


DE ABDIJMOLENS

16/10/2024

A 3D illustration of a human hand holding a heart. The heart is rendered in a realistic style with visible blood vessels and is glowing with a warm orange light. The hand is shown from the side, with the fingers gently cupping the heart. The background is a dark blue gradient.

# New insights in the treatment of arterial hypertension : ESC Guidelines 2024 Casuïstiek Dr. Rik Celen

# DISCLOSURE : MENARINI

Accreditatie activiteit werd het nummer 24023853

GELIEVE NAMEN MET RIZIVNR TE NOTEREN

## Wat gebruiken jullie als middel om hypertensie te meten

- 24 uur bloeddrukmeting
- Spreekkamermeting 1 x
- Spreekkamermeting 2X
- Zelfcontrole (2 dag)



# INHOUD

- Inleiding: definitie ?
- Hoe meten ?
- ESC Richtlijnen 2024
- CASUISTIEK (7) EN DISCUSSIE
- PDF presentatie [www.cardiologie-bertem.be](http://www.cardiologie-bertem.be)

- Dieet en alcohol
- Lipidencontrole
- Duursport
- Hormonaal
- Genetica
- Diabetes
- Rookstop
- **Arteriële hypertensie**
- Psychologie (type D)
- Cultuur

# Primaire preventie

# Oorzaak dood

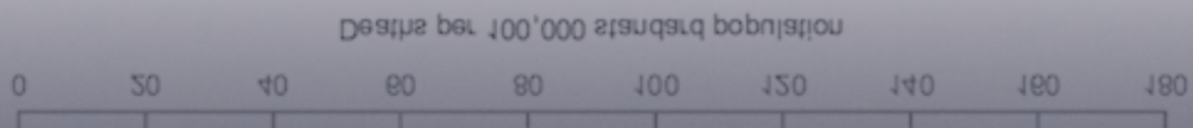
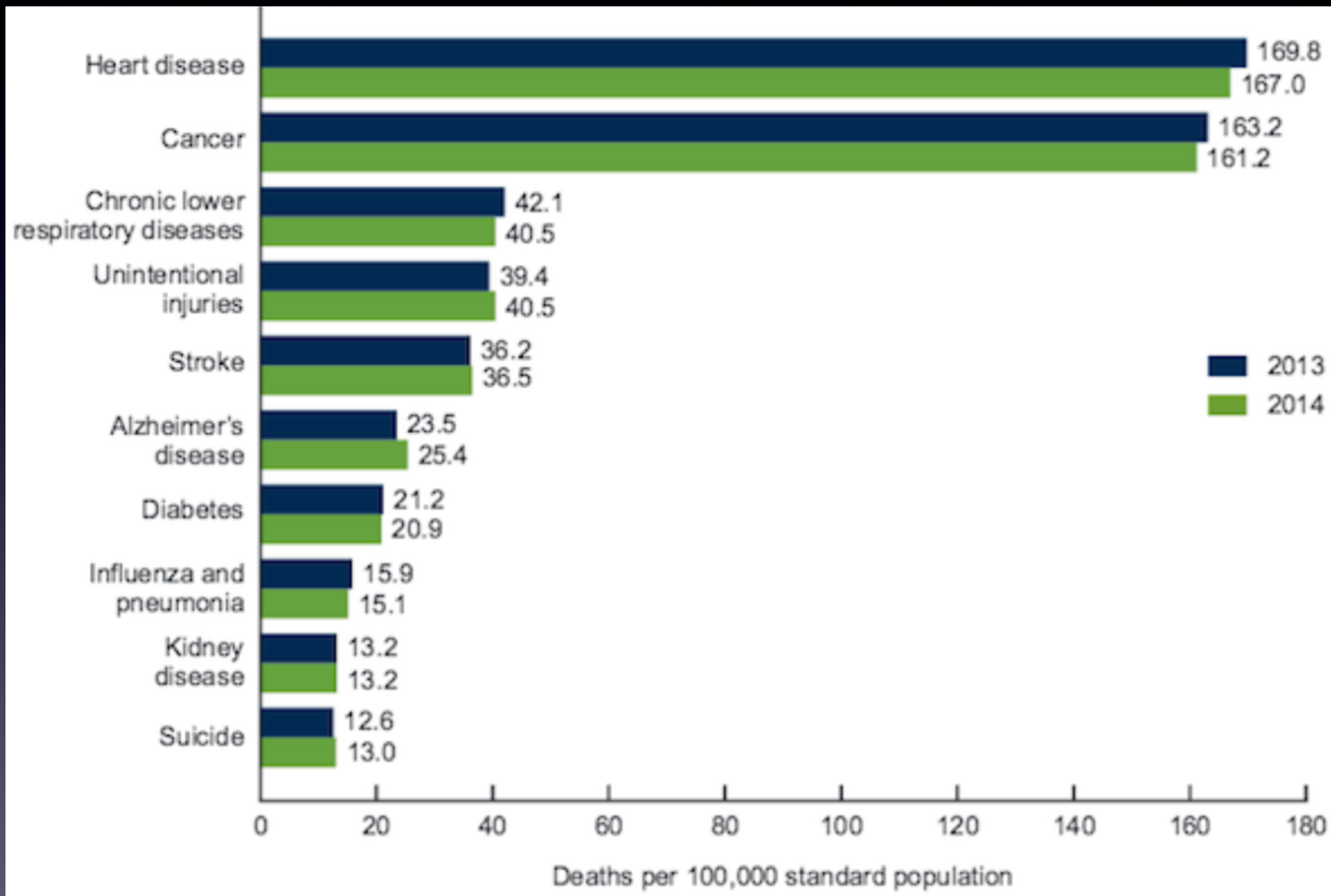
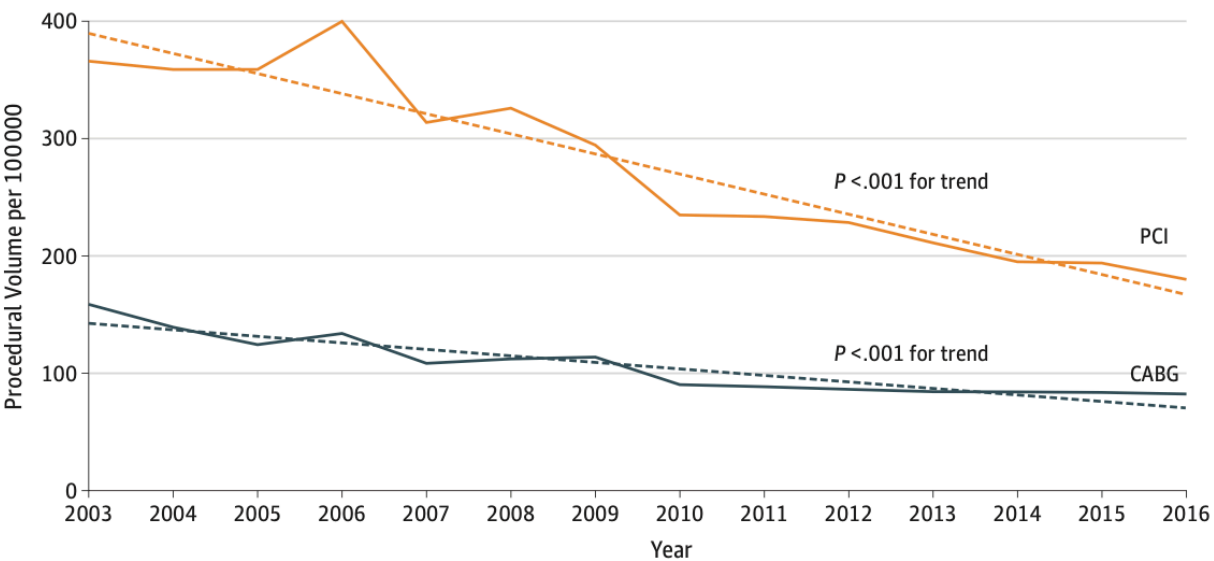


Figure 1. Temporal Trend in the Annual Rate of Percutaneous and Surgical Coronary Revascularization for 100 000 US Adults



Dashed line indicates the mean trend and solid line the year-to-year trend. CABG indicates coronary artery bypass grafting; PCI, percutaneous coronary intervention.

24  
HOUR

FITNESS

FITNESS  
QUALITY FITNESS  
& SERVICE  
MUSCLE GAIN  
10% LOSS

WEIGHT LOSS  
10% LOSS

FITNESS

24  
HOUR

POINT LO  
HANDICAP  
TO UPPER  
LOCATED  
24 HOUR

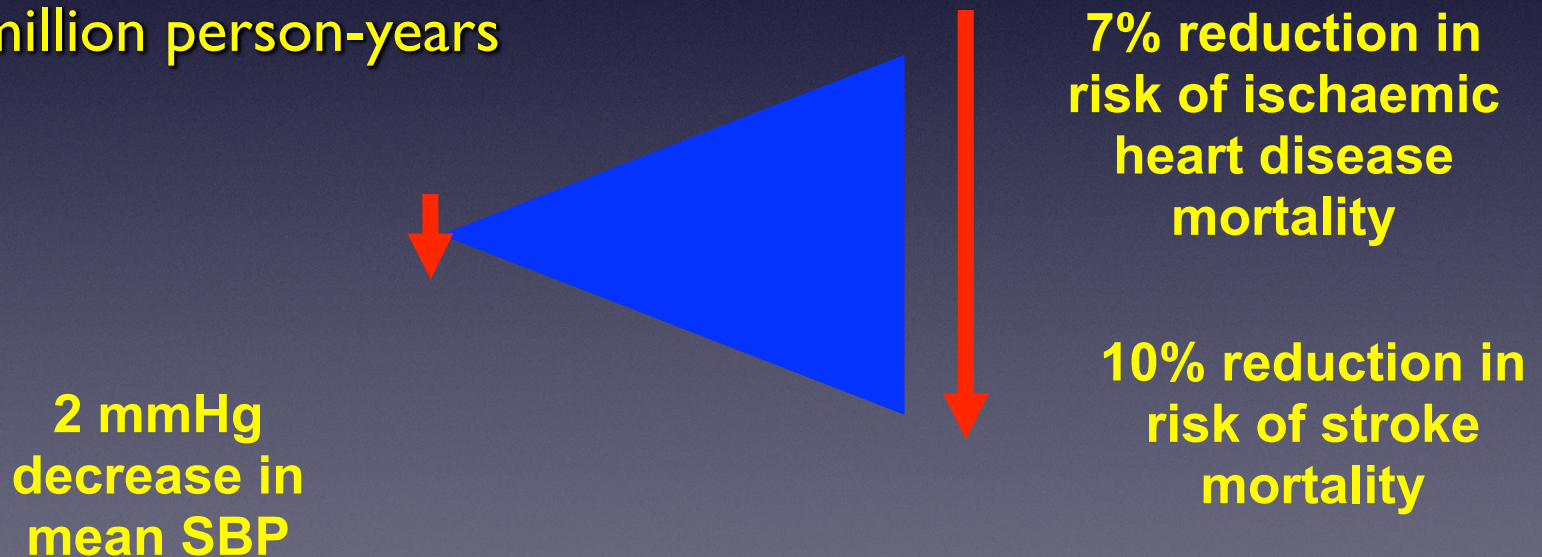


# Prevalentie : 50%regel

- 50% ontwikkeld ooit hypertensie
- 50% weet dit
- 50 % hiervan is goed behandeld

# Blood Pressure Reduction of 2 mmHg Decreases the Risk of Cardiovascular Events by 7–10%

- Meta-analysis of 61 prospective, observational studies
- 1 million adults
- 12.7 million person-years

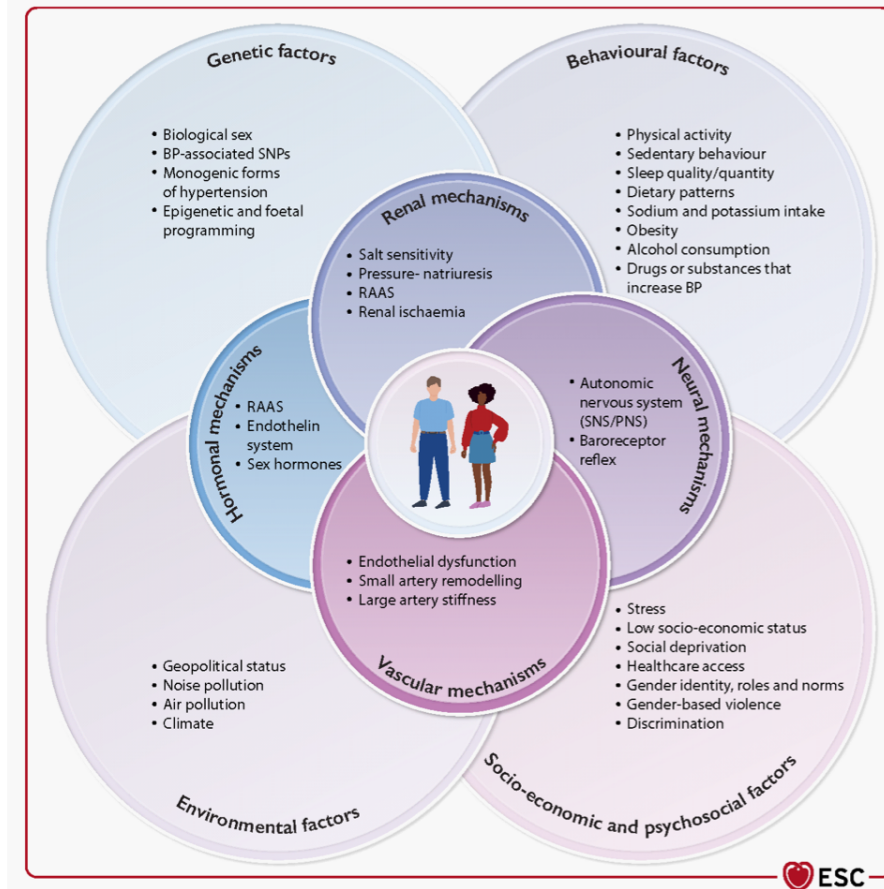


# Klinisch voordeel van bloeddrukcontrole

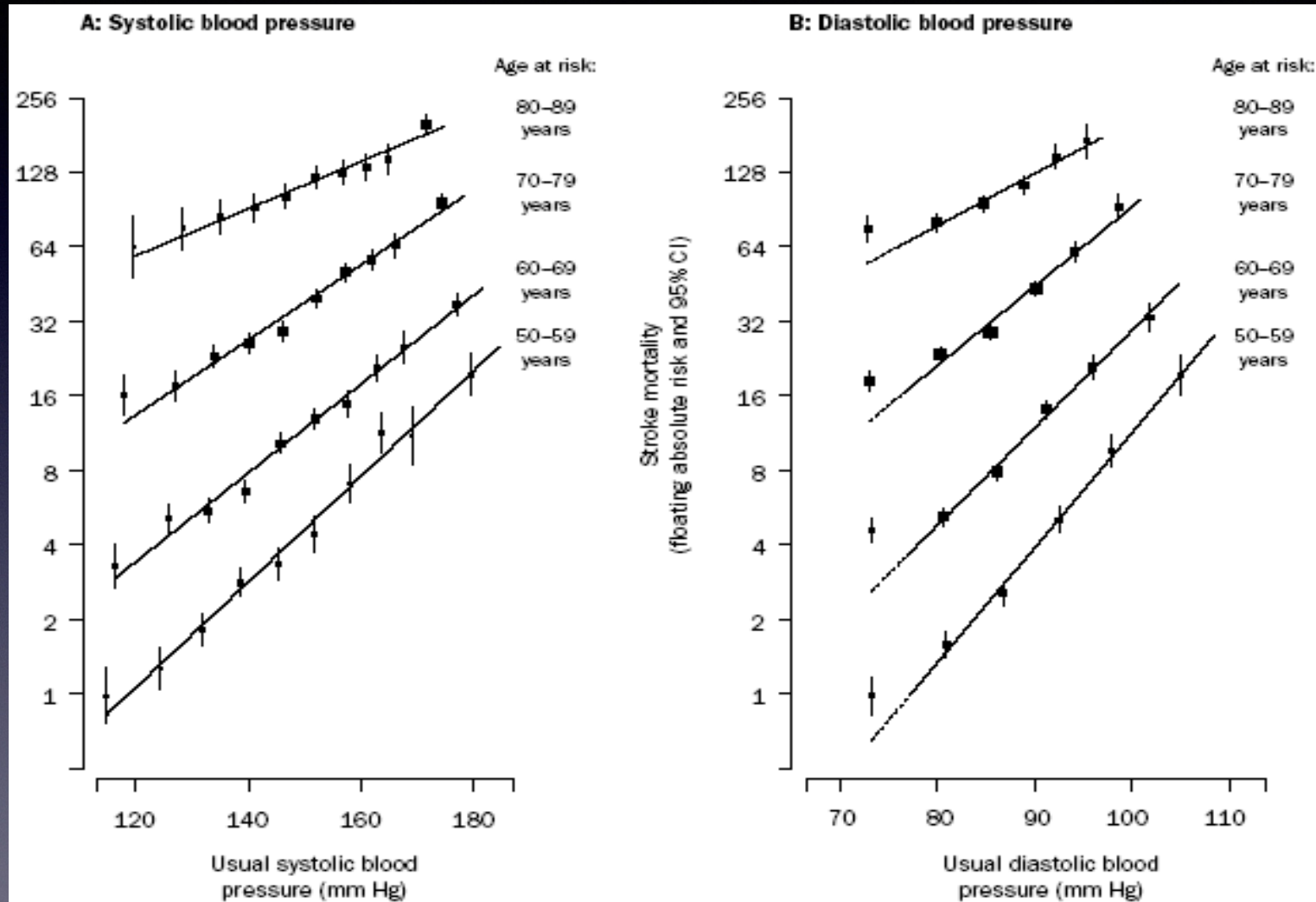
- Preventie van CVA:
  - 5 mm Hg = risicodaling van 34 %
- Preventie van AMI:
  - 5 mm Hg = risicodaling van 21 %
  - 20 mmhg = risicodaling van 50 %

