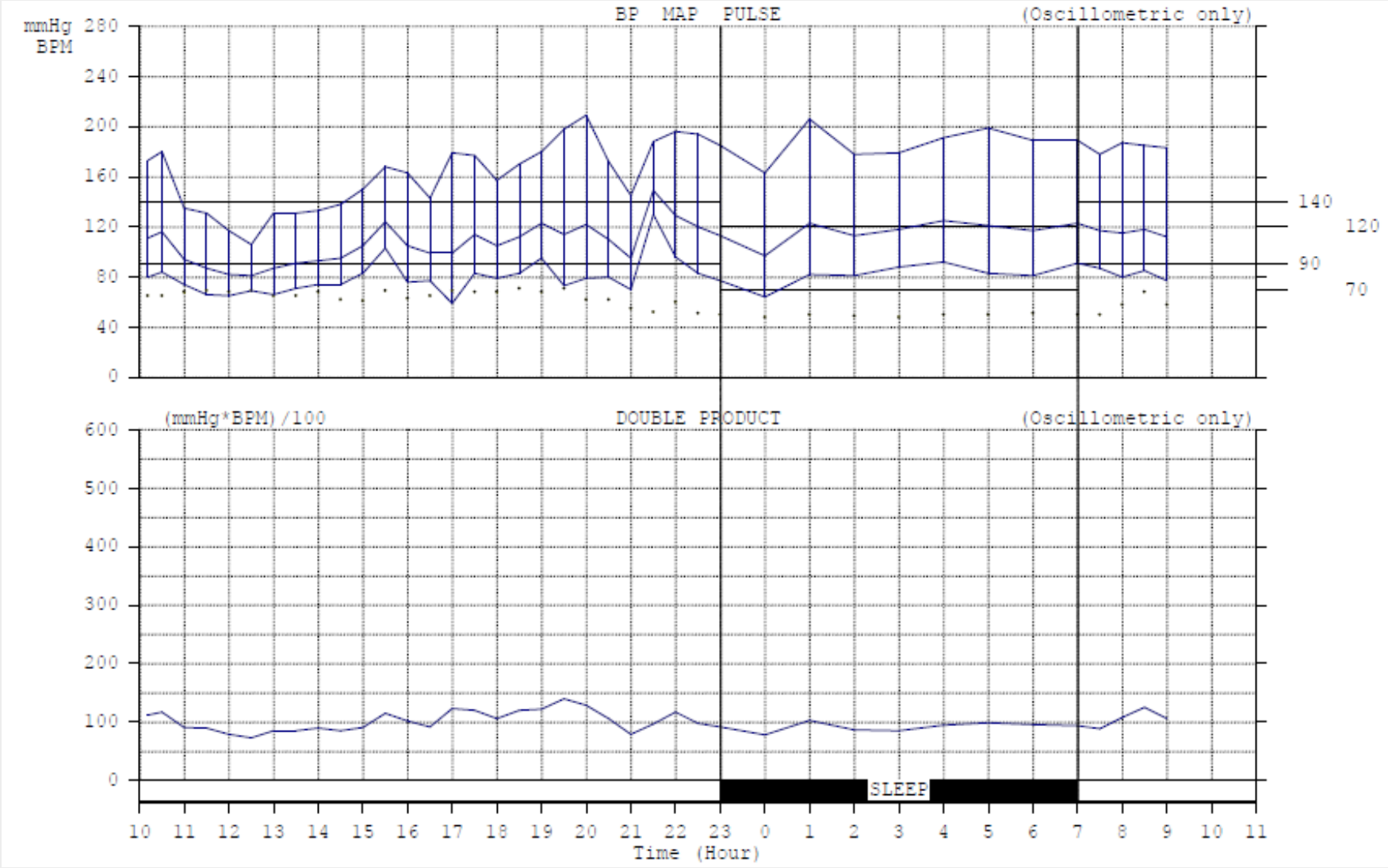
  (OR = 1.27, 95% CI: 1.09 – 1.48, P = 0.003)

