Practical workshop on ABPM

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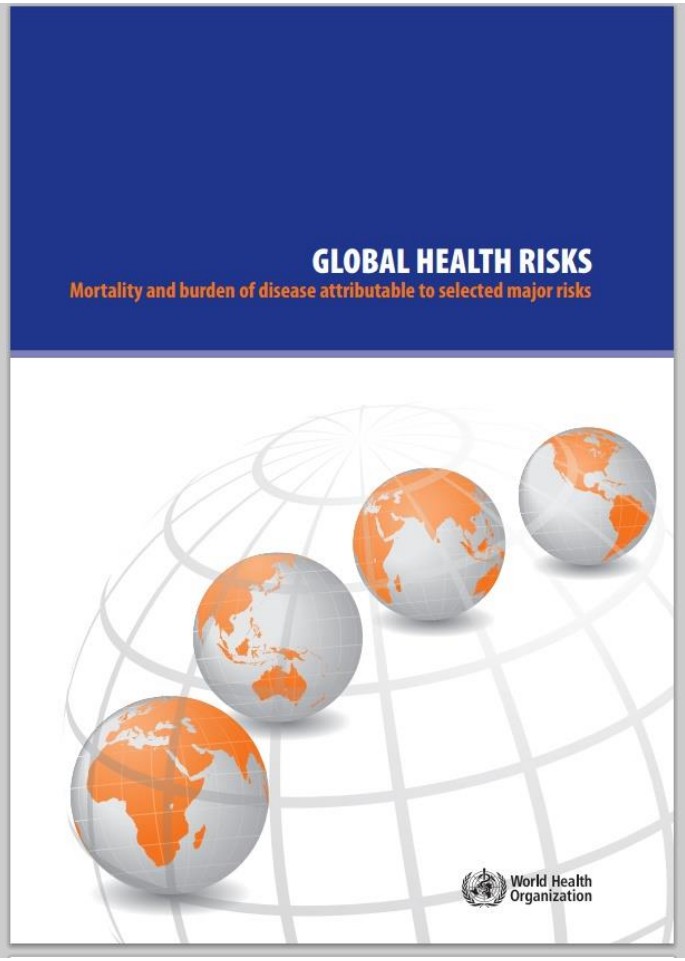
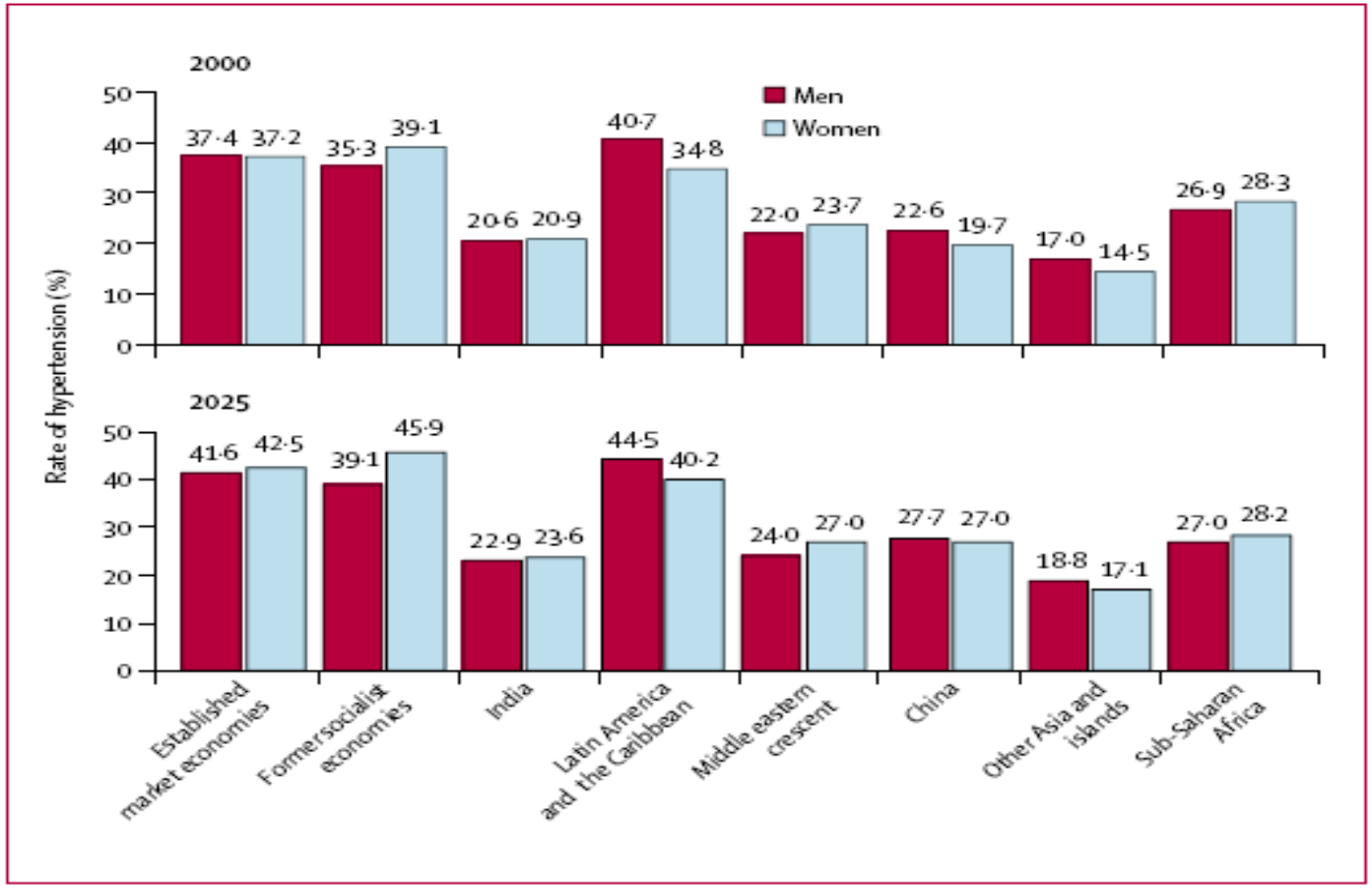
Content