# Figure 1

## Pathophysiology of elevated blood pressure and hypertension



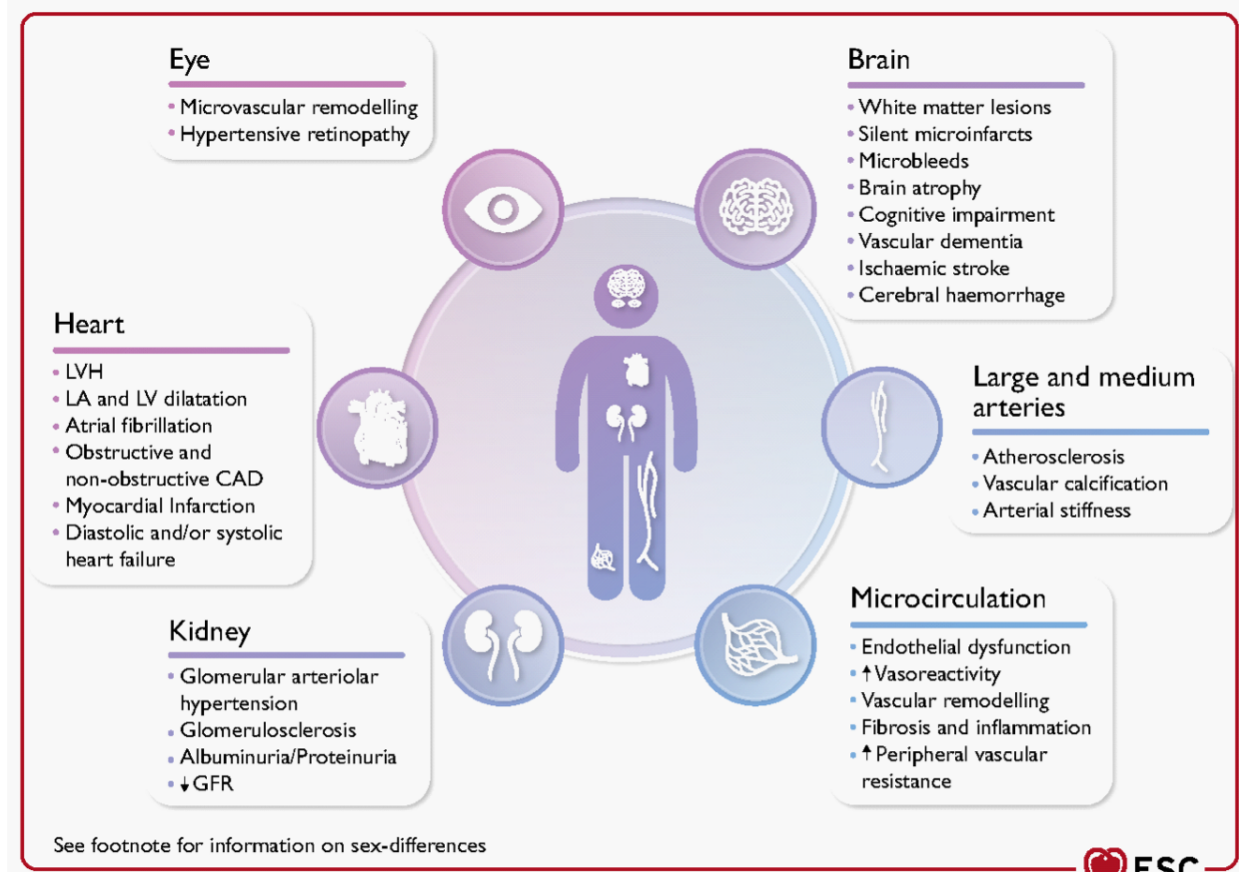
# Cardiovasculair risico hangt samen met het niveau van hypertensie



Lewington S, Clarke R, Qizilbash N, et al. Age-specific relevance of usual blood pressure to vascular mortality: a meta-analysis of individual data for one million adults in 61 prospective studies. *Lancet*. 2002; 360:1903-13.

## Figure 2

**Persistently elevated blood pressure and hypertension lead to hypertension-mediated organ damage and cardiovascular disease**



# 2024 ESC Guidelines for the management of elevated blood pressure and hypertension



2013

“in office” bloeddrukmeting

**Normotens  
< 140 en < 90**

**Optimaal**

**<120 en <80**

**Normaal**

**120-129 of 80-84**

**Hoognormaal**

**130-139 of 85-89**

**Hypertens  
≥ 140 of ≥ 90**

**Graad I – mild**

**140-159 of 90-99**

**Graad II – matig**

**160-179 of 100-109**

**Graag III - ernstig**

**≥ 180 of ≥ 110**



Hypertension disease staging	Other risk factors, HMOD, or disease	BP (mmHg) grading			
		High normal SBP 130-139 DBP 85-89	Grade 1 SBP 140-159 DBP 90-99	Grade 2 SBP 160-179 DBP 100-109	Grade 3 SBP $\geq$ 180 or DBP $\geq$ 110
Stage 1 (uncomplicated)	No other risk factors	Low risk	Low risk	Moderate risk	High risk
	1 or 2 risk factors	Low risk	Moderate risk	Moderate to high risk	High risk
	$\geq$ 3 risk factors	Low to Moderate risk	Moderate to high risk	High Risk	High risk
Stage 2 (asymptomatic disease)	HMOD, CKD grade 3, or diabetes mellitus without organ damage	Moderate to high risk	High risk	High risk	High to very high risk
Stage 3 (established disease)	Established CVD, CKD grade $\geq$ 4, or diabetes mellitus with organ damage	Very high risk	Very high risk	Very high risk	Very high risk

# Instellen van een antihypertensieve behandeling 2018

A

SBD 130–139 of DBD 85–89mmHg  
bij herhaalde metingen  
(Hoognormale BD)

Evaluatie van andere risicofactoren,  
TOD (vooral de nieren), diabetes, ACC

Begin met leefstijlmaatregelen en correctie  
van andere risicofactoren of ziekten

Stratificeer het absolute risico

Zeer hoog Hoog Matig Laag

Begin geneesmiddel-behandeling  
Begin geneesmiddel-behandeling  
Controleer regelmatig de BD  
Geen BD interventie

B

SBD 140–179 of DBD 90–109mmHg  
bij herhaalde metingen  
(Graad 1 en 2 hypertensie)

Evaluatie van andere risicofactoren,  
TOD, diabetes, ACC

Begin met leefstijlmaatregelen en correctie  
van andere risicofactoren of ziekten

Stratificeer het absolute risico

Zeer hoog Hoog Matig Laag

Begin onmiddellijk geneesmiddel-behandeling  
Begin onmiddellijk geneesmiddel-behandeling  
Controleer de bloeddruk en andere risicofactoren gedurende minstens 3 maanden

SBD  $\geq$  140 of DBD  $\geq$  90 mmHg  
Begin geneesmiddel-behandeling

SBD  $<$  140 en DBD  $<$  90 mmHg  
Blijf de BD controleren

SBD  $\geq$  140–159 of DBD  $\geq$  90–99mmHg

Overweeg een geneesmiddel-behandeling en tracht de voorkeur van de patiënt te weten te komen

SBD  $<$  140 en DBD  $<$  90mmHg  
Blijf de BD controleren


C

SBD  $\geq$  180 of DBD  $\geq$  110mmHg  
bij herhaalde metingen binnen enkele dagen  
(Graad 3 hypertensie)

Begin onmiddellijk een geneesmiddelbehandeling

Evaluatie van andere risicofactoren,  
TOD, diabetes, ACC

Voeg leefstijlmaatregelen toe en correctie van  
andere risicofactoren of ziekten

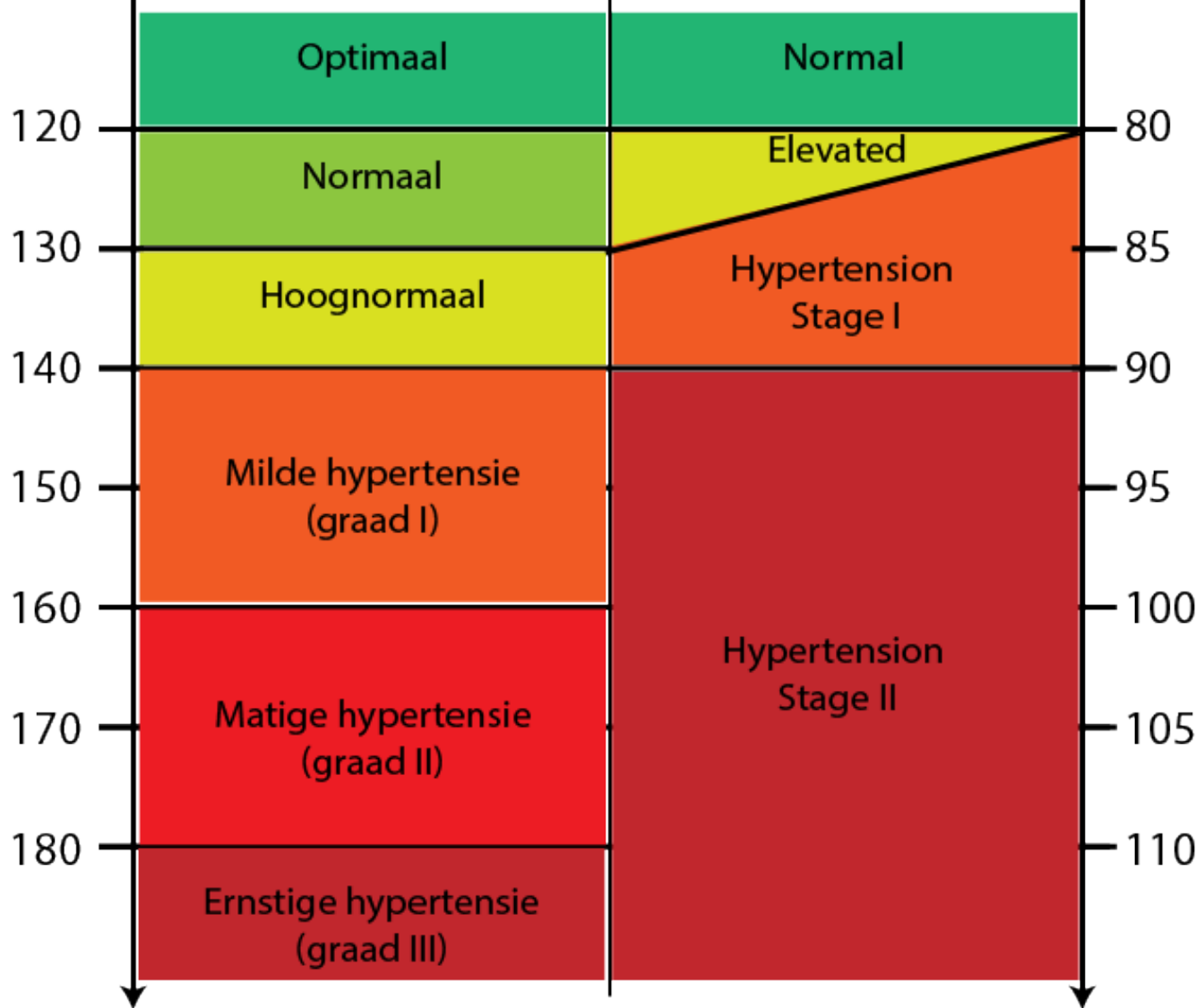
 = 2003

Systolische BD  
(mmHg)

Europese richtlijnen  
2013

Amerikaanse richtlijnen  
2017

Diastolische BD  
(mmHg)



2024

“in office” bloeddrukmeting

Non Elevated

<120 en <70

Elevated

120-139 of 80-89

**Hypertensie  
≥ 140 of ≥ 90**

~~Graad I – mild~~

~~140-159 of 90-99~~

~~Graad II – matig~~

~~160-179 of 100-109~~

~~Graag III - ernstig~~

~~≥ 180 of ≥ 110~~

# Comparison of office, home, and ambulatory blood pressure measurement thresholds for elevated blood pressure and HTN



	Office BP (mmHg)	Home BP (mmHg)	Daytime ABPM (mmHg)	24 h ABPM (mmHg)	Night-time ABPM (mmHg)
Non-elevated BP	<120/70	<120/70	<120/70	<115/65	<110/60
Elevated BP	120/70– <140/90	120/70– <135/85	120/70– <135/85	115/65– <130/80	110/60– <120/70
Hypertension	≥140/90	≥135/85	≥135/85	≥130/80	≥120/70

# Streefwaarden bloeddruk

- Streefwaarden: < 140/90 mmHg
- Diabetes: < 130/85 mmHg
- Proteinurie < 1 g/dag: < 130/80 mmHg
- Proteinurie > 1 g/dag: < 125/75 mmHg

Hoe meten ?

# Continue BD variabiliteit : nood aan veelvuldige metingen

## Spreekkamer

- Herhaling van het aantal evaluaties door het aantal consultaties op te voeren :
- . minimum 2 bloeddrukmetingen per bezoek
  - . minimum 2 tot 3 bezoeken gedurende verschillende maanden

## Ambulant

BD monitoring gedurende 24 uren

## Thuis

3 maal 's ochtends voor ontbijt en medicatie

3 maal 's avonds

Minimum 3 opeenvolgende dagen (exclusief de eerste dag van de monitoring, idealiter 7 dagen)



# Spreekkamerbloeddruk (SKBD)

- SKBD-meting is de hoeksteenscreening voor hypertensie
- SKBD-meting heeft echter belangrijke beperkingen:
  - grote spontane variaties zowel overdag als tussen verschillende dagen, maanden en seizoenen.
  - onvoldoende reproduceerbaar
  - niet representatief voor de gemiddelde BD van de patiënt
  - meestal hoger dan metingen die thuis gebeuren of ambulantly
  - witte-jas-effect (15% van de bevolking in het algemeen, 30% van de hypertensiepopulatie)

**TABLE 2-1.** *Factors affecting the immediate accuracy of office blood pressure (BP) measurements*

Increases BP	Decreases BP	No effect on BP
<p>Examinee</p> <ul style="list-style-type: none"><li>Soft Korotkoff sounds</li><li>Pseudohypertension</li><li>White-coat reaction</li><li>Paretic arm (due to stroke)</li><li>Pain, anxiety</li><li>Acute smoking</li><li>Acute caffeine</li><li>Acute ethanol ingestion</li><li>Distended bladder</li><li>Talking, signing</li></ul> <p>Setting, equipment</p> <ul style="list-style-type: none"><li>Environment noise</li><li>Leaky bulb valve</li><li>Blocked manometer vents</li><li>Cold hands or stethoscope</li></ul> <p>Examiner</p> <ul style="list-style-type: none"><li>Expectation bias</li><li>Impaired hearing</li></ul> <p>Examination</p> <ul style="list-style-type: none"><li>Cuff too narrow</li><li>Cuff not centered</li><li>Elbow too low</li><li>Cuff too low</li><li>Too-short rest period</li><li>Arm, back unsupported</li><li>Deflation too fast or slow</li></ul>	<p>Examinee</p> <ul style="list-style-type: none"><li>Soft Korotkoff sounds</li><li>Recent meal</li><li>Missed auscultatory gap</li><li>High stroke volume</li><li>Habituation</li><li>Shock</li></ul> <p>Setting, equipment</p> <ul style="list-style-type: none"><li>Noisy environs</li><li>Faulty aneroid device</li><li>Low mercury level</li><li>Leaky bulb</li></ul> <p>Examiner</p> <ul style="list-style-type: none"><li>Reading to next lowest 5 or 10 mm Hg, or expectation bias</li><li>Impaired hearing</li></ul> <p>Examination</p> <ul style="list-style-type: none"><li>Left vs. right arm</li><li>Resting for too long (25 min)</li><li>Elbow too high</li><li>Too rapid deflation</li><li>Excess bell pressure</li><li>Parallax error (aneroid)</li></ul>	<p>Examinee</p> <ul style="list-style-type: none"><li>Menstrual phase</li><li>Chronic caffeine ingestion</li><li>Phenylephrine nasal spray</li><li>Cuff self-inflation</li></ul> <p>Examinee and examiner</p> <ul style="list-style-type: none"><li>Discordance in gender or race</li></ul> <p>Examination</p> <ul style="list-style-type: none"><li>Thin shirtsleeve under cuff</li><li>Bell vs. diaphragm</li><li>Cuff inflation per se</li><li>Hour of day (during work hours)</li><li>Room temperature</li></ul>

# Patiënteneducatie is belangrijk :



- Meet de BD niet:
  - overdag
  - wanneer de patiënt zich niet lekker voelt
  - na een fysieke inspanning
  - bij geprikkeldheid of nervositeit
  - Doe niet te veel metingen
- Voer de metingen niet te dicht op elkaar uit
- Maak geen selectie uit de metingen
- Vergis u niet bij het berekenen van het gemiddelde

# Common Mistakes in BP Measurement

## MISMEASUREMENT OF BLOOD PRESSURE IN THE OFFICE: FINDING THE COMMON MISTAKES



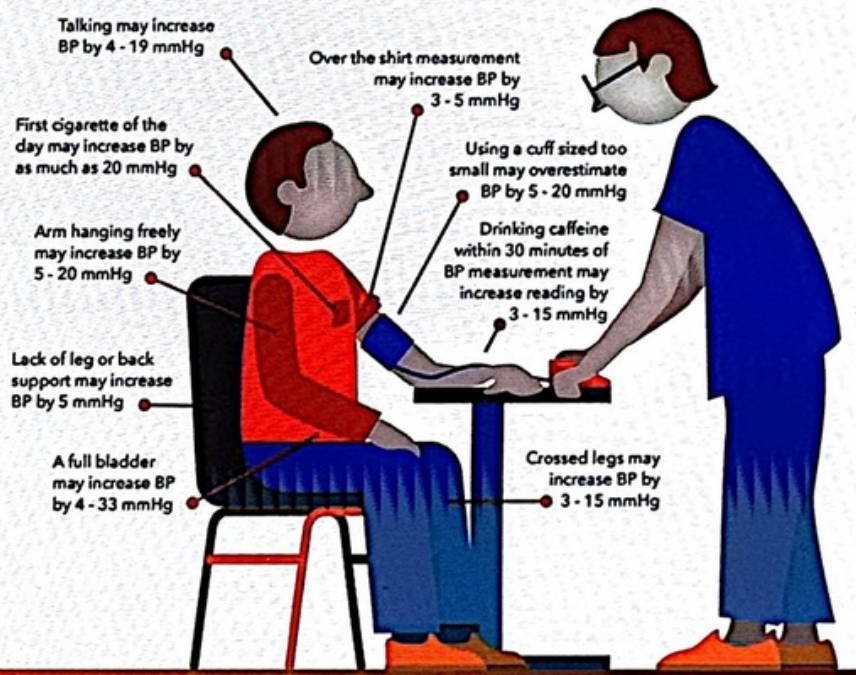
Talking increase SBP  
4-19 mmHg

First cigarette increase  
SBP 20 mmHg

Arm hanging increase  
SBP 5-20 mmHg

Lack of Legs or back  
support increase SBP  
5 mmHg

A full bladder increase  
SBP 4-33 mmHg



Over the shirt  
measurement increase  
SBP 3-5 mmHg

Too small cuff  
increase SBP 5-20  
mmHg

Caffeine within 30  
minutes increase SBP  
3-15 mmHg

Crossed legs increase  
SBP 3-15 mmHg

# Patiënteneducatie is belangrijk : contraindicaties



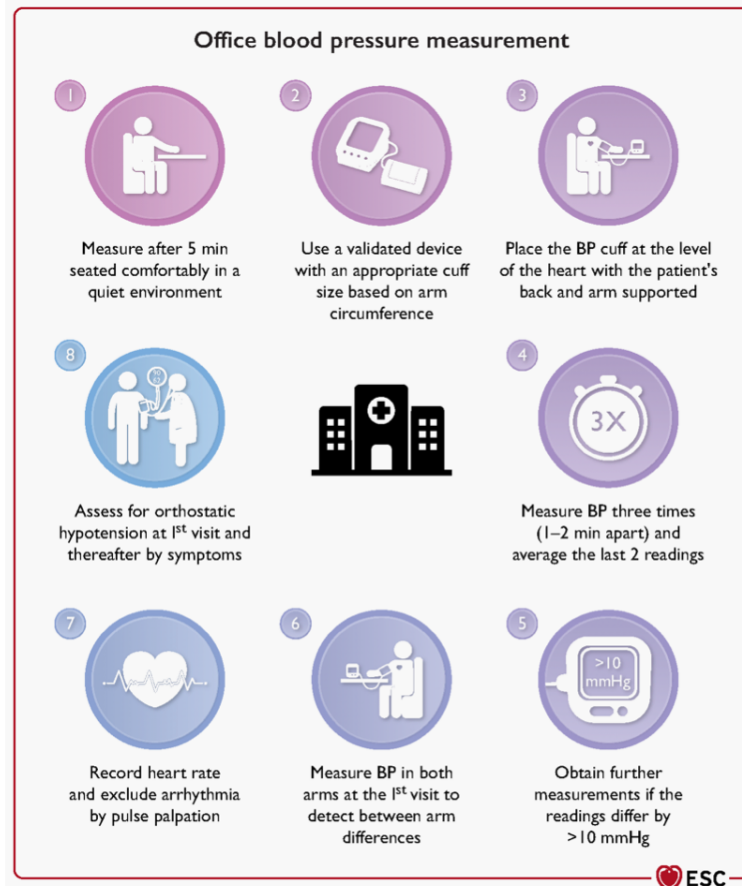
- **Obese of zeer sportieve patiënten**  
(omtrek arm > 33 cm)
- **Aritmie**
- **Angst voor het apparaat**
- **Cognitieve stoornissen**