Management

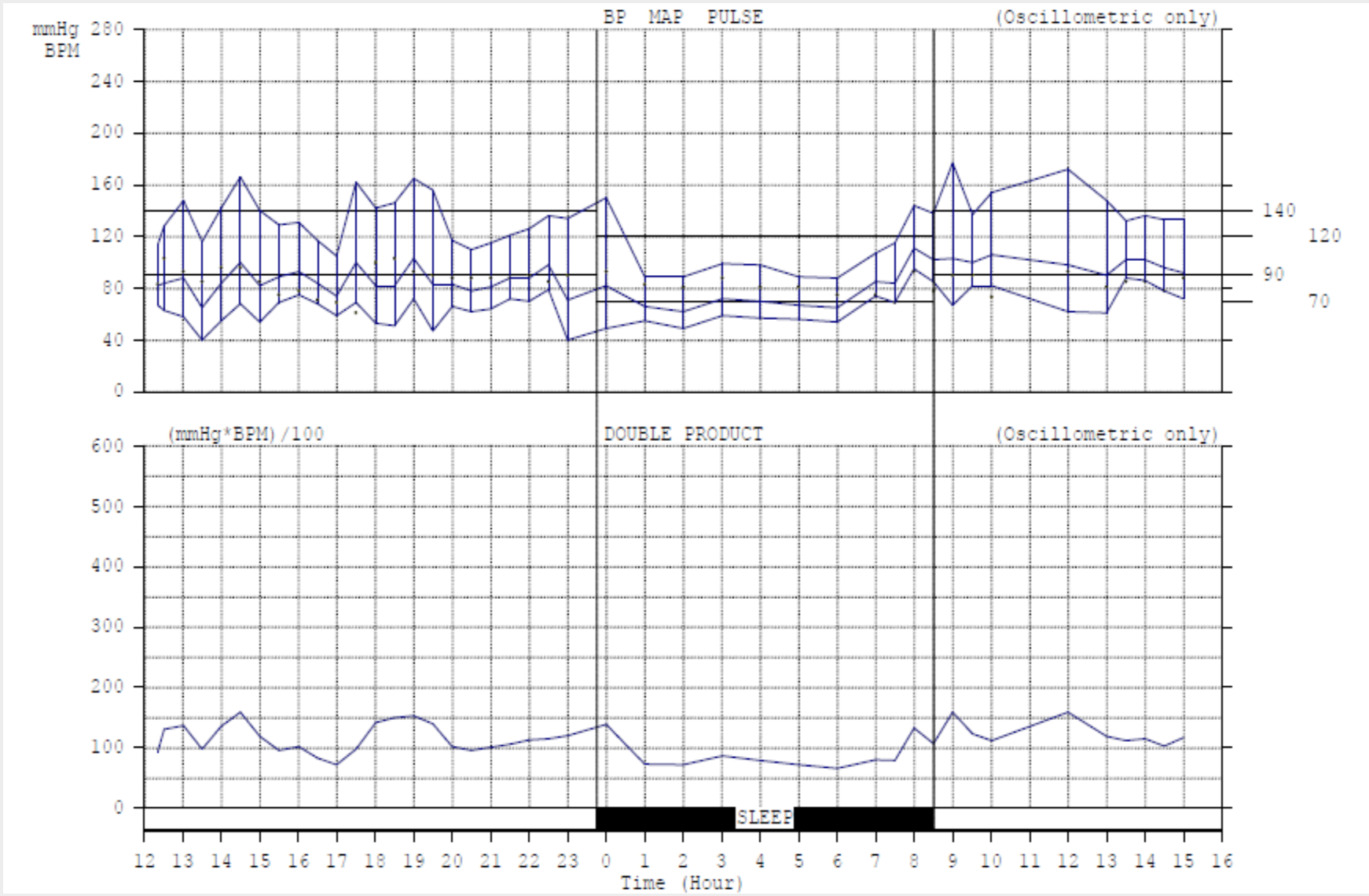
Hypertension – Day and Night



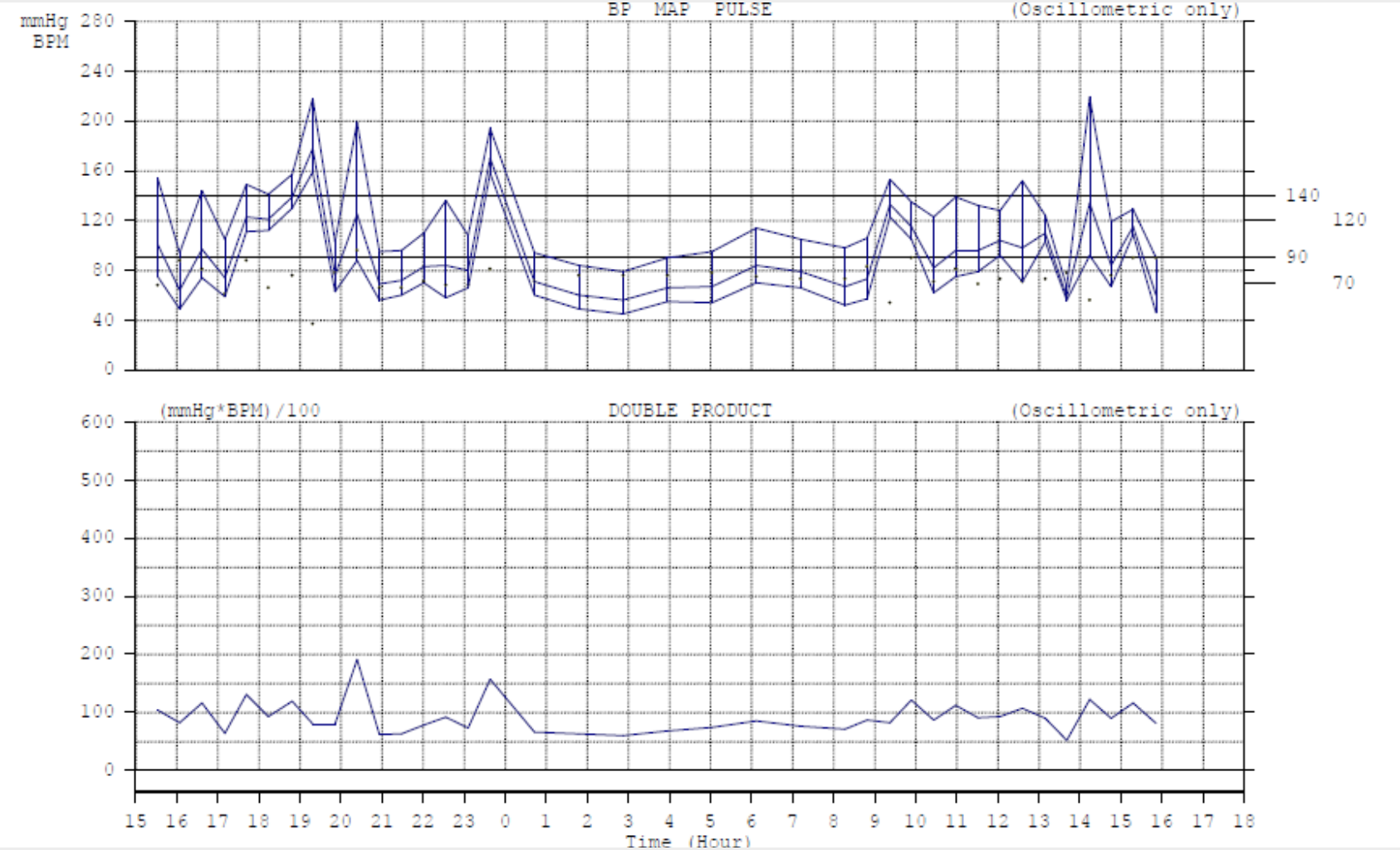
Nocturnal Hypertension



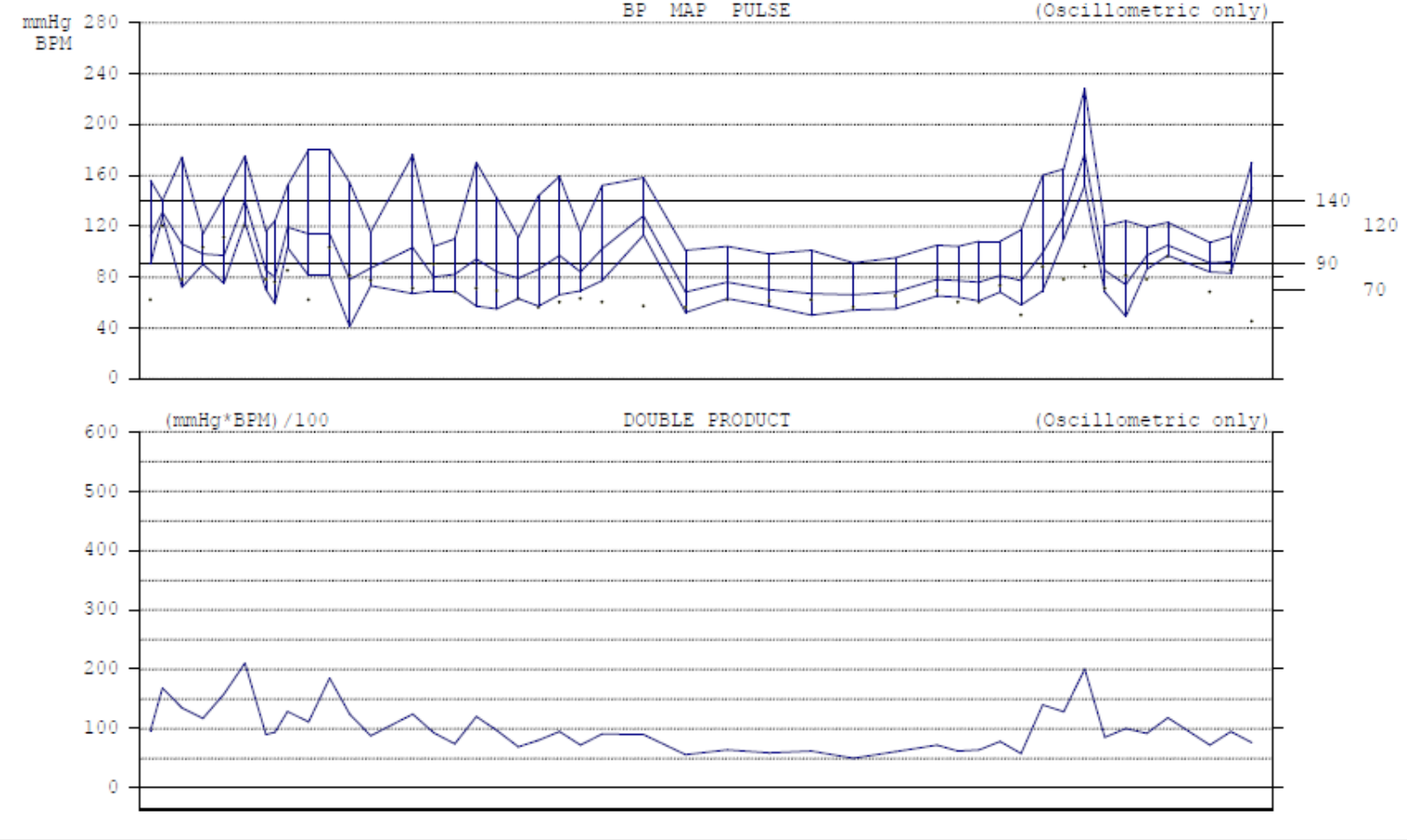
Nocturnal Dip



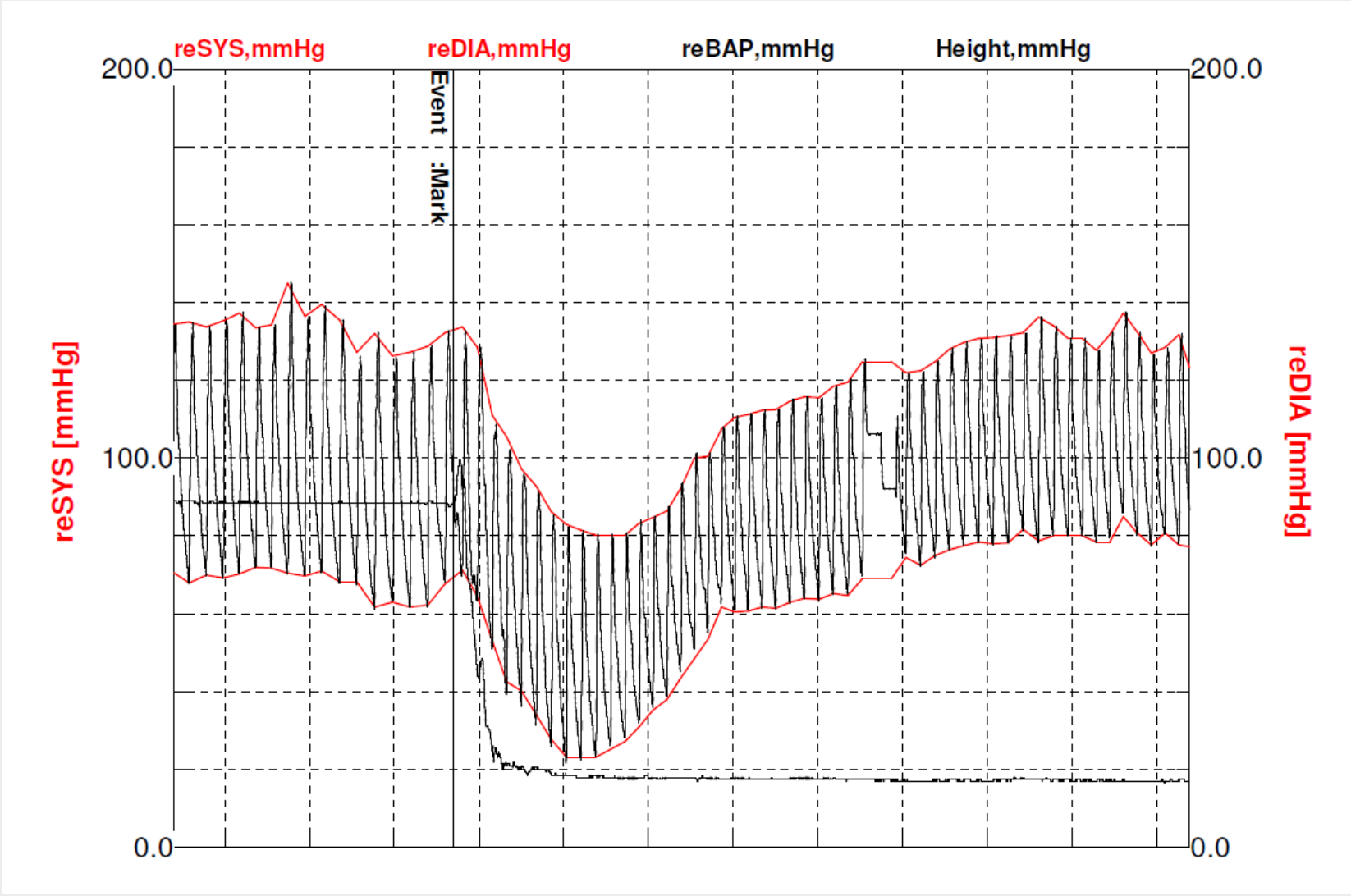
BP variabilty 2



BP variability 1



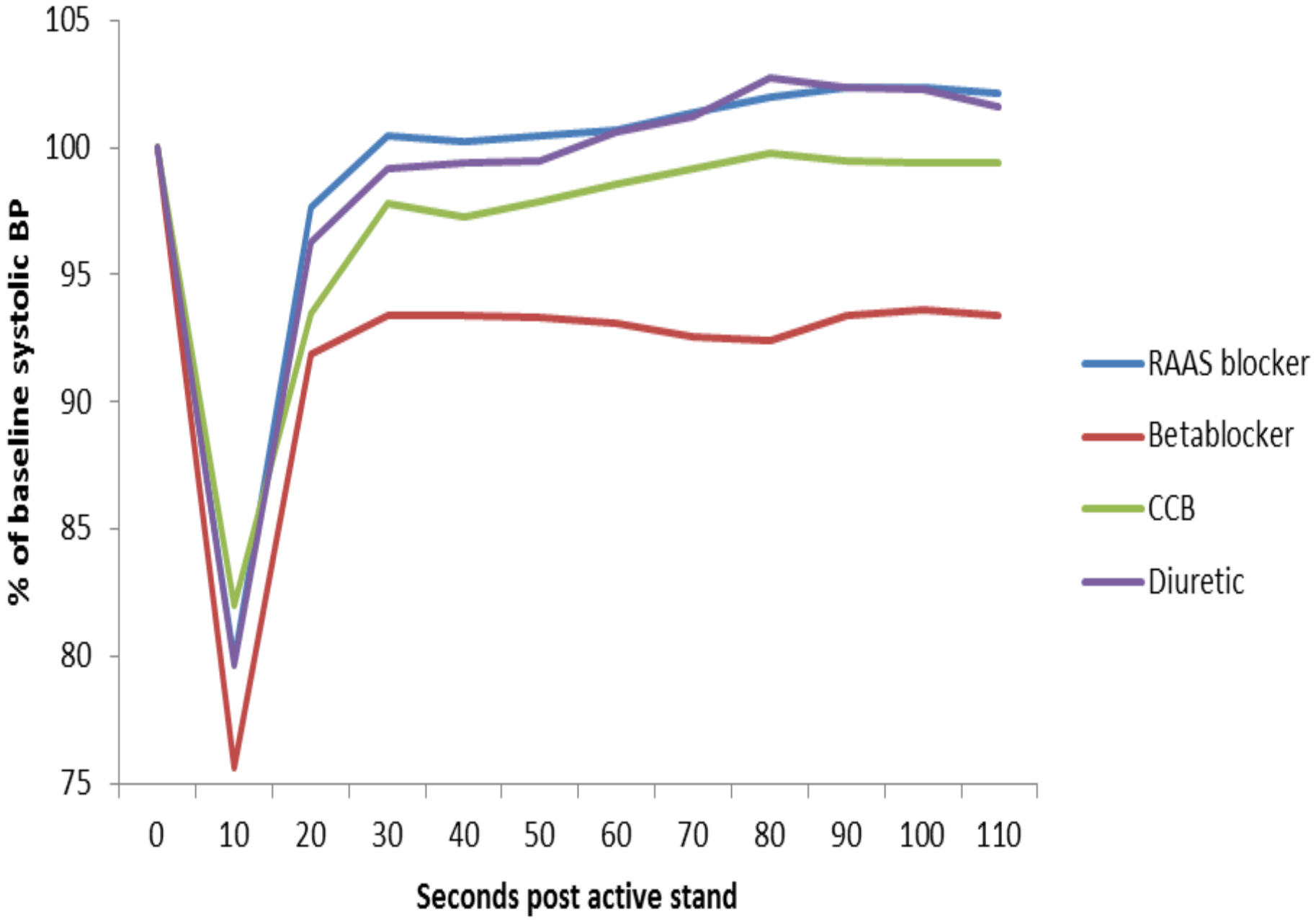
OH on AS


reSYS,mmHg
reDIA,mmHg