- Diagnostic challenges
- ABPM: use it!
- Serial Automated OBPM


GLOBAL HEALTH RISKS
Mortality and burden of disease attributable to selected major risks
World Health Organization



Kearney. Lancet. 2005

Table 1 Blood pressure control and knowledge of target blood pressure among patients using antihypertensive medication by demographic and clinical characteristics

		Blood pressure control		Knowledge of target blood pressure	
	N	*n*	%	*n*	%
Sex					
Women	1983	946	47.7	924	46.6
Men	5666	2910	51.4	2853	50.4
Age at event					
<50 years	887	571	64.4	480	54.1
50–59 years	2256	1247	55.3	1182	52.4
60–69 years	2870	1347	46.9	1417	49.4
70–79 years	1636	691	42.2	698	42.7
Educational level					
Primary	1947	881	45.3	740	38.0
Secondary	2967	1475	49.7	1402	47.3
Intermediate	1361	721	53.0	759	55.8
Higher	1374	779	56.7	876	63.8
Diagnostic group					
CABG	1508	689	45.7	738	48.9
PCI	3127	1610	51.5	1453	46.5
AMI	1511	799	52.9	811	53.7
Ischaemia	1503	758	50.4	775	51.6
Current smoking					
No	6389	3133	49.0	3152	49.3
Yes	1260	723	57.4	625	49.6
Reported diabetes					
No	5721	3019	52.8	2835	49.6
Yes	1928	837	43.4	942	48.9
Obesity					
No	4917	2668	54.3	2479	50.4
Yes	2732	1188	43.5	1298	47.5
Total	7649	3856	50.4	3777	49.4

Prugger et al. EuroAspire3. JoHT. 2011

Hypertension

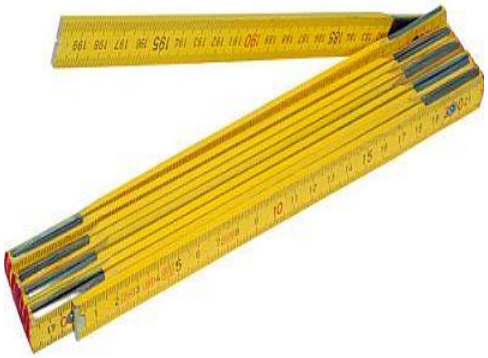
- Prevalent
- Major impact on global burden of disease
- Control rates are poor / suboptimal

- …. Diagnostic challenges

Challenges in measurement of BP

- Which ones?
- Impact in systolic mmHg?