# Thuisbloeddrukmeting

- validatie van de toestellen
- 3 soorten toestellen
  - (vingerbloeddrukmeters)
  - polsbloeddrukmeters
  - bovenarmbloeddrukmeters

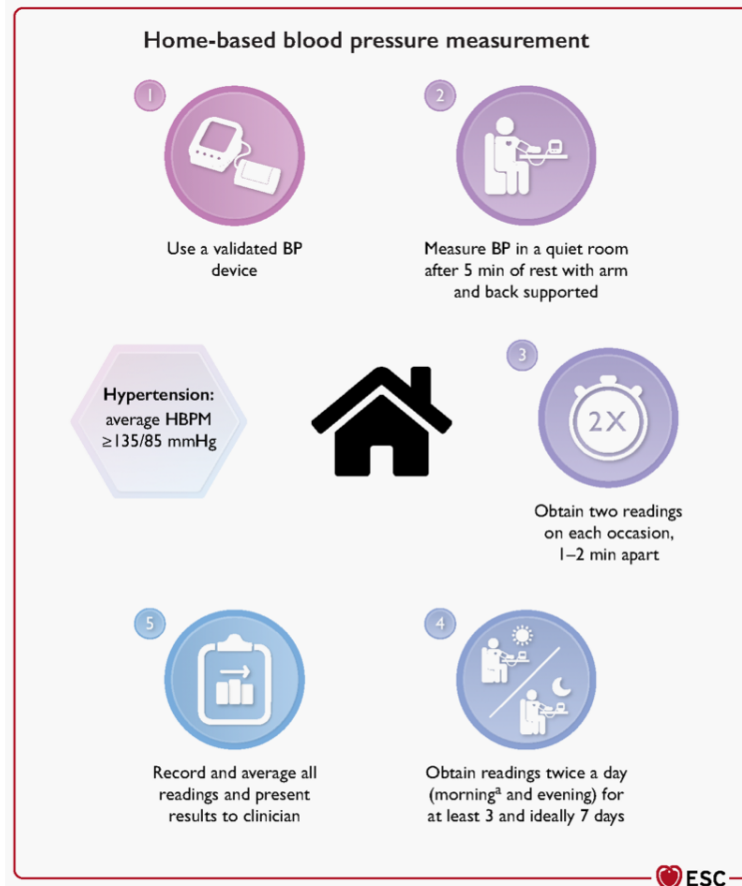
# Figure 3

## Summary of office blood pressure measurement

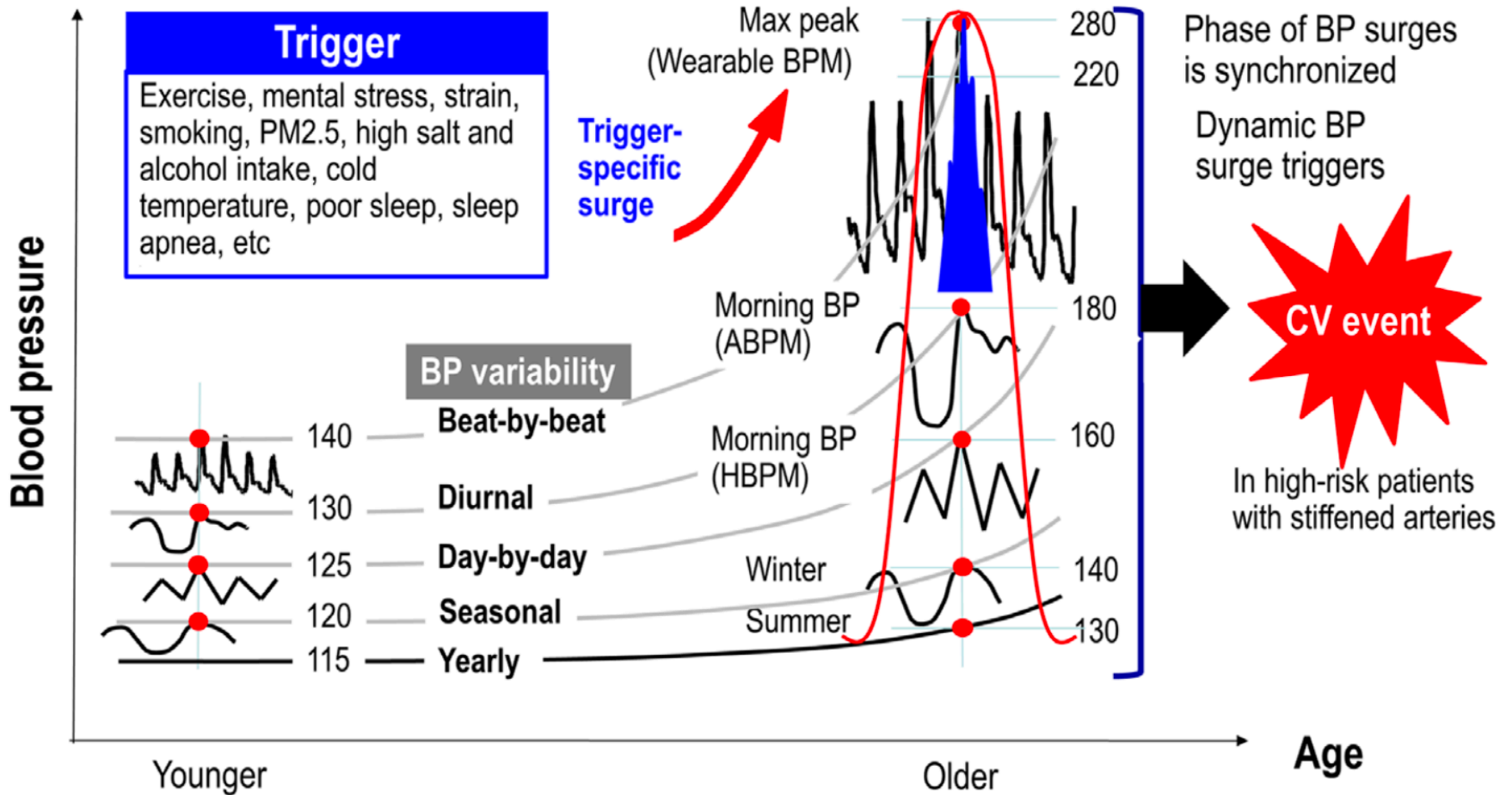


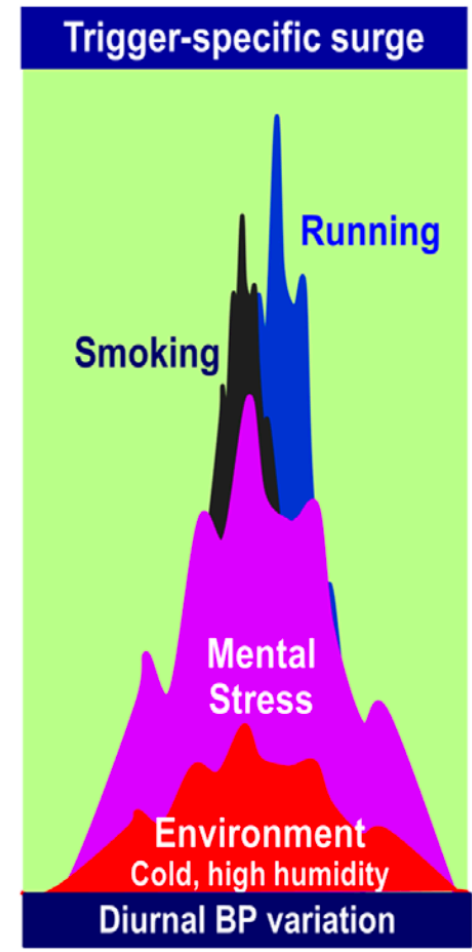
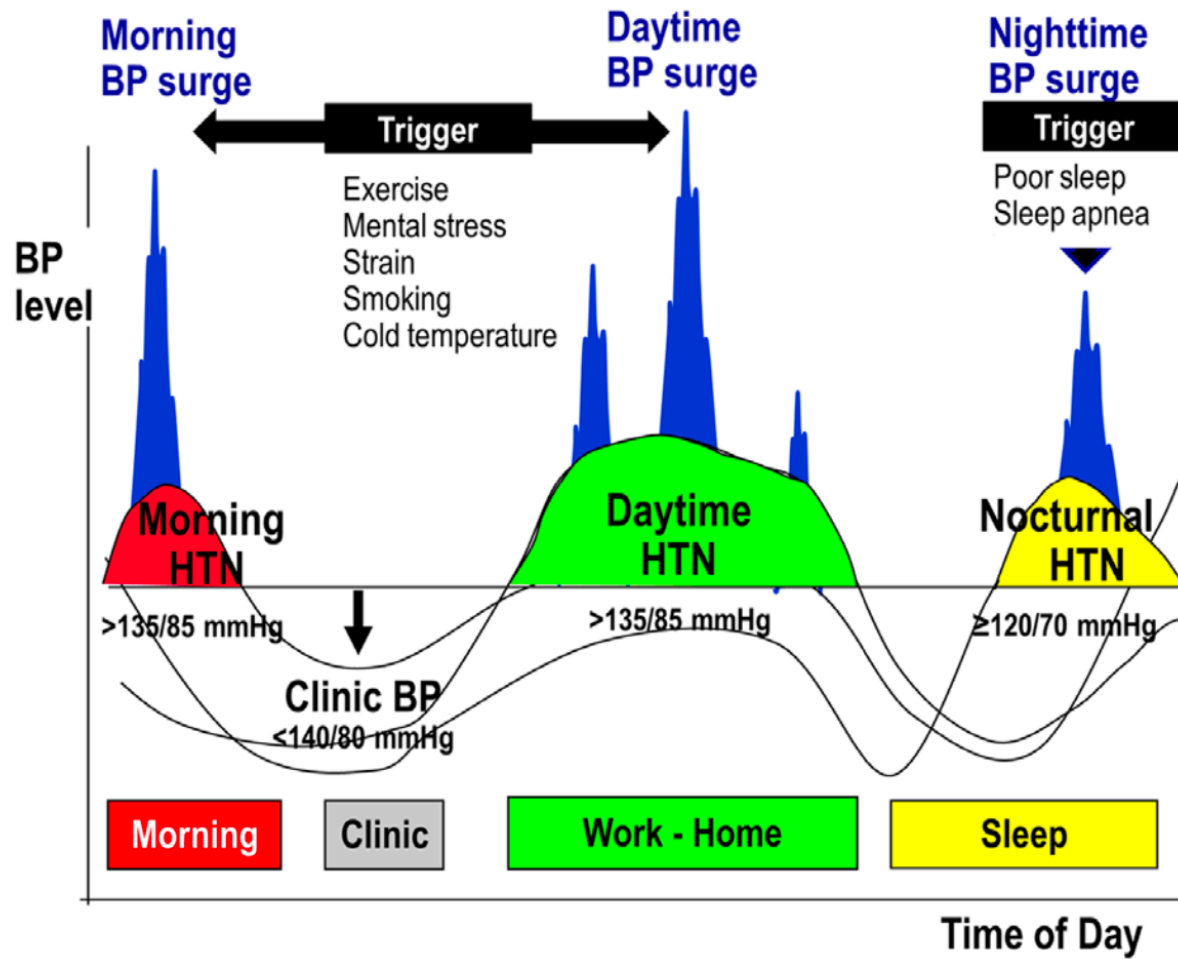
# Figure 4

## Summary of home blood pressure measurement

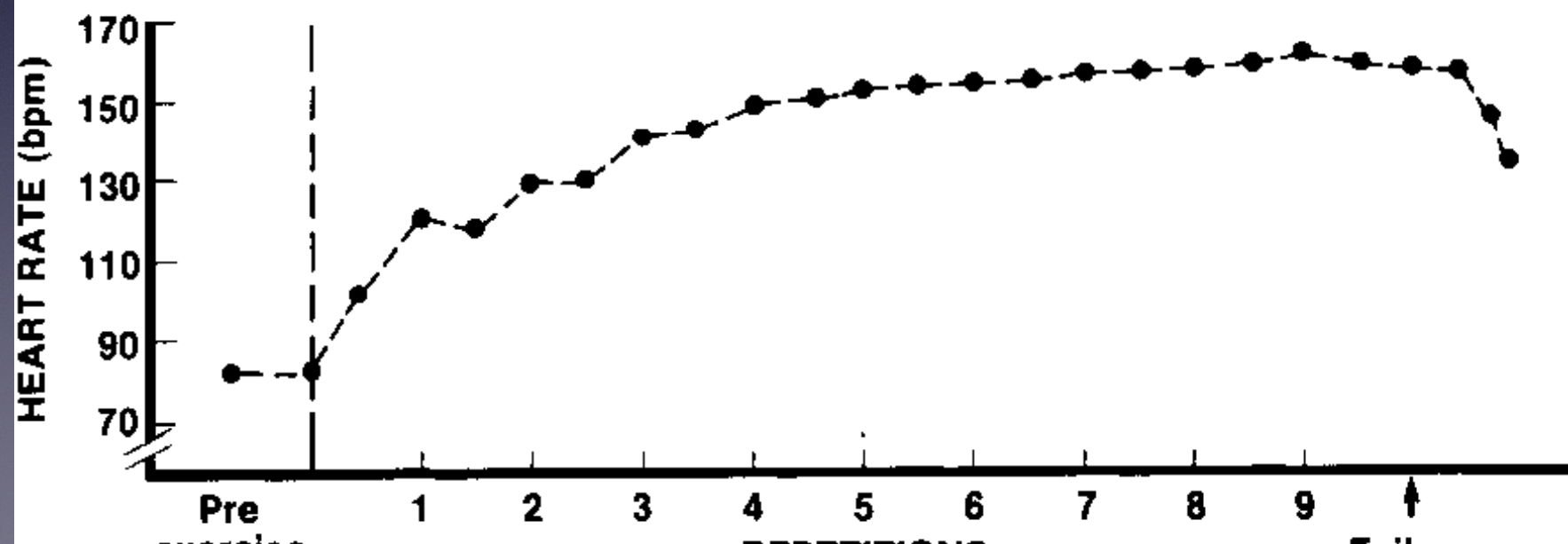
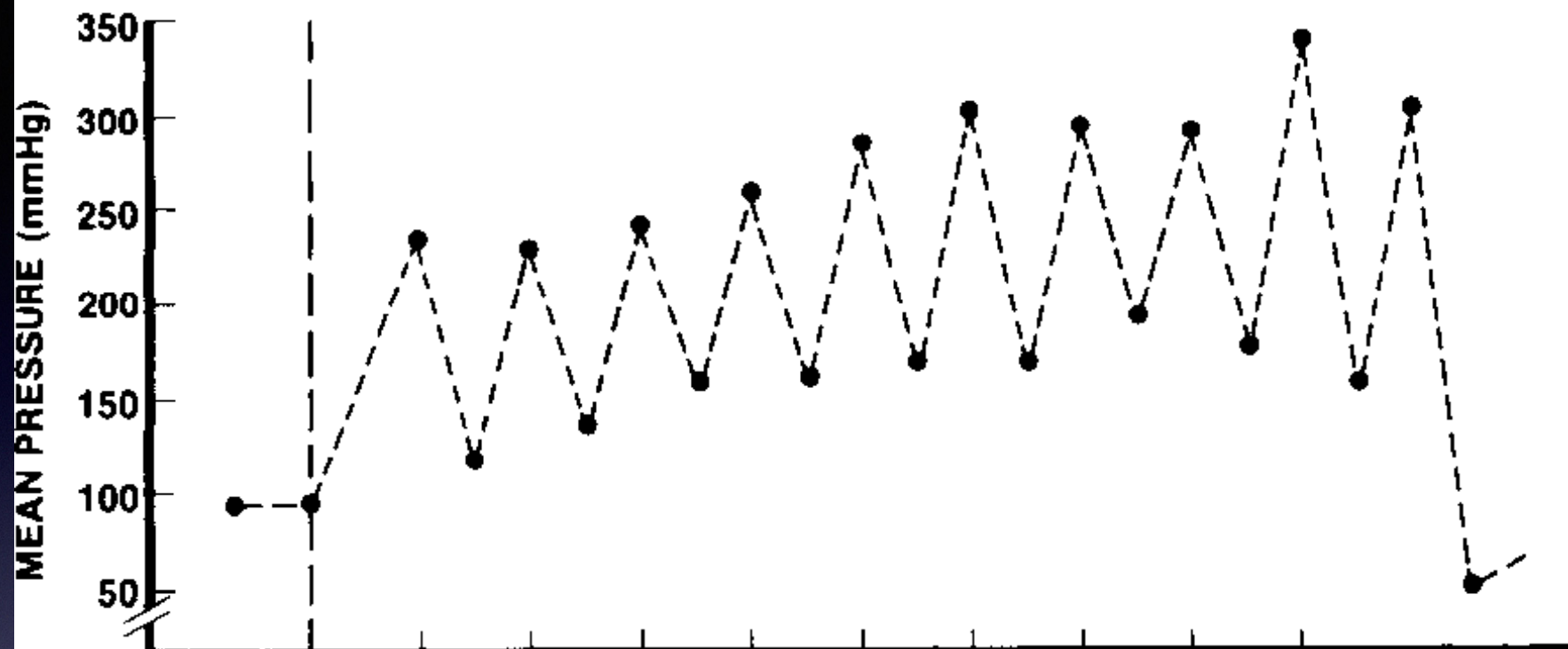