reBAP,mmHg
Height,mmHg
200.0
100.0
0.0
Event :Mark
reSYS [mmHg]
reDIA [mmHg]

Management

Interrelated goals:

- to treat hypertension
- to improve orthostatic blood pressure without excessive supine hypertension
- to improve standing time
- to relieve orthostatic symptoms
- to improve the patient's ability in orthostatic activities of daily living


105
100
95
90
85
80
75
% of baseline systolic BP
0
10
20
30
40
50
60
70
80
90
100
110
Seconds post active stand
RAAS blocker
Betablocker
CCB
Diuretic

Orthostatic hypotension with supine hypertension

A practical goal :

- relieve OH symptoms for most of the day
- supine blood pressure <180/110 mm Hg

: early time of day, a meal, a rise in core temperature, physical activity, or reduced salt or fluid intake.

Older patients might become symptomatic after a period of bed rest, after medications or after starting certain drugs.

Nocturnal orthostatic hypotension – older

Low Lancet Neurology 2007
Age ageing 2013

Orthostatic hypotension with supine hypertension

Non pharmacological interventions:

- Culprit medication- CV, PD meds, anti depressants, Urinary
- Fluid and salt
- Getting up slowly, PCM, Meals, Nocturnal, elevate BED head, hot showers

Orthostatic hypotension with supine hypertension

Pharma

- Fludro
- Midodrine
- Pyridostigmine
- Pseudoephedrine
- Octeotride
- Droxidope

Orthostatic hypotension with supine hypertension

Professor Rose Anne Kenny
Trinity College
Dublin