Challenges in measurement of BP



Biological Variability

- Breathing, temperature, talking, diet, etc
- From beat to beat, minute to minute, hour to hour, week to week, etc
- ± 8 mmHg systolic

Clark et al. J Chron Dis. 1987

Mancia et al. Circ Res. 1983

Measurement error

	mmHg	Effect	Ref
Talking during measurement	17	Higher	5
Doc vs nurse (both measuring acc to guideline)	11	Higher	3,6
Biologic variation	10	Random	7
Cuff to small for arm circumference	2-13	Hoger	8,9
Cuff to big for arm circumference	?	Lower	
Arm at arm rest chair vs midsternal height	5-10	Higher	10
Legs crossed instead of both feet on the floor	7	Higher	11

Measurement error

Measurement according to protocol: time and effort needed

Williams. N Eng J Med. 2009

Measurement error

Impact on daily practice:

	Usual care	Strictly acc to guideline
SBD	153 (16)	134 (16)
DBD	82 (10)	84 (11)

N. Scherpbier et al. Br J Gen Pr 2011

White coat effect

White coat effect:

Blood pressure measured by medical staff in office higher than at home

White coat hypertension:

Patient has elevated blood pressure (above 140/90 mmHg) in the office but normal blood pressure at home

Masked hypertension:

Patient has hypertension at home and is normotensive in office

Sustained hypertension: elevated blood pressure in office and at home

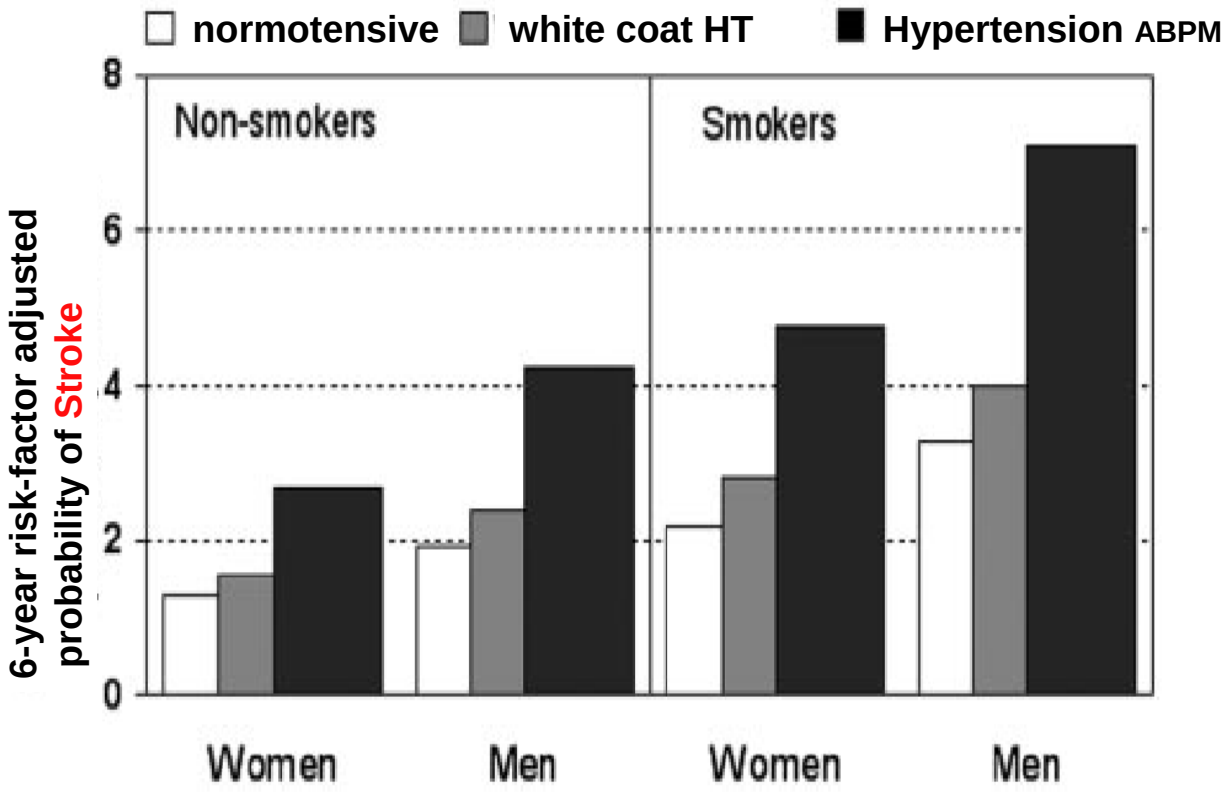
White coat effect

- Mechanism not fully understood
  - Appears to be Pavlov-respons to physician > nurse > setting
  - Reflex activation of the sympathetic nervous system
- More often in higher age, higher BP's
- Prevalent: 20-25%

Pickering et al. BPM. 2002

Ogedegbe et al. Arch Intern Med. 2008

White coat hypertension and prognosis



Verdecchia et al, Hypertension. 2005

Why do we need diagnostic accuracy?

- Individual risk prediction / prognosis
- Prevent overdiagnosis and overtreatment

Additional BP measurements

Out of office:

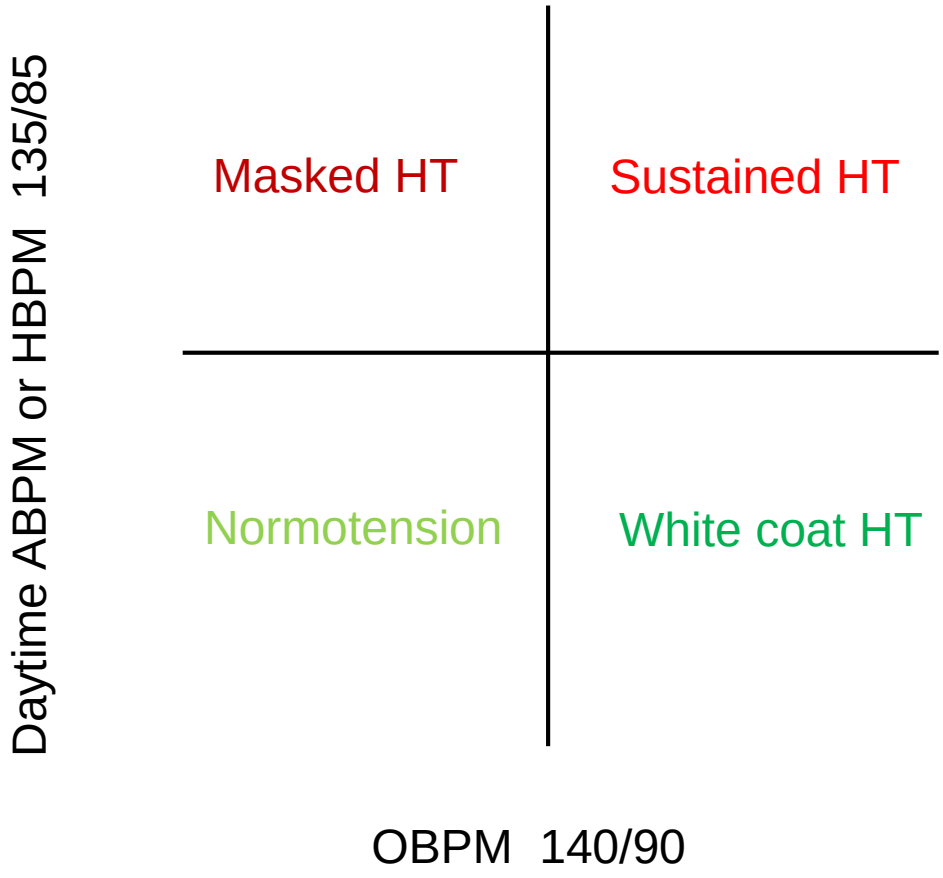
- Home Blood Pressure Monitoring (HBPM)
- Ambulatory BloodPressure Monitoring (24hr ABPM)

In office:

- Automated, serial office blood pressure monitoring (AOBPM)

Different cut-offs of hypertension

	Blood pressure
OBPM	140/90 mmHg
Daytime ABPM	135/85 mmHg
Nighttime ABPM	120/70 mmHg
24hr average ABPM	130/80 mmHg
HBPM	135/85 mmHg
AOBPM	135/85 mmHg


Daytime ABPM or HBPM 135/85
Masked HT
Sustained HT
Normotension
White coat HT
OBPM 140/90

I am curious to know…

- Do you use HBPM ?
- Do you have HBP devices to lend to patients?