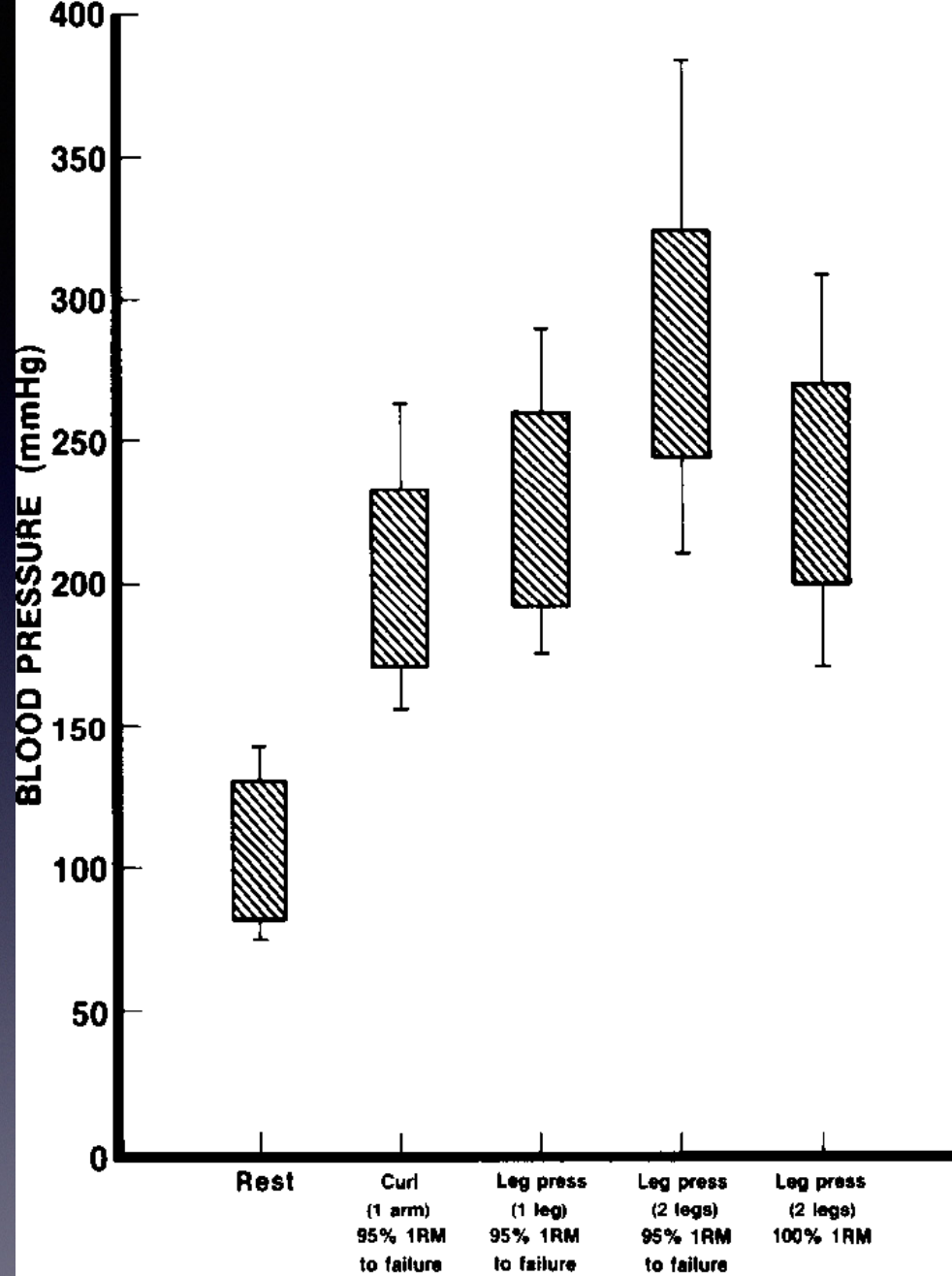






# Double leg press 95% 1RM (9 reps to failure)



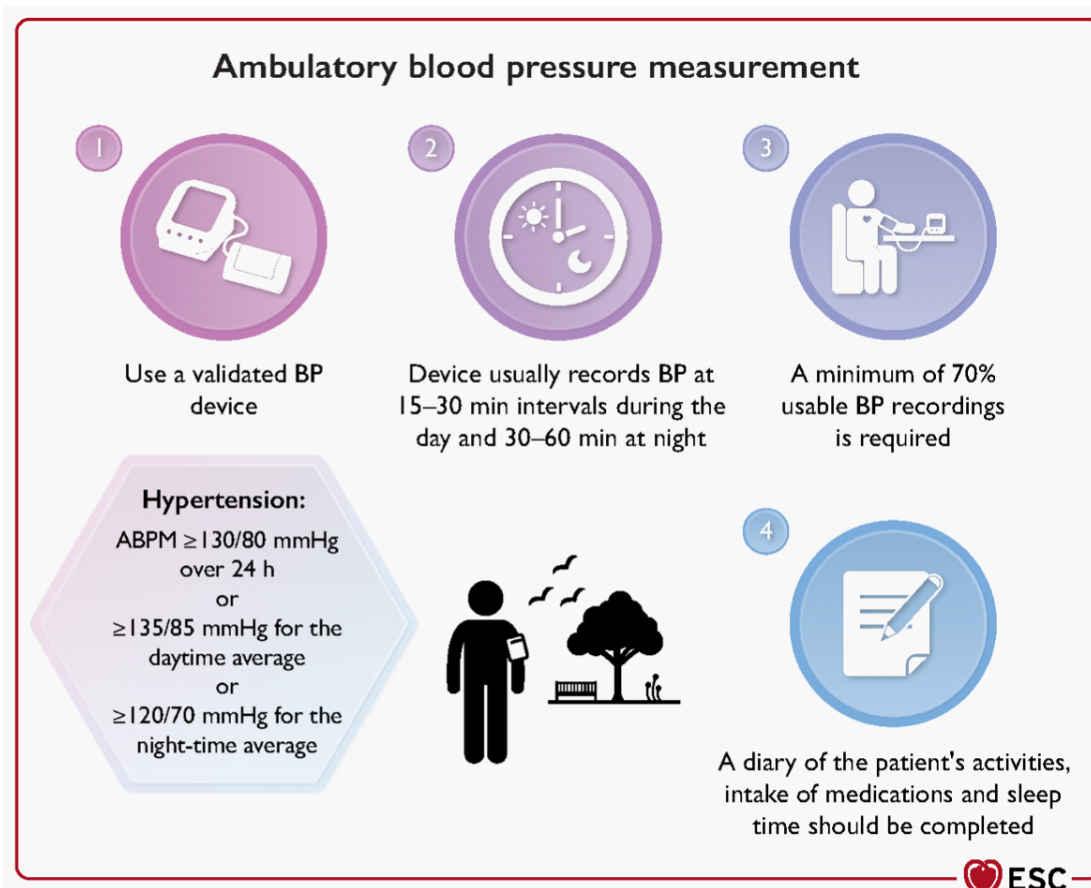


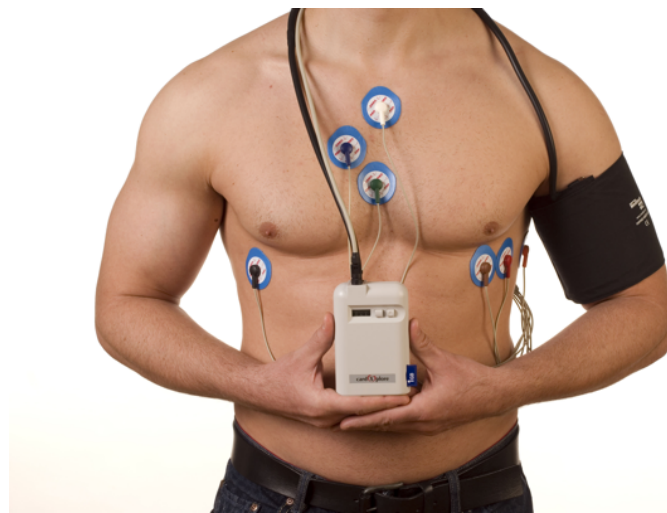
Peak systolic and diastolic blood pressures reached during various exercises.  $\bar{X}$  and SD, N=5

FIG. 4. Means  $\pm$  SD peak blood pressures for all subjects during

## Figure 5

### Summary of ambulatory blood pressure measurement





Conventioneel

Geautomatiseerd  
op consultatie

Ambulante bloeddrukmeting

24u

dag

nacht

Zelf-  
meting

$\geq 140$   
of  
 $\geq 90$

$\geq 135$   
of  
 $\geq 85$

$\geq 130$   
of  
 $\geq 80$

$\geq 135$   
of  
 $\geq 85$

$\geq 120$   
of  
 $\geq 70$

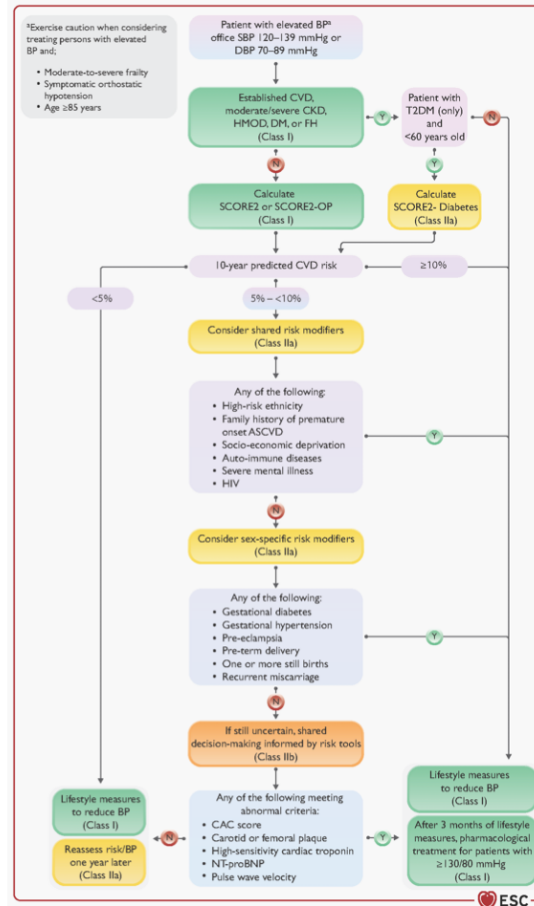
$\geq 135$   
of  
 $\geq 85$

# Thuisbloeddruk

- Zeer beschikbaar
- Meer reproduceerbaar dan SKBD
- Geen witte-jas-effect
- Groter aantal metingen met als gevolg een grotere nauwkeurigheid
- Verhoogt bewustzijn van de patiënt omtrent hypertensie
- Verhoogt de therapietrouw van de patiënt
- Geen afwijkingen veroorzaakt dr. arts die meting uitvoert

# Figure 9

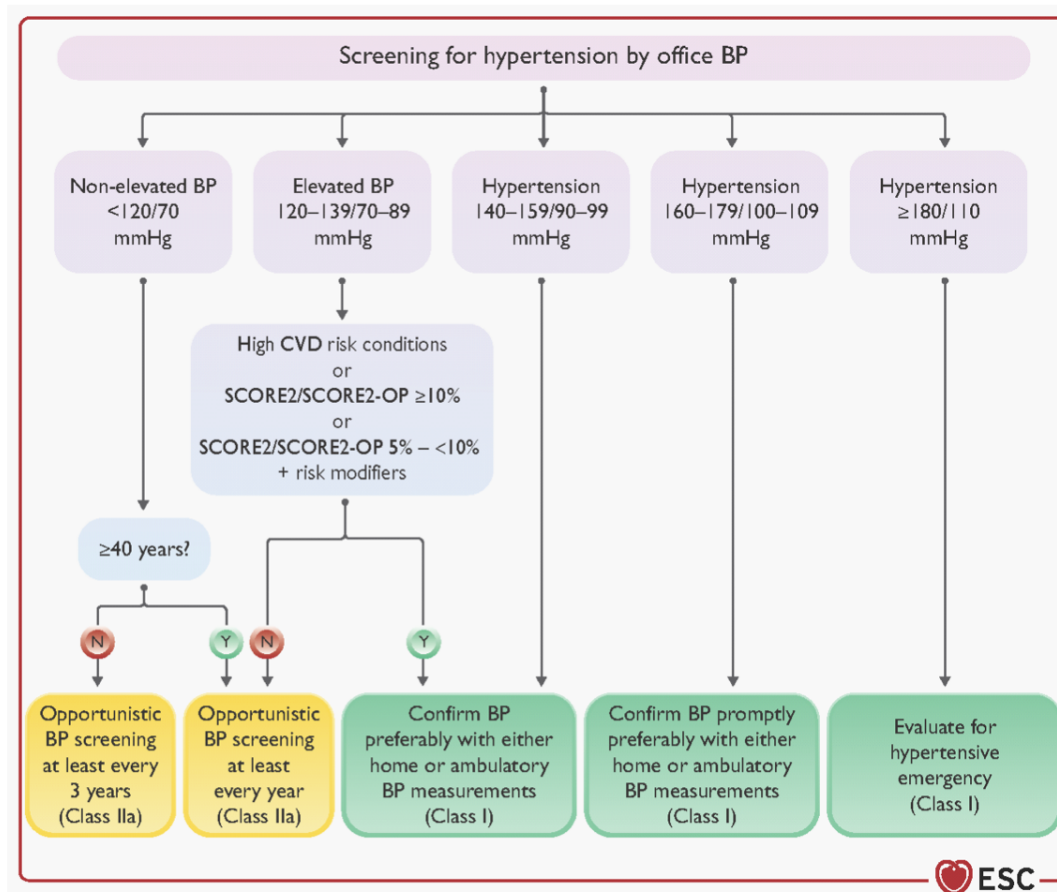
## Summary of cardiovascular disease risk-stratification approach for blood pressure treatment in adults with elevated blood pressure





# Figure 10

## Protocol for confirming hypertension diagnosis



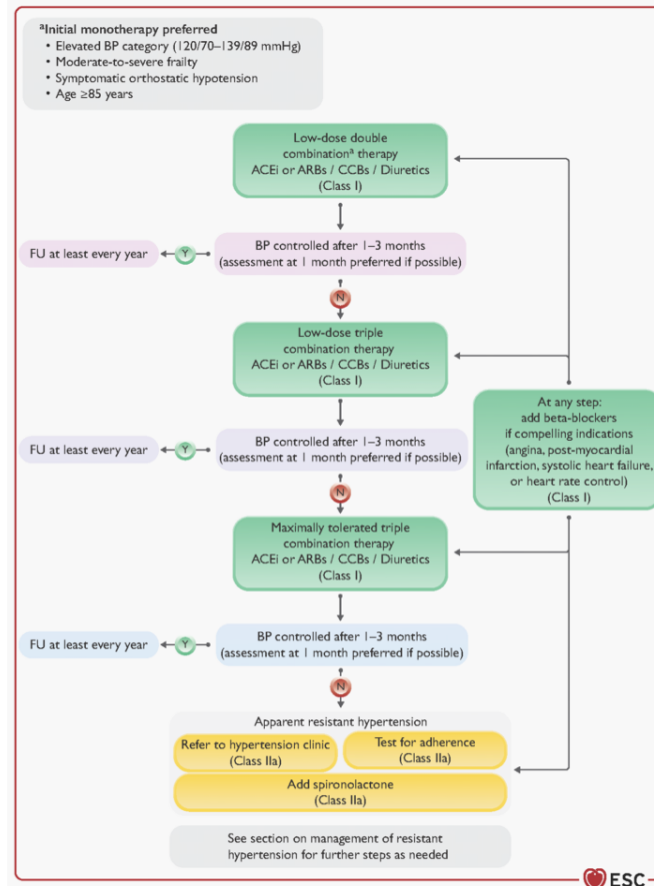
# Figure 12

## Tests and criteria for defining hypertension-mediated target organ damage and considerations for their use in clinical practice

Why measure?	Which organ?	What to measure?	How to diagnose HMOD?	
<p>Support decision to start or intensify BP-lowering treatment for:</p> <ul style="list-style-type: none"> <li>Individuals with elevated BP with SCORE2/SCORE2-OP risk of 5–10%</li> <li>Uncertain situations (i.e. BP or risk close to thresholds, masked or white-coat hypertension, non-traditional CVD risk factors)</li> <li>Individuals &lt;40 years old with elevated blood pressure</li> <li>Assistance overcoming patient and physician inertia</li> </ul>	Kidney	<p>eGFR ACR</p>	<p>Moderate-to-severe kidney disease</p> <ul style="list-style-type: none"> <li>eGFR &lt;60 mL/min/1.73 m<sup>2</sup> irrespective of albuminuria</li> <li>Albuminuria ≥30 mg/g irrespective of eGFR</li> </ul>	
	Heart	ECG	<p>ECG</p>	<p>LVH</p> <ul style="list-style-type: none"> <li>Sokolow-Lyon: SV1+RV5 &gt;35 mm</li> <li>RaVL ≥11 mm</li> <li>Cornell voltage: SV3+RaVL &gt;28 mm (men) SV3+RaVL &gt;20 mm (women)</li> </ul>
		Echocardiography	<p>Echocardiography</p>	<p>LVH</p> <ul style="list-style-type: none"> <li>LV mass/height<sup>2.7</sup> (g/m<sup>2.7</sup>): &gt;50 (men) &gt;47 (women)</li> <li>LV mass/BSA (g/m<sup>2</sup>): &gt;115 (men) &gt;95 (women)</li> <li>LV concentric geometry: RWVT ≥0.43</li> </ul> <p>Diastolic dysfunction</p> <ul style="list-style-type: none"> <li>LA volume/height<sup>2</sup> (mL/m<sup>2</sup>): &gt;18.5 (men) &gt;16.5 (women)</li> <li>LA volume index (mL/m<sup>2</sup>): 34</li> <li>e' &lt;7cm; E/e' &gt;14</li> </ul>
		Cardiac biomarkers	<p>Cardiac biomarkers</p>	<ul style="list-style-type: none"> <li>hs-cTnT or I &gt;99<sup>th</sup> percentile upper reference limit</li> <li>NT-proBNP &gt;125 pg/mL if age &lt;75 years or &gt;450 pg/mL if ≥75 years</li> </ul>
	Arteries	Carotid or femoral ultrasound	<p>Carotid or femoral ultrasound</p>	<p>Plaque (focal wall thickening &gt;1.5 mm)</p>
		Pulse wave velocity	<p>Pulse wave velocity</p>	<ul style="list-style-type: none"> <li>Carotid-femoral PWV &gt;10 m/s</li> <li>Brachial-ankle PWV &gt;14 m/s</li> </ul>
		Cardiac CT	<p>Cardiac CT</p>	<p>Coronary artery calcium score &gt;100 Agatston units</p>

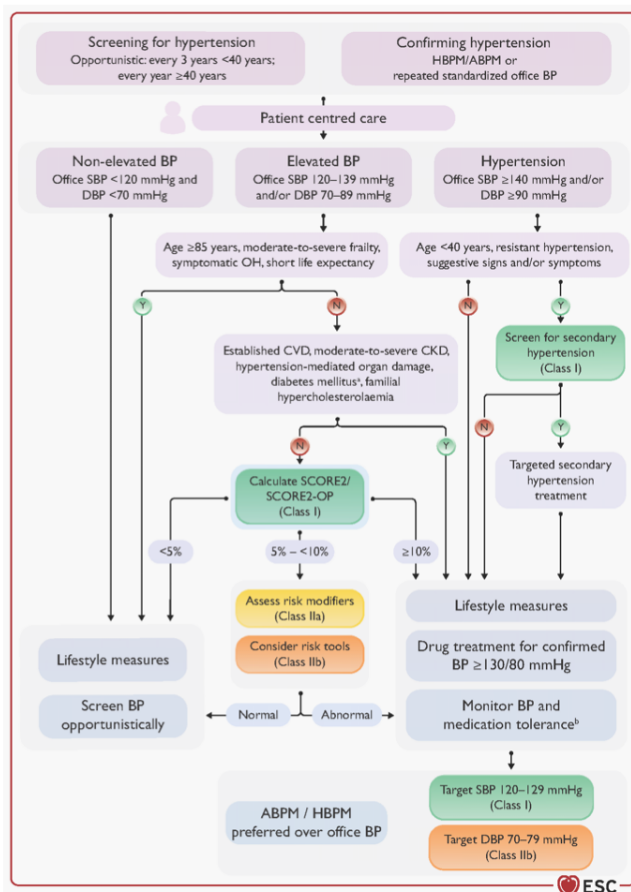
# Figure 18

## Practical algorithm for pharmacological blood pressure lowering



# Figure 19

## Central Illustration



# Patiënteneducatie is belangrijk

7 5 4 8 3 6  
automesure.com  
mesurez votre santé !

► Première visite  
► Nouveau  
► Contacts  
► Comité scientifique  
► Accès professionnels  
► Adresses utiles  
► Essais cliniques  
► Matériel/Achat  
► Plan du site

accès au

Newsletter

		Mesure 1		Mesure 2		Mesure 3	
		SYS	DIA	SYS	DIA	SYS	DIA
Jour 1	Matin						
	Soir						
		SYS	DIA	SYS	DIA	SYS	DIA
Jour 2	Matin						
	Soir						
		SYS	DIA	SYS	DIA	SYS	DIA
Jour 3	Matin						
	Soir						
		SYS	DIA	SYS	DIA	SYS	DIA
Jour 4	Matin						
	Soir						

- Vraag de patiënt de waarden te noteren en het document /formulier terug te brengen
- Bereken de gemiddelde bloeddruk
- Leg de relevantie uit van de resultaten en pas de behandeling dienovereenkomstig aan

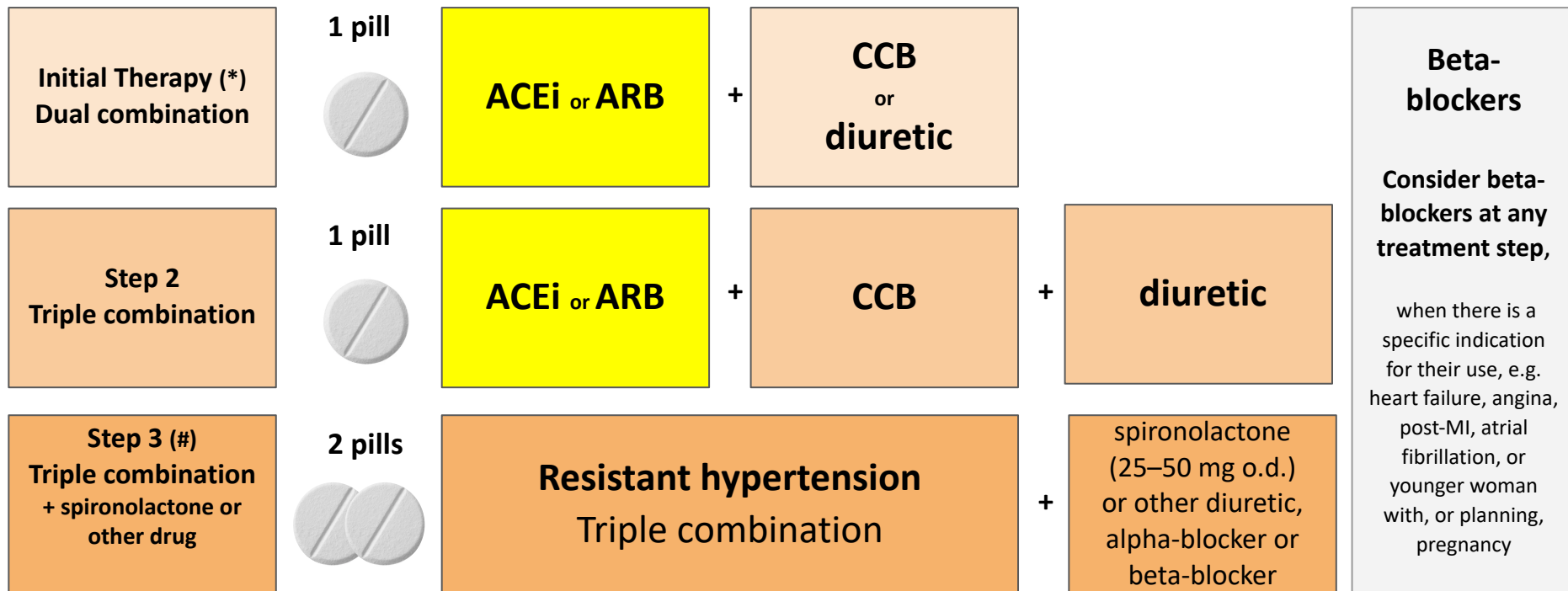
Problem: 50 % stopt medicatie



# ACEi of Sartaan: ESC/ESH Guidelines 2018

## 2018 ESC/ESH Guidelines for the management of arterial hypertension: core drug treatment strategy for uncomplicated hypertension <sup>(1)</sup>

The core algorithm is also appropriate for most patients with HMOD, cerebrovascular disease, diabetes, or PAD:



Adapted from Figure 4 (Core drug treatment strategy for uncomplicated hypertension) ref. 1 Williams B. et al., ESC Scientific Document Group, 2018 ESC/ESH Guidelines for the management of arterial hypertension: The Task Force for the management of arterial hypertension of the European Society of Cardiology (ESC) and the European Society of Hypertension (ESH), *European Heart Journal*, Volume 39, Issue 33, 01 September 2018, Pages 3021–3104, <https://doi.org/10.1093/eurheartj/ehy339>

The core algorithm is also appropriate for most patients with HMOD, cerebrovascular disease, diabetes, or PAD.

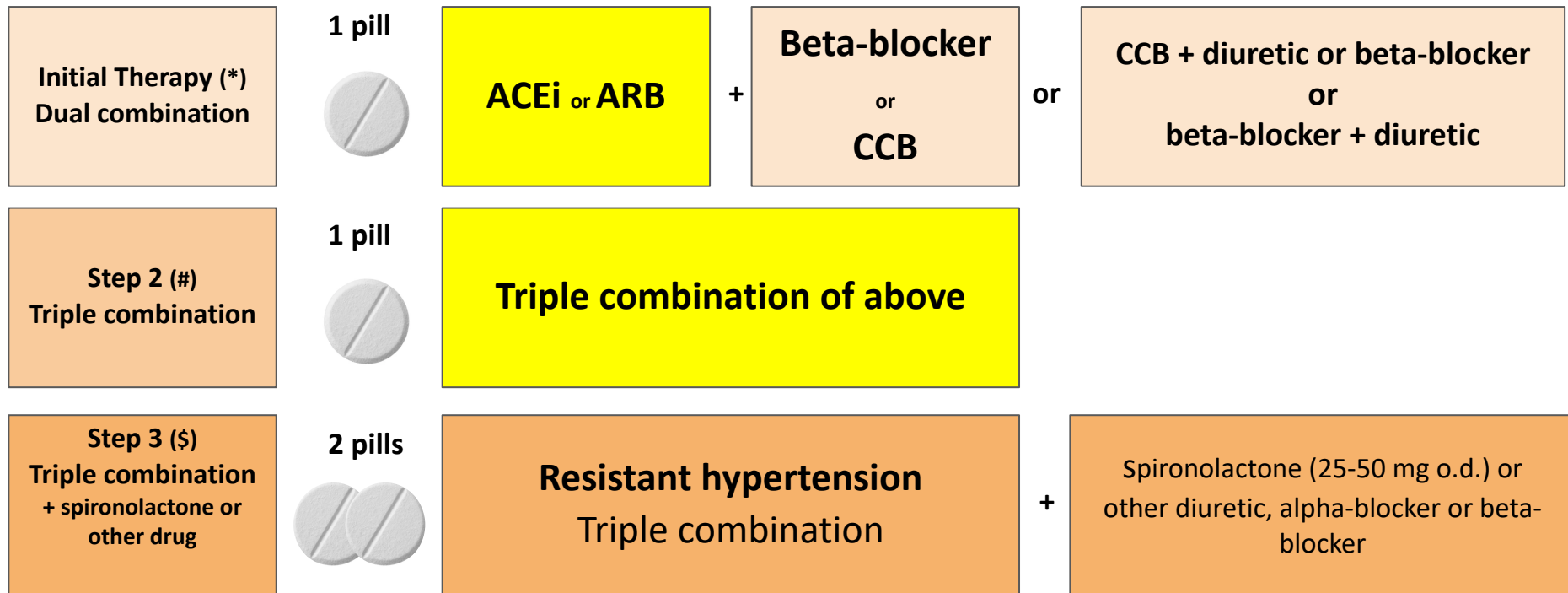
(\*) Consider monotherapy in low risk grade 1 hypertension (systolic BP < 150 mmHg), or in very old (≥ 80 years) or frailer patients

(#) Consider referral to a specialist centre for further investigation

ACEi = angiotensin-converting enzyme inhibitor; ARB = angiotensin receptor blocker; CCB = calcium channel blocker; HMOD = hypertension-mediated organ damage; MI = myocardial infarction; o.d. = omni die (every day); PAD = peripheral artery disease.

# ACEi of Sartaan: ESC/ESH Guidelines 2018

## 2018 ESC/ESH Guidelines for the management of arterial hypertension: drug treatment strategy for hypertension and coronary artery disease<sup>(1)</sup>



Adapted from Figure 5 (Drug treatment strategy for hypertension and coronary artery disease) ref. 1 Williams B. et al., ESC Scientific Document Group, 2018 ESC/ESH Guidelines for the management of arterial hypertension: The Task Force for the management of arterial hypertension of the European Society of Cardiology (ESC) and the European Society of Hypertension (ESH), *European Heart Journal*, Volume 39, Issue 33, 01 September 2018, Pages 3021–3104, <https://doi.org/10.1093/eurheartj/ehy339>

(\*) Consider monotherapy in low risk grade 1 hypertension (systolic BP < 150 mmHg), or in very old (≥ 80 years) or frailer patients

(#) Consider initiating therapy when systolic BP is ≥ 130 mmHg in these very high risk patients with established CVD

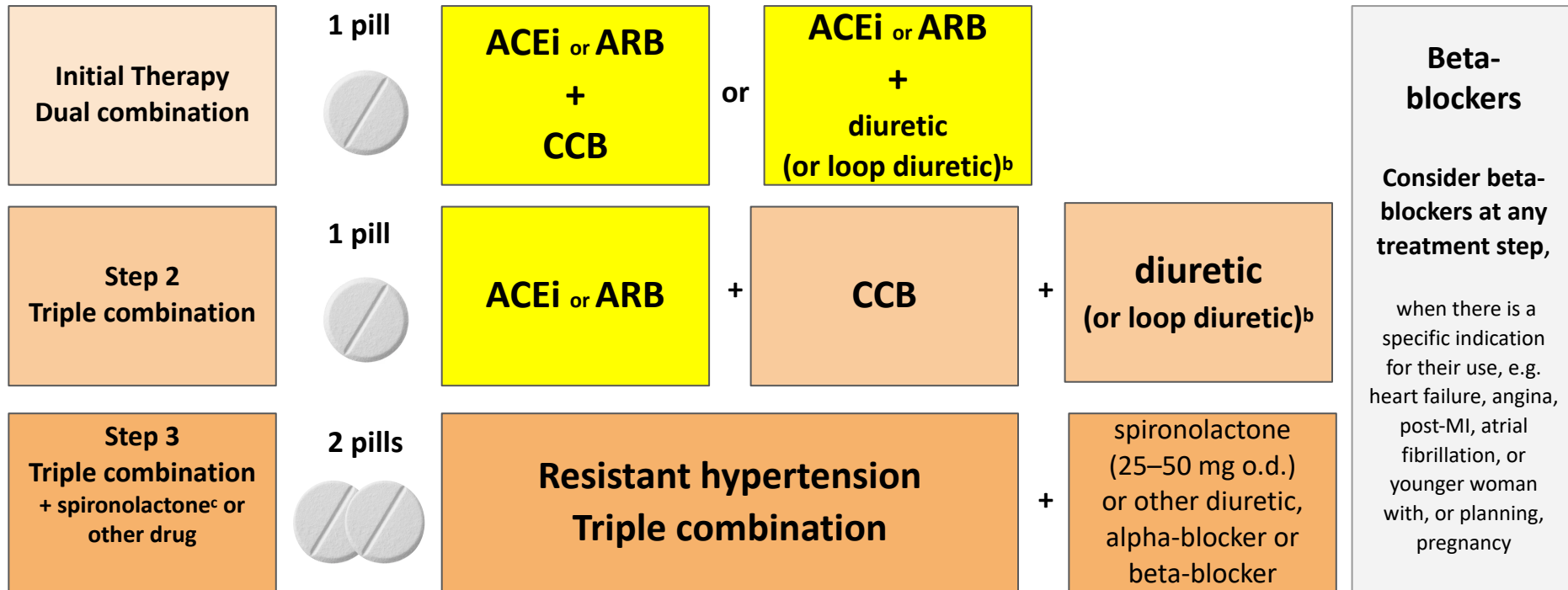
(\$) Consider referral to a specialist centre for further investigation

ACEi = angiotensin-converting enzyme inhibitor; ARB = angiotensin receptor blocker; BP = blood pressure; CCB = calcium channel blocker; CVD = cardiovascular disease; o.d. = omni die (every day)



# ACEi of Sartaan: ESC/ESH Guidelines 2018

## 2018 ESC/ESH Guidelines for the management of arterial hypertension: drug treatment strategy for hypertension and chronic kidney disease <sup>(1)</sup>



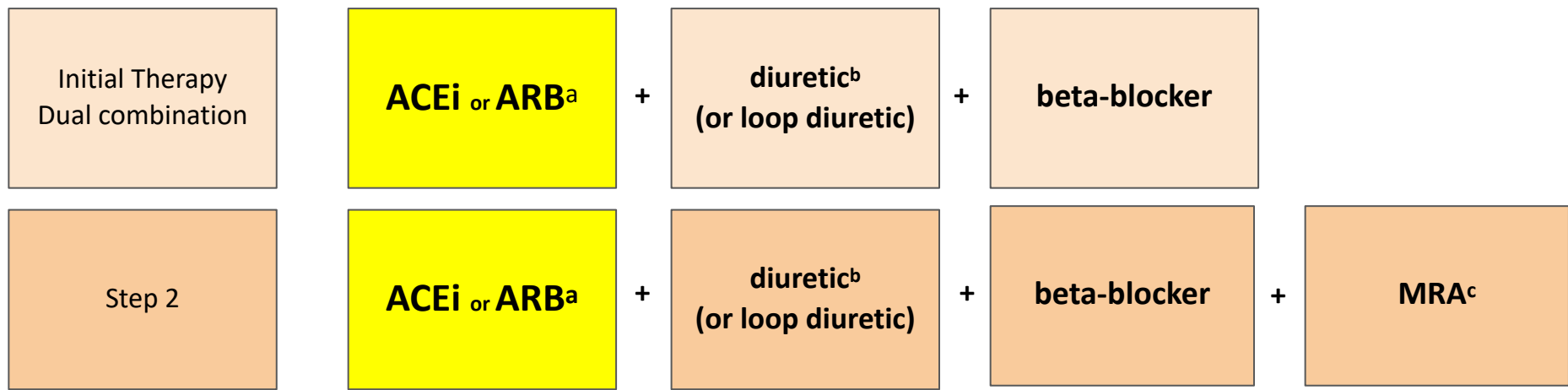
A reduction in eGFR and rise in serum creatinine is expected in patients with CKD<sup>a</sup> who receive BP-lowering therapy, especially in those treated with an ACEi or ARB but a rise in serum creatinine of > 30% should prompt evaluation of the patient for possible renovascular disease.

Adapted from Figure 6 (Drug treatment strategy for hypertension and chronic kidney disease) ref. 1 Williams B. et al., ESC Scientific Document Group, 2018 ESC/ESH Guidelines for the management of arterial hypertension: The Task Force for the management of arterial hypertension of the European Society of Cardiology (ESC) and the European Society of Hypertension (ESH), *European Heart Journal*, Volume 39, Issue 33, 01 September 2018, Pages 3021–3104, <https://doi.org/10.1093/eurheartj/ehy339>

ARB = angiotensin receptor blocker; BP = blood pressure; CCB = calcium channel blocker; CKD = chronic kidney disease; eGFR = estimated glomerular filtration rate; MI = myocardial infarction; o.d. = omni die (every day).  
<sup>a</sup>CKD is defined as an eGFR <60 mL/min/1.72 m<sup>2</sup> with or without proteinuria. <sup>b</sup>Use loop diuretics when eGFR is <30 mL/min/1.72 m<sup>2</sup>, because thiazide/thiazide-like diuretics are much less effective/ineffective when eGFR is reduced to this level. <sup>c</sup>Caution: risk of hyperkalaemia with spironolactone, especially when eGFR is <45 mL/min/1.72 m<sup>2</sup> or baseline K<sup>+</sup> ≥ 4.5 mmol/L.