- Do you use 24hr ABPM
- Do you have a 24hr monitor in your practice?

- Do you use AOBP (BpTru, 30 minutes measurement?)

Let’s focus on 24hr ABPM

24hr ABPM: How?

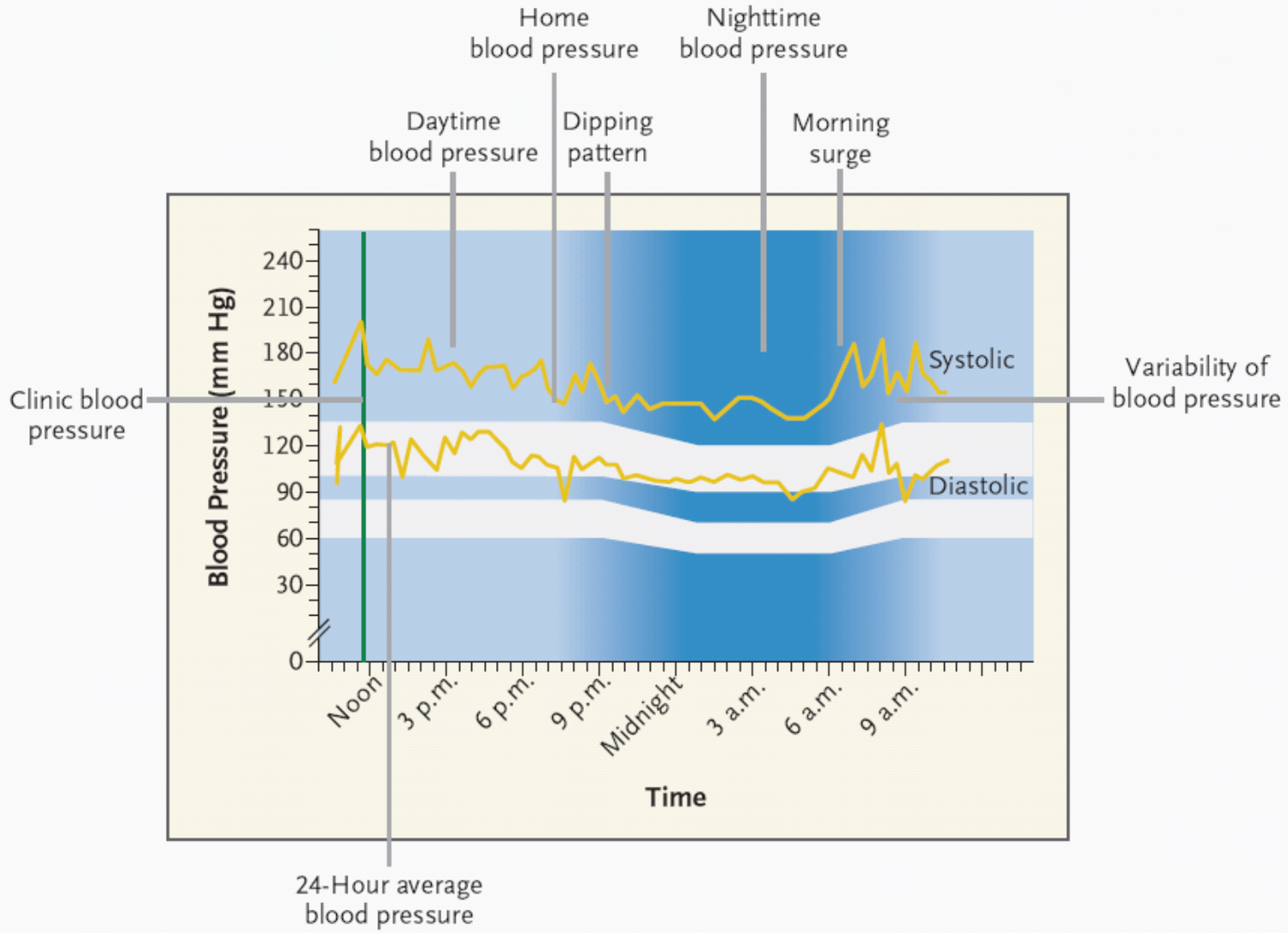
- Adjust and set software to measurement of BP: 07.00-23.00u, each 20 min; 23.00-07.00u each 30 min
- Non-dominant arm
- Explain to patient how to perform extra measurement, how to connect / disconnect device
- Keep arm still during measurement
- Keep record of activities (24hr diary)
- Use validated device (www.dableducational.org)
- Adjust and set software to: 09.00-21.00u mean daytime, 0.00-06.00u mean nighttime BP value
- Valid result: ≥ 70 % of measurements are correct (no error)