# ACEi of Sartaan: ESC/ESH Guidelines 2018

## 2018 ESC/ESH Guidelines for the management of arterial hypertension: drug treatment strategy for hypertension and heart failure with reduced ejection fraction<sup>(1)</sup>



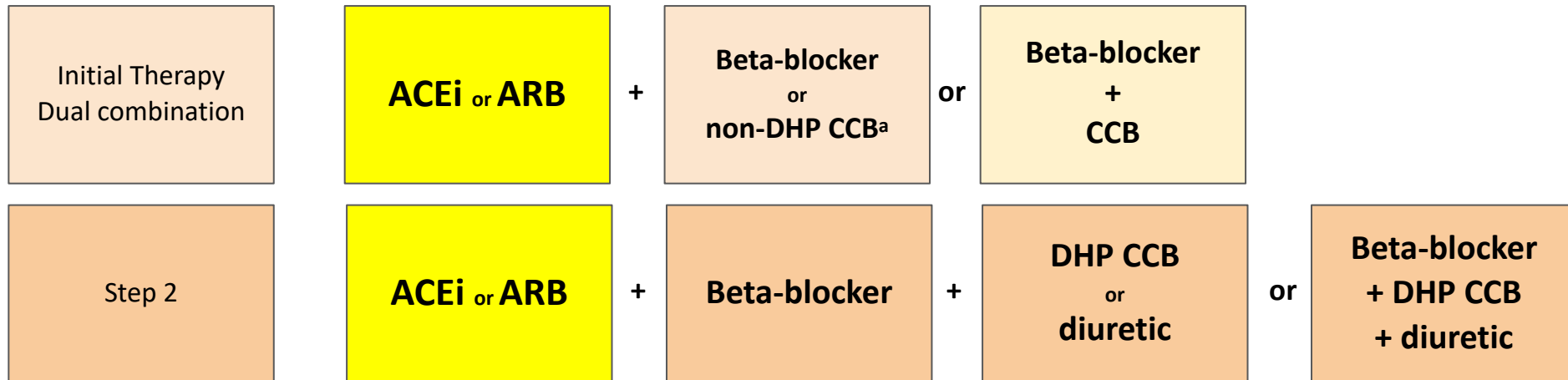
When antihypertensive therapy is not required in HFrEF, treatment should be prescribed according to the ESC Heart Failure Guidelines.

Adapted from Figure 7 (Drug treatment strategy for hypertension and heart failure with reduced ejection fraction) ref. 1 Williams B. et al., ESC Scientific Document Group, 2018 ESC/ESH Guidelines for the management of arterial hypertension: The Task Force for the management of arterial hypertension of the European Society of Cardiology (ESC) and the European Society of Hypertension (ESH), *European Heart Journal*, Volume 39, Issue 33, 01 September 2018, Pages 3021–3104, <https://doi.org/10.1093/eurheartj/ehy339>

Do not use non-dihydropyridine CCBs (e.g. verapamil or diltiazem). ACEi = angiotensin-converting enzyme inhibitor; ARB = angiotensin receptor blocker; CCB = calcium channel blocker; ESC = European Society of Cardiology; HFrEF = heart failure with reduced ejection fraction; MRA = mineralocorticoid receptor antagonist. <sup>a</sup>Consider an angiotensin receptor/neprilysin inhibitor instead of ACEi or ARB per ESC Heart Failure Guidelines. <sup>b</sup>Diuretic refers to thiazide/thiazide-like diuretic. Consider a loop diuretic as an alternative in patients with oedema. <sup>c</sup>MRA (spironolactone or eplerenone).

# ACEi of Sartaan: ESC/ESH Guidelines 2018

## 2018 ESC/ESH Guidelines for the management of arterial hypertension: drug treatment strategy for hypertension and atrial fibrillation<sup>(1)</sup>



Add oral anticoagulation when indicated according to the CHA<sub>2</sub>DS<sub>2</sub>-VASc score, unless contraindicated.

<sup>a</sup>Routine combination of beta-blockers with non-dihydropyridine CCBs (e.g; verapamil or diltiazem) is not recommended due to the potential marked reduction in heart rate.

Adapted from Figure 8 (Drug treatment strategy for hypertension and atrial fibrillation) ref. 1 Williams B. et al., ESC Scientific Document Group, 2018 ESC/ESH Guidelines for the management of arterial hypertension: The Task Force for the management of arterial hypertension of the European Society of Cardiology (ESC) and the European Society of Hypertension (ESH), *European Heart Journal*, Volume 39, Issue 33, 01 September 2018, Pages 3021–3104, <https://doi.org/10.1093/eurheartj/ehy339>

ACEi = angiotensin-converting enzyme inhibitor; AF = atrial fibrillation; ARB = angiotensin receptor blocker; CCB = calcium channel blocker; CHA<sub>2</sub>DS<sub>2</sub>-VASc = CHA<sub>2</sub>DS<sub>2</sub>-VASc = Cardiac failure, Hypertension, Age >\_75 (Doubled), Diabetes, Stroke (Doubled) – Vascular disease, Age 65–74 and Sex category (Female); DHP = dihydropyridine.

<sup>a</sup>Non-DHP CCB (non-DHP CCB, e.g. verapamil or diltiazem).

**Table 27** Incidence and typical causes of secondary hypertension according to age

Age group	Per cent with underlying cause	Typical causes
Young children (<12 years)	70 - 85	<ul style="list-style-type: none"><li>● Renal parenchymal disease</li><li>● Coarctation of the aorta</li><li>● Monogenic disorders</li></ul>
Adolescents (12–18 years)	10–15	<ul style="list-style-type: none"><li>● Renal parenchymal disease</li><li>● Coarctation of the aorta</li><li>● Monogenic disorders</li></ul>
Young adults (19–40 years)	5–10	<ul style="list-style-type: none"><li>● Renal parenchymal disease</li><li>● Fibromuscular dysplasia (especially in the renal artery)</li><li>● Undiagnosed monogenic disorders</li></ul>
Middle-aged adults (41–65 years)	5–15	<ul style="list-style-type: none"><li>● Primary aldosteronism</li><li>● Obstructive sleep apnoea</li></ul>

## Leeftijd en secundaire hypertensie

Cause	Prevalence in hypertensive patients	Suggestive symptoms and signs	Screening Investigations
Obstructive sleep apnoea	5–10%	Snoring; obesity (can be present in non-obese); morning headache; daytime somnolence	Epworth score and ambulatory polygraphy
Renal parenchymal disease	2–10%	Mostly asymptomatic; diabetes; haematuria, proteinuria, nocturia; anaemia, renal mass in adult polycystic CKD	Plasma creatinine and electrolytes, eGFR; urine dipstick for blood and protein, urinary albumin:creatinine ratio; renal ultrasound
<b>Renovascular disease</b>			
Atherosclerotic renovascular disease	1–10%	Older; widespread atherosclerosis (especially PAD); diabetes; smoking; recurrent flash pulmonary oedema; abdominal bruit	Duplex renal artery Doppler or CT angiography or MR angiography
Fibromuscular dysplasia		Younger; more common in women; abdominal bruit	
<b>Endocrine causes</b>			
Primary Aldosteronism	5 - 15%	Mostly asymptomatic; muscle weakness (rare)	Plasma aldosterone and renin, and aldosterone:renin ratio; hypokalaemia (in a minority); note hypokalaemia can depress aldosterone levels
Phaeochromocytoma	<1%	Episodic symptoms (the 5 'Ps'): paroxysmal hypertension, pounding headache, perspiration, palpitations, and pallor; labile BP; BP surges precipitated by drugs (e.g. beta-blockers, metoclopramide, sympathomimetics, opioids, and tricyclic antidepressants)	Plasma or 24 h urinary fractionated metanephrines
Cushing's syndrome	<1%	Moon face, central obesity, skin atrophy, striae and bruising; diabetes; chronic steroid use	24 h urinary-free cortisol
Thyroid disease (hyper- or hypothyroidism)	1 - 2%	Signs and symptom of hyper- or hypothyroidism	Thyroid function tests
Hyperparathyroidism	<1%	Hypercalcaemia, hypophosphataemia	Parathyroid hormone, Ca <sup>2+</sup>
<b>Other causes</b>			
Coarctation of the aorta	<1%	Usually detected in children or adolescence; different BP ( $\geq 20/10$ mmHg) between upper–lower extremities and/or between right–left arm and delayed radial-femoral femoral pulsation; low ABI interscapular ejection murmur; rib notching on chest X-ray	Echocardiogram

**Table 28 Medications and other substances that may increase blood pressure**

Medication/substance	
Oral contraceptive pill	Especially oestrogen containing; cause hypertension in ~5% of women, usually mild but can be severe
Diet pills	For example, phenylpropanolamine and sibutramine
Nasal decongestants	For example, phenylephrine hydrochloride and naphazoline hydrochloride
Stimulant drugs	Amphetamine, cocaine, and ecstasy; these substances usually cause acute rather than chronic hypertension
Liquorice	Chronic excessive liquorice use mimics hyperaldosteronism by stimulating the mineralocorticoid receptor and inhibiting cortisol metabolism
Immunosuppressive medications	For example, cyclosporin A (tacrolimus has less effect on BP and rapamycin has almost no effect on BP) and steroids (e.g. corticosteroids and hydrocortisone)
Antiangiogenic cancer therapies	Antiangiogenic drugs such as VEGF inhibitors (e.g. bevacizumab), tyrosine kinase inhibitors (e.g. sunitinib), and sorafenib have been reported to increase BP
Other drugs and substances that may raise BP	Anabolic steroids, erythropoietin, non-steroidal anti-inflammatory drugs, and herbal remedies (e.g. ephedra and ma huang)

BP = blood pressure; VEGF = vascular endothelial growth factor.

# Medicatie/ drugs ?

# Casuïstiek

- 7 X casuïstiek ;
- Metingen goed : zelfcontrole
- Primair versus secundair
- Orgaanschade? Geassocieerde pathologie?
- Therapie ?

# Casus I

- Vrouw 46 j :Arteriële hypertensie waarvoor Coversyl
- gewichtstoename, deconditionering, spieratrofie, typische veranderingen van gelaat/hals, verdwijnen dag-nachtritme en psychische-emotionele weerslag.
- 2014 normale botdensiteit (T-score lumbaal 0.9; femurhals links 0.4)



# Casus 1

Spreekkamer-BD met behandeling: 148/92 mmHg  
Geen andere risicofactoren

		Meting 1		Meting 2		Meting 3	
		SYS	DIA	SYS	DIA	SYS	DIA
Dag 1	AM	148	92	144	90	150	94
	PM	138	86	134	84	134	84

		Meting 1		Meting 2		Meting 3	
		SYS	DIA	SYS	DIA	SYS	DIA
Dag 2	AM	140	90	136	88	142	90
	PM	136	84	132	84	132	82

		Meting 1		Meting 2		Meting 3	
		SYS	DIA	SYS	DIA	SYS	DIA
Dag 3	AM	150	92	146	90	148	90
	PM	134	82	132	82	130	80

# Resultaten en discussie

## Spreekkamer-BD

Resultaat: 148/92 mmHg — Boven normaal ( $\leq 140/90$ )

## Thuis-BD

Gemiddelde TBD: 139/86 mmHg → Boven normaal ( $\leq 135/85$ )

*Gemiddelde 's ochtends: 144/90 mmHg*

*Gemiddelde 's avonds: 133/83 mmHg*



### Ongecontroleerde patiënt

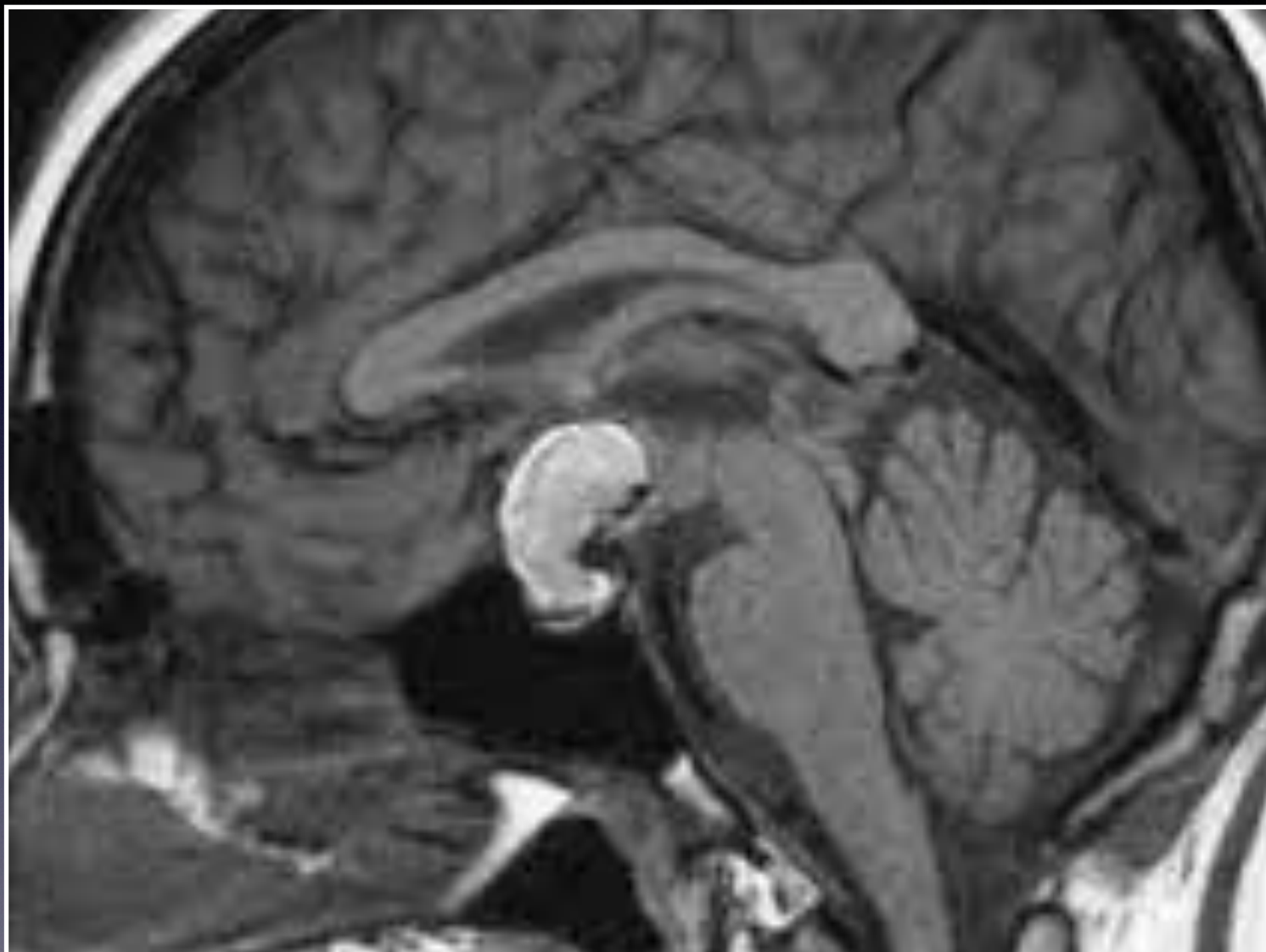
BD niet gecontroleerd in de spreekkamer en thuis  
Belangrijk verschil tussen ochtend en avond

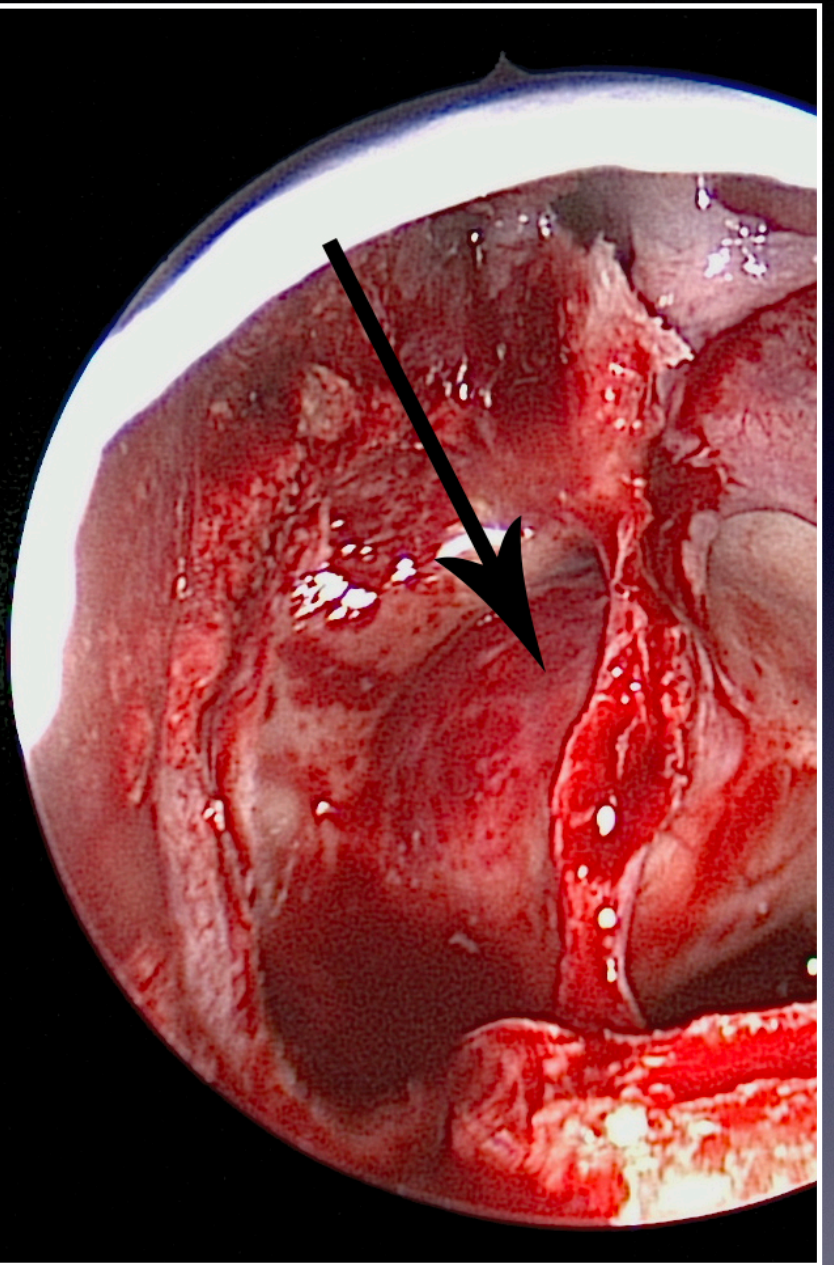
### Therapeutische beslissing

Wijziging behandeling (posologie / medicament)  
Wijziging levensstijl

# Casus 1

- Cortisolurie >50, ACTH verhoogd
- Ambulant 24 uur : verlies diurne variatie,
- Gezien hierbij verhoogd ACTH werd aanvullende beeldvorming met KST hypofyse gepland
- Diagnose?





# Casus 1

- 6-2014: ziekte van Cushing met beeld van hypertensie, gewichtstoename, deconditionering, spieratrofie, typische veranderingen van gelaat/hals, verdwijnen dag-nachtritme en psychische-emotionele weerslag.
- Matig verhoogde cortisolurie (max. 2x ULN), maar volledige suppressie na dexamethason. ACTH verhoogd en duidelijk MRI-beeld van linkszijdig microadenoom >6 mm. Behandeling met Sostilar sinds 30-6-2014.
- Transsphenoidale resectie

# Casus 2

- Jonge vrouw 32 j, partner van profvoetballer
- Bloeddruk spreekkamer : 155/90mmhg
- BMI 23, labo normaal
- ECG normaal, sinustachycardie 110/min
- 3x week uitgaan, slaapt weinig, 5 uur per nacht
- Therapie ? Onderzoeken ?

# Klinisch geval 2 32 j vrouw

Spreekkamer-BD met 155/90 mmHg

Klachtenvrij

		Meting 1		Meting 2		Meting 3	
		SYS	DIA	SYS	DIA	SYS	DIA
Dag 1	AM	134	84	130	82	132	80
	PM	122	80	124	78	120	76

		Meting 1		Meting 2		Meting 3	
		SYS	DIA	SYS	DIA	SYS	DIA
Dag 2	AM	130	84	132	82	130	80
	PM	112	80	114	78	110	74

		Meting 1		Meting 2		Meting 3	
		SYS	DIA	SYS	DIA	SYS	DIA
Dag 3	AM	134	86	134	82	132	80
	PM	128	82	124	80	126	80



# Resultaten en discussie

## Spreekkamer-BD

Resultaat: 140/85 mmHg → Normaal ( $\leq 140/90$ )

## Thuis-BD

Gemiddelde TBD: 126/80 mmHg → Normaal ( $\leq 135/85$ )

*Gemiddelde 's ochtends: 132/82 mmHg*

*Gemiddelde 's avonds: 120/78 mmHg*



### Gecontroleerde patiënt

BD gecontroleerd in de spreekkamer en thuis

### Therapeutische beslissing

Geen wijziging

## Casus 2 : Wat moet onze houding zijn ?

niets, gewoon stress spreekkamer 0%

vragen naar drug en alchohol gebruik 0%

sturen naar een diëtist voor zoutarme voeding 0%

ABD 24 uur 0%

Hormonaal bilan en labo 0%

## Klinisch geval 3

- Jonge man 18 j : verwijzing wegens BD 180/90 mmHg apparaat moeder
- Systolische soufflé , TTE hart normaal
- Zwakke lies pulsaties

# Klinisch geval 3

Spreekkamer-BD met behandeling: 138/88 mmHg  
Geen andere risicofactoren

		Meting 1		Meting 2		Meting 3	
		SYS	DIA	SYS	DIA	SYS	DIA
Dag 1	AM	148	92	144	90	150	94
	PM	138	88	134	87	134	88

		Meting 1		Meting 2		Meting 3	
		SYS	DIA	SYS	DIA	SYS	DIA
Dag 2	AM	150	92	148	90	147	93
	PM	146	89	143	88	144	87

		Meting 1		Meting 2		Meting 3	
		SYS	DIA	SYS	DIA	SYS	DIA
Dag 3	AM	149	91	145	90	151	94
	PM	136	87	133	88	132	86

# Resultaten en discussie

## Spreekkamer-BD

Resultaat: 138/88 mmHg → Normaal ( $\leq 140/90$ )

## Thuis-BD

Gemiddelde TBD: 142/89 mmHg → Boven normaal ( $\leq 135/85$ )

*Gemiddelde 's ochtends: 148/91 mmHg*

*Gemiddelde 's avonds: 133/87 mmHg*



### **Ongecontroleerde, gemaskeerde hypertensie**

BD gecontroleerd in de spreekkamer MAAR niet thuis

### **Therapeutische beslissing**

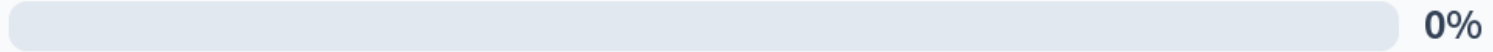
Wijziging behandeling (posologie / medicament)

Wijziging levensstijl

Doen we nog aanvullende onderzoeken ?

### Casus 3 : 18 jaar welke onderzoeken

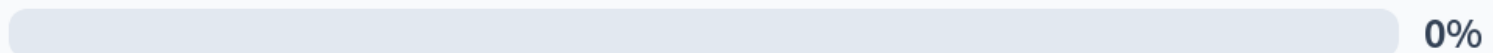
Echocardiografie



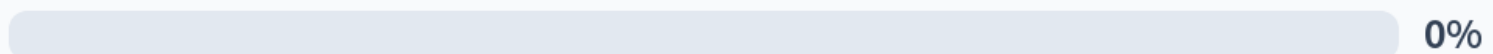
Hormonaal bilan urine / serum



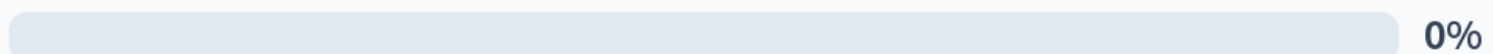
CT nierarterien

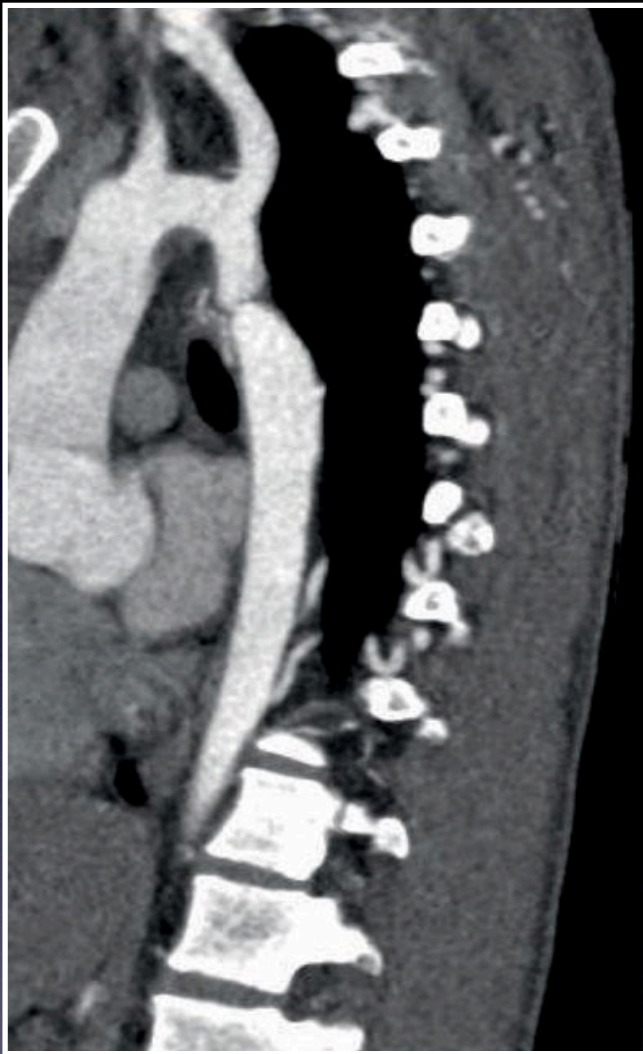


CT aorta



None of the above





Wat zien we ?

## Casus 3 : 17 j

- Hypertensie bij adolescenten kinderen zonder obesitas is abnormaal : altijd zoeken naar secundaire hypertensie
- CT Aorta : coarctatio aorta
- Heelkunde



# Klinisch geval 4 en discussie

- Vrouw 73,
- Diabetes sedert 15 j
- BMI 31, vrouw
- Triplixam 10/5/10
- Cre 1,3 GFR 50, K 4,0
- Metformine 3 x 800, unidiamicron en Jardiance 25 mg

# Klinisch geval 4 en discussie

## Spreekkamer-BD

Resultaat: 155/95 mmHg → Normaal ( $\leq 140/90$ )

## Thuis-BD

Gemiddelde TBD: 153/90 mmHg → Normaal ( $\leq 135/85$ )

*Gemiddelde 's ochtends: 155/92 mmHg*

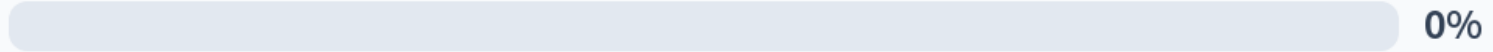
*Gemiddelde 's avonds: 152/89 mmHg*

**Ongecontroleerd**

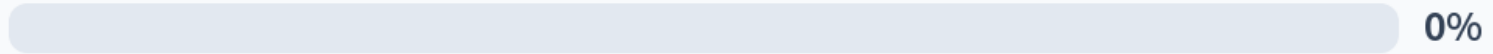
Therapeutische beslissing  
?

## Casus 4 : welke therapie aanvullend

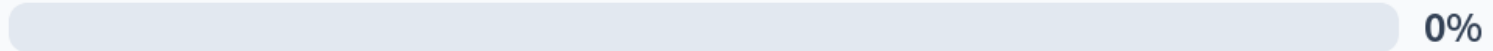
Moxonidine 0,4 mg



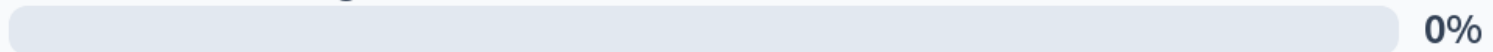
Forzaten 40/10/25 mg



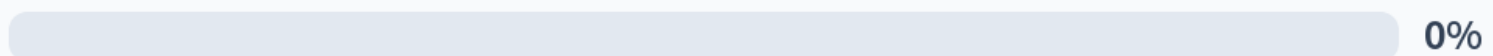
Spiro lactone 25 mg



Furosemide 40 mg



Geen



## Casus 4

- Start spironolactone 25 mg
- Bloeddruk na 4 weken Spreekkamer 146/80 mmhm

## Casus 5

- Man 76 j
- Roken: sedert 16 j , diabetes type II 3 j
- Sevikar plus 40/10/25 mg, moxonidine 0,4 mg
- Orale anti diabetica
- Perifeer zwakke pulsatie, shuffel femoralis re en li
- TTE LVhypertrofie. Cyclo negatief

# Casus 5

- BD Spreekkamer : 170/95 mmhg
- Crea 1,5 GFR 44, geen proteinurie
- Welke Onderzoeken ?
- Medicatie ?

## Casus 5 : welk onderzoek ?

Hormonaal bilan

0%

CT angiografie nierarterieën

0%

NMR nier arterien

0%

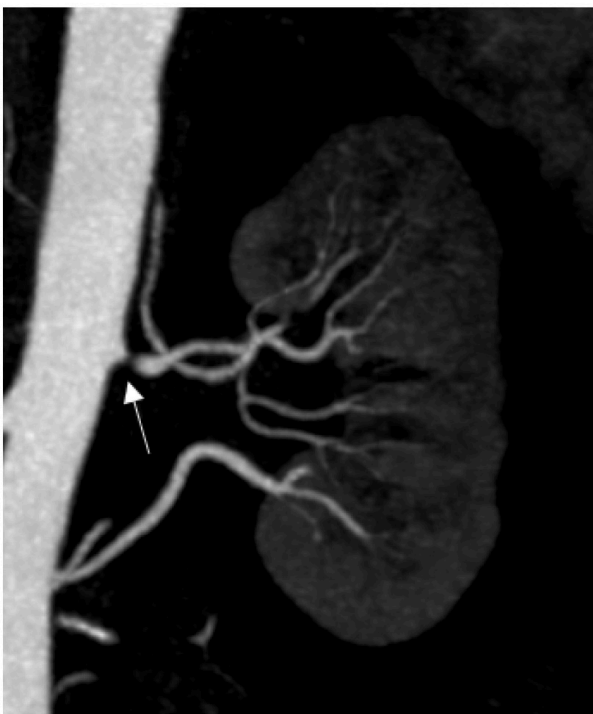
Echo nier arterien

0%

None of the above

0%

**a** Multidetector CTA



**b** MRA



**c** Catheter angiography



NMR nier aterien



## Casus 5

- Bilaterale atherosclerotisch plaques, hooggradig links
- PTA links
- Na 4 weken : BD 145 /85
- Na 10 maanden...: BD 195/95 en vkf

## Casus 5

- PTA nierarterien bij perifere atheromatose valt vaak tegen op langere termijn
- Betere prognose bij fibromusculaire dysplasie

# Casus 6

- Vrouw 93 j, verwezen door neuroloog
- BMI 17, G : 46 kg, alleenwonend
- Voorgeschiedenis :
  - heupfractuur en heekunde
  - Parkinsonisme ? Levodopa ?
- BD SK liggend 166/75 mmhg, staande 110/60 mmhm

## Casus : 6 welke therapie

amlodipine 5 mg

0%

olmesartan 20 mg

0%

Bisoprolol 5 mg

0%

coversyl 5 mg

0%

None of the above

0%

# Casus 6

- Orthostatische hypotensie en frailty
- Risico op vallen te hoog
- Geen medicatie
- Mobilisatie

# Casus 7 47 j

1998: ernstige spondylarthropathie na bewezen Chlamydia infectie met nadien persisterende chronische artritis.

HLA B27 positief.

4-99: tibialis posterior tendinitis links.

9-99: coxitis links waarvoor opname.

2011 : Totale heupprothese links

sport: wielertoerismen , hartslagmeter

13000 km per jaar MTB / wegfiets

Risicofactoren

Nicotine abusius : geen 0pakjaren)

Familiaal (vader <65 moeder <55 j) : geen

Arteriële hypertensie : geen

Dyslipidaemie : - laatste chol : 195 -mg/dl

2022 : Atletes heart

12/2023: bilateraal TEP liesbreukherstel + inguinale vasectomie op vraag van patiënt

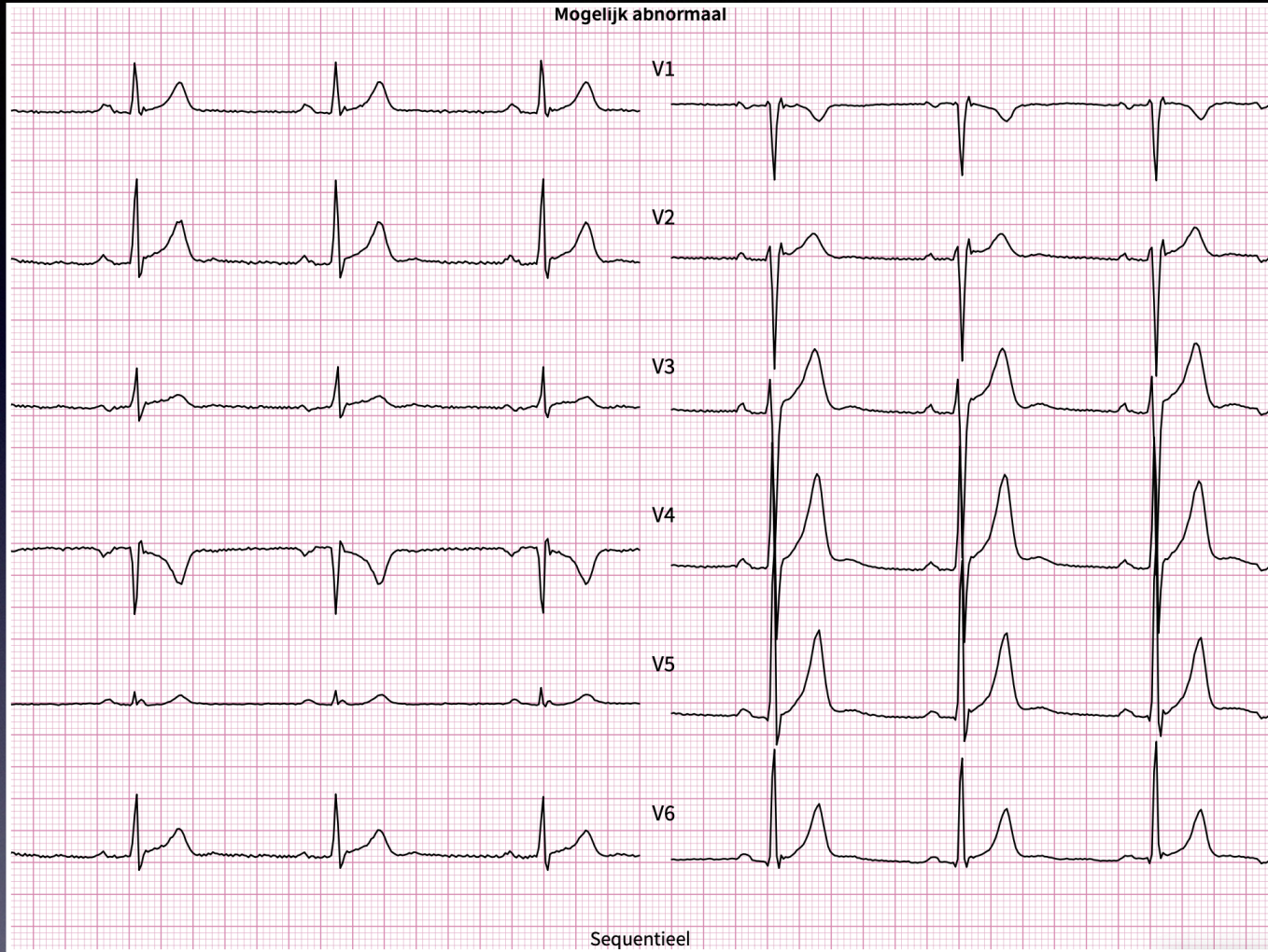
2023: acute neuronitis vestibularis links

USUS : INGENIEUR,

# Casus 7 : 47 j

2022

- Het electrocardiogram beantwoordt aan de normale criteria zoals vastgelegd in de internationale criteria voor ECG interpretatie bij atleten. [http://www.cardiologie-bertem.be/wpcontent/uploads/2019/02/BJSM-International-Criteria-for-ECGInterpretation\\_BJSM-2017.pdf](http://www.cardiologie-bertem.be/wpcontent/uploads/2019/02/BJSM-International-Criteria-for-ECGInterpretation_BJSM-2017.pdf)
- Er treden geen ernstige ritmestoornissen op bij inspanning (VES, couples zelden) en de inspanningscapaciteit is uitzonderlijk goed.
- TTE toont tekens van een sporthart ; met discrete excentrische linker ventrikel hypertrofie.
- Er is dan uiteraard geen contraindicatie voor aerobe training of competitieve sportbeoefening



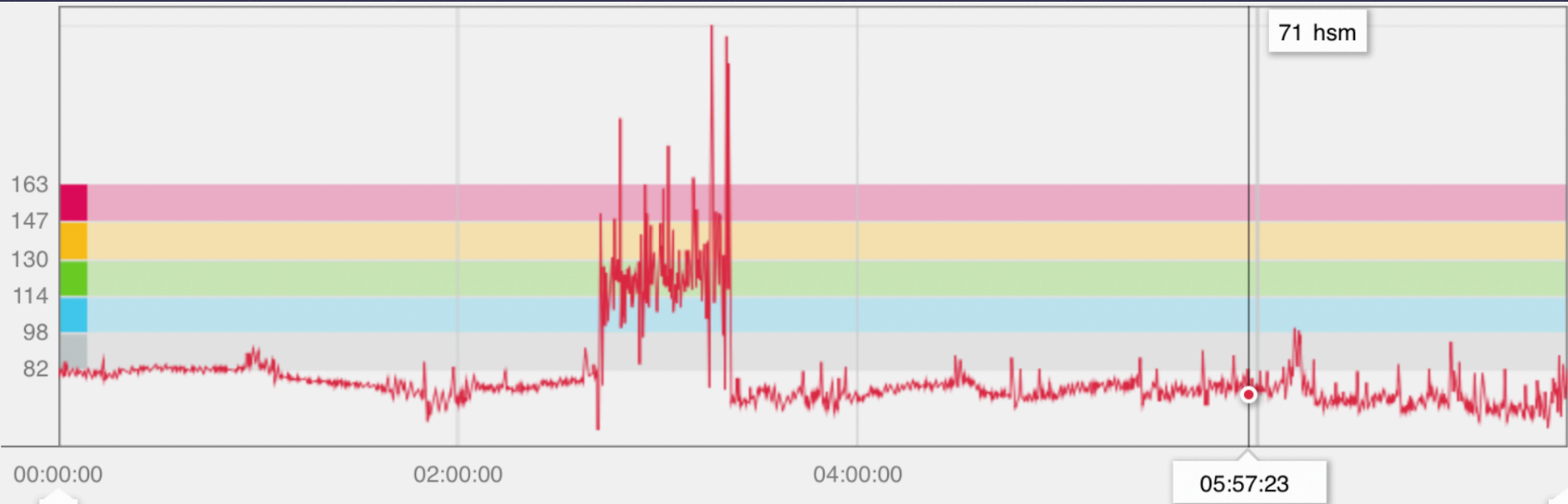
# Casus 7



# Casus 7

2024

- Klachten van palpitations, cardioloog Jessa ,
- TTE : Gedilateerde aorta ascendens 41 mm- sinussen 45 m STJ 41 mm
- -aorta ascendens 41 mm
- Polar en 2de opinie :



# CASUS 7

2024

- TTE toont en bevestig tekens van een sporthart ; met discrete excentrische linker ventrikel
- hypertrofie, dilatatie van de beide atriae met functionele licht mitralisinsufficiëntie en
- tricuspiedinsufficiëntie.
- Aorta ascendens toont ectopie en een dilatatie in de sinussen van valsalva tot 47 mm,
- aorta ascendens tot 45 mm, boog normalisdert evenals aorta abdominalis.