24hr ABPM: How?

In daily practice:

- Two consultations with practice assistent or nurse (collect and drop-off)
- Instruction on paper for patient (how to connect / disconnect, what to do when repeated errors, optimal posture during measurement etc)
- Practice protocol including information on data storage and registration in electronic medical file of the patient

24hr ABPM – interpretation

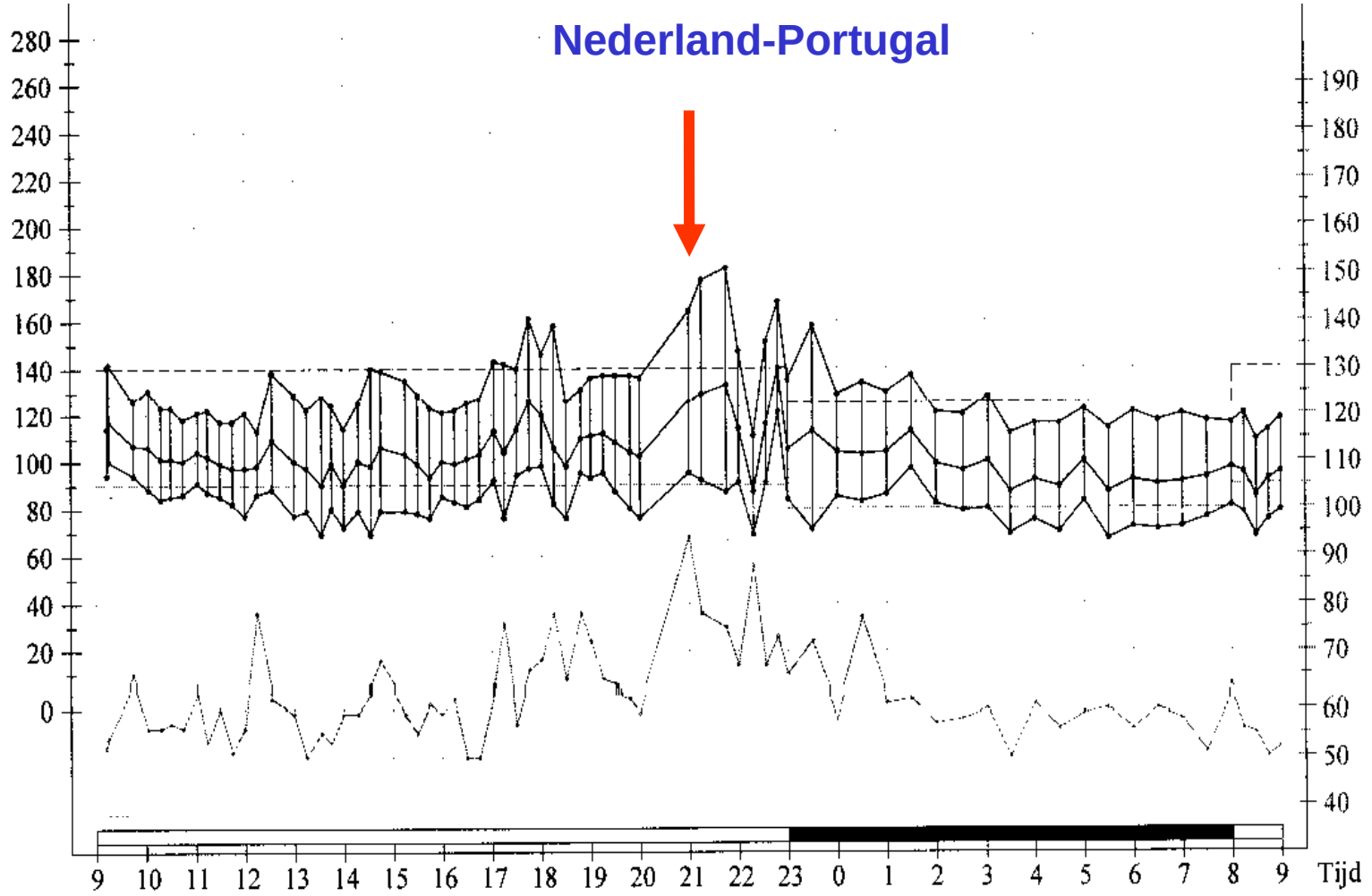


24hr ABPM – Interpretation

What to do with “error” reading:

- Different types of error , coding differs per device
- Frequency: on average 5-15% of measurments
- Frequency: > 30% error: result not valid
- Causes:
  - Arm movements
  - Extrasystolic complexes, AF
  - Incorrect cuff position / placement

24hr ABPM – Example



Resultaten overzicht	Meetrij 2 (MOB) Begin: 31-01-2007, 10:04 Einde: 01-02-2007, 09:45

A) verplicht

		Normale waarden
Valide metingen	78 of 78 = 100%	> 90%
Totale gemiddelde	122/85 mmHg, 70 /min	
Totale polsdruk	37,8 mmHg	

Daginterval (08:00 - 22:59)

Valide metingen	60	
Gemiddelde	127/87 mmHg, 72 /min	< 135/85 mmHg
Polsdruk	39,3 mmHg	
≥ 140 mmHg syst.	15,0%	< 25%
≥ 90 mmHg diast.	36,7%	< 25%
Minimum syst.	107 mmHg (01-02-07, 09:00)	
Maximum syst.	167 mmHg (31-01-07, 10:15)	
Minimum diast.	75 mmHg (31-01-07, 13:45)	
Maximum diast.	104 mmHg (31-01-07, 20:45)	

Nachtinterval (23:00 - 07:59)

Valide metingen	18	
Gemiddelde	108/75 mmHg, 64 /min	< 120/75 mmHg
Polsdruk	32,9 mmHg	
≥ 125 mmHg syst.	11,1%	< 25%
≥ 80 mmHg diast.	27,8%	< 25%
Minimum syst.	82 mmHg (01-02-07, 06:00)	
Maximum syst.	139 mmHg (01-02-07, 06:36)	
Minimum diast.	59 mmHg (01-02-07, 06:00)	
Maximum diast.	91 mmHg (01-02-07, 00:00)	
Dag/Nacht-vermindering	15,0% / 13,8%	> 15% syst.
	Non-Dipper	

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When ?

- NICE 2011: in all patients with OBPM of > 140/90 mmHg
- NHG 2012: alternative to HBPM (HBPM when in doubt about “true” BP, high variability, monitoring treatment, suspicion hypotensive episodes, analysis TRH)
- ESH 2013: see ESC 2016
- ESC 2016: Table 16, no clear preference ABPM or HBPM, high variability in office BP’s, marked discordance OBPM and HBPM, suspicion of non-dipping (in sleep apnea, DM, CKD)
- AHA 2017: HBPM or ABPM are recommended to confirm the diagnosis of hypertension and for the use of titration of treatment

What data are useful?

- NICE 2011: info lacking
- NHG 2012: info lacking
- ESH 2013: average daytime, nighttime and 24hr most comonly used; dipping limited reproducibility, all other variables: experimental
- ESC 2016: info lacking
- AHA 2017: ABMP can identify: mean daytime/nighttime/24hr; dipping; morning surge, variability; no descrption of how to use / identify

What data are useful - personal

	Relevance	Validity
High - Low	?	?
Morning surge	?	?
Variability	?	?
Dipping	+	+
Mean daytime	+++	++
Mean nighttime	++	++
24 hr average	++	++

Van der Wel et al. HenW 2010

Interpretation

- NHG 2012: unclear
- ESH 2013: see ESC 2016

- ESC 2016: in white coat hypertensive patients without additional risk factors, therapeutic intervention should be limited to lifestyle changes, accompanied by close follow-up.
  Drug treatment may also be considered in white coat hypertensive patients with a higher CV risk because of metabolic derangements or in the presence of organ damage

- AHA 2017: unclarity about reproducibilty, confirm HBPM diagnosed WCH with ABPM

All: Relevant white coat effect: >20/10 mmHg difference

Interpretation - personal

Reproducible

Assess when in doubt: range and context that will affect management
(intermediate risk, doubt of starting or changing medication)

When indeed relevant white coat effect:

- take into account in risk assessment
- no “trics” to adapt in risk profile calculations
- monitor: once a year ?

How often ?

- NICE 2011: info lacking
- NHG 2012: info lacking
- ESH 2013: confirm WCH within 3-6 months
- AHA 2017: annual ABPM or HBPM in diagnosed WCH or masked HT

24hr ABPM: pros and cons

Pro	Con
Better understanding “true” BP	Not in Cardiovascular risk functions
Measurements usual, daily life	Impact / burden
Evaluation respons to treatment	Expensive
Superior prediction CVoutcome	Less suitable for repeat measurements
Fee for service	Less suitable in cardiac arythmias (AF)
	Value several variables unclear

Challenges in implementation?

Challenges in implementation?

- Fee for service
- Investment devices
- Availability of diagnostic centres
- Knowledge / interpretation
- National guidelines
- Other ?

In summary…

- Use out of office measurements !
- Use when results may affect choices in management
- Consider using in every OBPM > 140/90 mmHg

Dessert: AOBPM

Serial, automatic OBPM

3 variants described:

- BpTRU: 5 - 10 minutes measurement with 1 minute intervals
- OMRON –907XL: 5 minutes rest, 3 measurements with 1 minute intervals
- 30 min AOBPM: 30 minutes, 7 measurements, 5 minutes interval

Why Serial, automatic OBPM?

- Quality of measurements?
- Fraude in self report (+/- 25%)
- Less suitable for anxious people

- Burdensome (also for bedpartner)
- Costs ?
- Less suitable for repeat measurements

30 minutes AOBPM

How does it work?

- 24-hr device
- 7 measurements, 5 minutes interval
- Comfortable room + patiënt seated in chair, back support, table side
- Leave room after first errorfree measurement
- Result invalid with 2 of more error readings
- Result is average of last 6 measurements (t5 – t30)
- Cut-off 135/85 mmHg

Van der Wel et al. Ann Fam Med. 2011
Scherpbier et al. BrJGP 2011

30 minutes AOBPM

Requirements:

- Two moments of consultation with dok ass
- Room available
- Protocol , incl data registration
- 24-hr device: validated, calibrated, able to measure in 5 minutes intervals (o.a. Welch Allyn, Suntech, Mobilograph)
- Charge / fee ?

Results Validation Research

- 30-min AOBP 8 mmHg SBD lower than OBPM strictly according to guideline
- 30-min AOBP superior reproducability than OBPM strictly according to guideline
- 30-min AOBP in agreement with mean daytime ABPM (mean difference 0 mmHg, SDD 8 mmHg)

Van der Wel et al. Ann Fam Med. 2011
N. Scherpbier et al. Br J Gen Pr 2011

Results Implementation research

Use of 30 min AOBPM in general practice – effect on prescriptions

- Mean SBP with 30min AOBPM 22,8 mmHg less (95%-BI 19,8 tot 26,1) than OBPM
- Without result 30min AOBPM change or start antihypertensive medication in79,1% (95%-BI 73,6 tot 84,6) of patients versus 24,9% with use of 30 min AOBPM

Bos en Buis. Ann Fam Med. 2017
OF HenW juli 2017

What's next ?

Direct comparison different methods of serial AOBPM

Reading during measurement

Measurement in waiting room / farmacie

Prognostic value

Canadian guideline, first mention AHA 2017 guideline

In summary…

- Use out of office measurements !
- Use when results may affect choices in management
- Consider using in every OBPM > 140/90 mmHg
- Serial automated OBPM: interesting alternative

Practical workshop on ABPM

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