Lisens, Roeland  
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47Y  
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R

RD: 182,50  
Tilt: 0  
mA: 96  
KVp: 120  
Acq no: 5  
Page: 13 of 37



H HART LEUVEN  
CT ANGIO THORAX  
Lung 5.0 CE  
17-07-2024, 13:22:22  
24072747\_01  
CE  
LOC: -31,25  
THK: 5 SP: ---  
FFS

L

CTA Thorax Coronal  
---  
SC  
Z: 0,5  
C: -500  
W: 1500  
DFOV: 69,847x 27,341cm  
IM: 13 SE: 8

- Ct aorta :
- Ectopie aorta met dilatie sinussen van valsalva tot verbreed voorkomen van de sinus aortae 54 mm.
- Arcus aorta is normaal

# CASUS 7

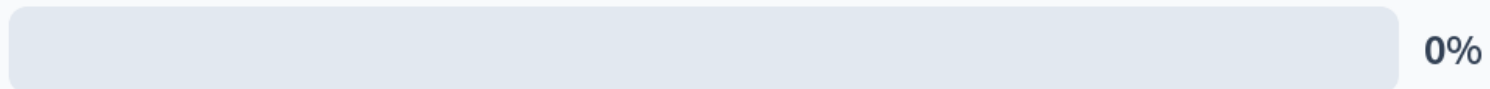
- Bloeddruk 145/95 / 150/90/ 150/95 tijdens spreekuur
- Partner ongerust en wenst advies omtrent intens sporten
- Ex man partner is plots overleden tijdens fietsen (<35 jaar) en ze werkt bij medtronic

# Casus 7

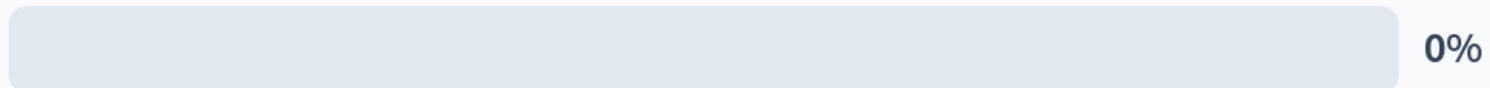
- Mag de man verder fietsen ?
- Moet de bloeddruk behandeld worden ?
- Welke onderzoeken ?

## Casus 7 : Mag de man fietsen ?

Ja

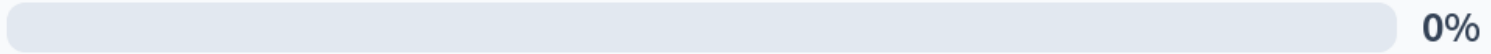


neen



## Starten we met medicatie ?

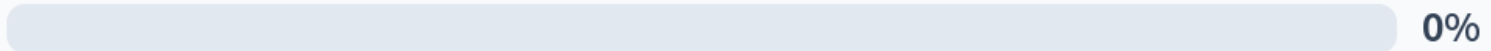
Na ambulante 24 BD meting



Na zelfcontrole 7 dagen



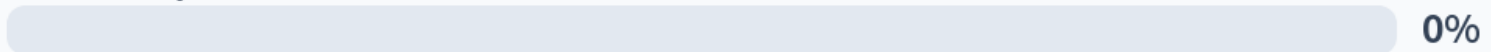
onmiddelijk met betablokkers



onmiddelijke met RAAS-I



onmiddelijke met calciumblokker



## Casus 7 : welke onderzoeken ?

Genetisch onderzoek aortapathologie

0%

NMR hart

0%

Rooti/EFO en VKF ablatie

0%

Bentall operatie

0%

None of the above en controle TTE 6 maanden

0%



# Casus 7

- Bloeddruk thuiscontrole
- Mag fietsen woon werk, niet competitief
- Rooti, genetische testen, NMR hart (9/24)
- Controle 5 maanden TTE (4 oktober)

# Casus 7

- 18 September 2024 : Nieuwe episode hevige thoracale pijn met tijdelijk uitgesproken hypotensie en braken tijdens fietsrit.
- Urgent transport vanuit dienst spoedgevallen na diagnose op CT van:
- 1/ Aneurysma van de aorta ascendens (53 mm) met DISSECTIE. Bifocale dissectieflap aan de linker laterale zijde.
- 2/ Hemopericard rond de aorta ascendens, uitbreidend langs de linker pulmonale vaatsteel : dreigende ruptuur.
- Aangekomen op OK terug hemodynamisch stabiel. Op TTE duidelijke dissectie in ascendens met visualisatie van dissectieflap in carotis rechts bij plaatsen DVC; Tevens aortaklepinsufficiëntie 3+/4.

# Casus 7

- Aortaklepparende wortelvervanging (Yacoub) met annuloplastiering en vervanging aorta ascendens
- Postoperatief vkf in ziekenhuis

# Casus 7

<http://www.cardiologie-bertem.be/voor-huisartsen/aortapathologie/>



**ESC**

European Society  
of Cardiology

European Heart Journal (2024) **00**, 1–163

<https://doi.org/10.1093/eurheartj/ehae179>

**ESC GUIDELINES**

## **2024 ESC Guidelines for the management of peripheral arterial and aortic diseases**

**Developed by the task force on the management of peripheral arterial and aortic diseases of the European Society of Cardiology (ESC)**

***Endorsed by the European Association for Cardio-Thoracic Surgery (EACTS), the European Reference Network on Rare Multisystemic Vascular Diseases (VASCERN), and the European Society of Vascular Medicine (ESVM)***

# Casus 7

## Recommendations for surgery in aortic root and ascending aorta dilatation associated with tricuspid aortic valve

Surgery should be considered in patients who have isolated aortic arch aneurysm with a maximal diameter  $\geq 55$  mm.

**IIa**

**C**

Surgery is recommended in patients with dilatation of the aortic root or ascending aorta with a tricuspid aortic valve and a maximum diameter of  $\geq 55$  mm.

**I**

**B**

Aortic valve repair using the reimplantation technique or remodelling with aortic annuloplasty is recommended in young patients with aortic root dilation and tricuspid aortic valves.

**I**

**C**

Valve-sparing aortic root replacement is recommended in patients with aortic root dilatation if performed in experienced centres and durable results are expected.

**I**

**B**

Lower thresholds for intervention may be considered according to BSA in patients with small stature or in the case of rapid progression, aortic valve regurgitation, planned pregnancy, and patient's preference.

**IIb**

**C**

Ascending aortic or root replacement may be considered at a maximum diameter of  $\geq 50$  mm in patients with proximal aorta dilatation who can be offered surgery with low predicted risk and present with any of the following:

- Growth of the aortic diameter  $\geq 3$  mm per year
- Resistant hypertension
- Short stature ( $< 1.69$  m)
- Root phenotype
- Aortic length  $> 11$  cm
- Age  $< 50$  years
- Desire for pregnancy
- Aortic coarctation.

**IIb**

**B**

# Casus 7

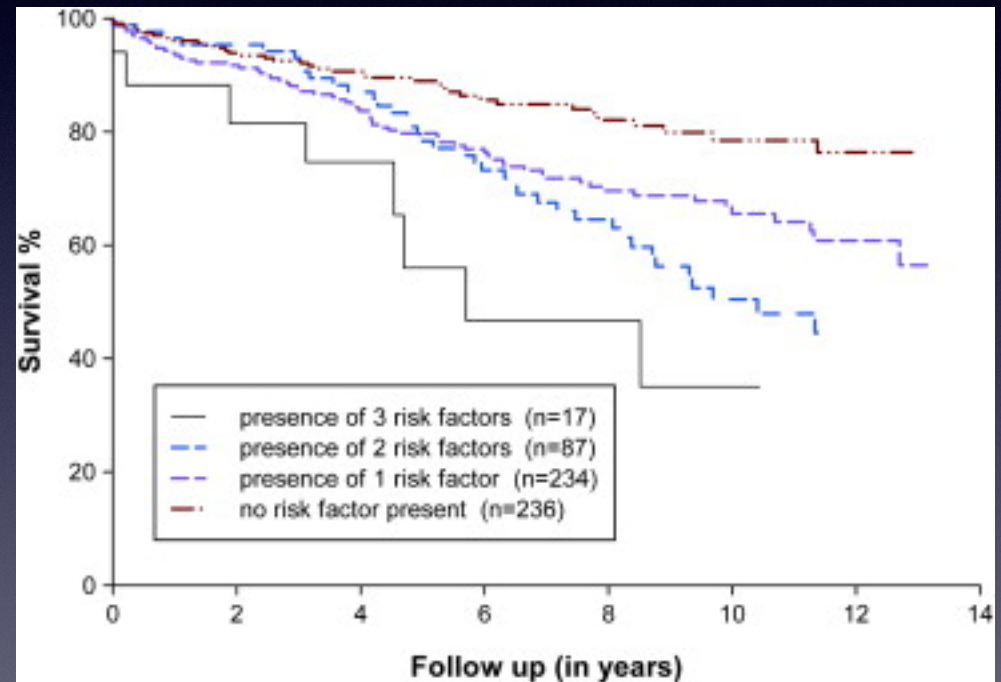
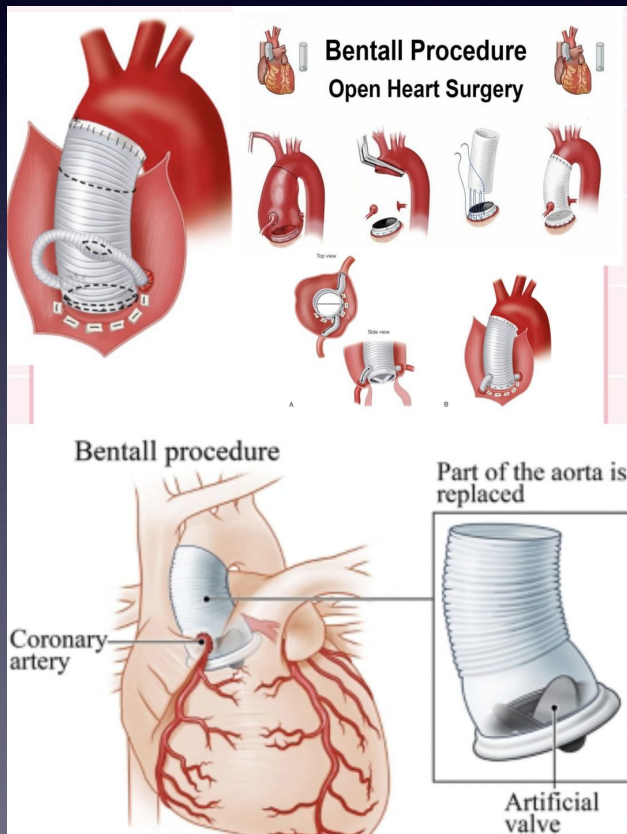
## Recommendations for bicuspid aortic valve-associated aortopathy management

Cardiac MRI or CT is indicated in patients with BAV when the morphology of the aortic root and the ascending aorta cannot be accurately assessed by TTE.	<b>I</b>	<b>C</b>	CCT or CMR of the entire thoracic aorta is recommended at first diagnosis and when important discrepancies in measurements are found between subsequent TTE controls during surveillance, or when the diameter of the aorta exceeds 45 mm.	<b>I</b>	<b>C</b>
In the case of aortic diameter >50 mm or an increase of >3 mm per year measured by echocardiography, confirmation of the measurement is indicated, using another imaging modality (CT or MRI).	<b>I</b>	<b>C</b>		<b>I</b>	<b>C</b>
In the case of a diameter of the aortic root or the ascending aorta >45 mm or an increase of >3 mm per year measured by echocardiography, annual measurement of aortic diameter is indicated.	<b>I</b>	<b>C</b>	Surveillance serial imaging by TTE is recommended in BAV patients with a maximum aortic diameter >40 mm, either with no indication for surgery or after isolated aortic valve surgery, after 1 year, then if stability is observed, every 2–3 years.	<b>I</b>	<b>C</b>
In cases of BAV, surgery of the ascending aorta is indicated in the case of: <ul style="list-style-type: none"> <li>• Aortic root or ascending aortic diameter &gt;50 mm in the presence of other risk factors (coarctation of the aorta, systemic hypertension, family history of dissection, or increase in aortic diameter of &gt;3 mm per year).</li> </ul>	<b>I</b>	<b>C</b>	In patients with low surgical risk and ascending phenotype bicuspid aortopathy, surgery should be considered at a maximum diameter $\geq 50$ mm if any of the following is the case: <ul style="list-style-type: none"> <li>• Age &lt;50 years</li> <li>• Short stature</li> <li>• Ascending aortic length <math>\geq 11</math> cm</li> <li>• Aortic diameter growth rate &gt;3 mm per year</li> <li>• Family history of acute aortic syndrome</li> <li>• Aortic coarctation</li> <li>• Resistant hypertension</li> <li>• Concomitant non-aortic-valve cardiac surgery</li> <li>• Desire for pregnancy</li> </ul>	<b>IIa</b>	<b>C</b>

# Casus 7

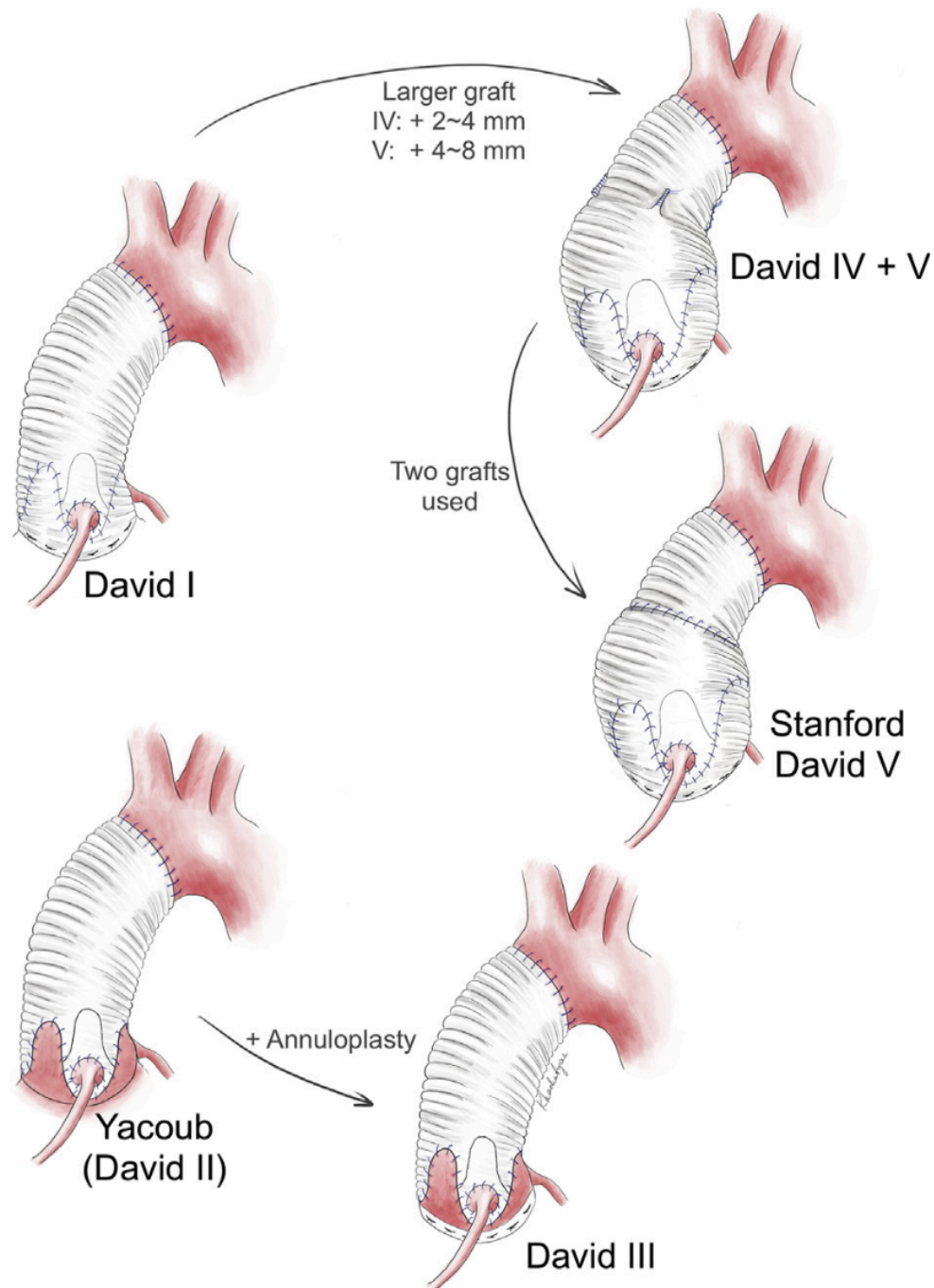
- Preventieve Bental ingreep aangewezen gezien progressie van dilatatie van 38 naar 45-48 mm
- Gezien geen AI, CT tot 50 mm, geen urgentie verwijzing
- Bloeddrukverlagende medicatie en ontraden van intens sporten, excitantia en cocaine ontraden
- Asymptomatisch en uitstekende conditie : vaak moeilijk te overtuigen van ingreep

# Casus 7 BENTALL



MORTALITEIT 3,9-10 %



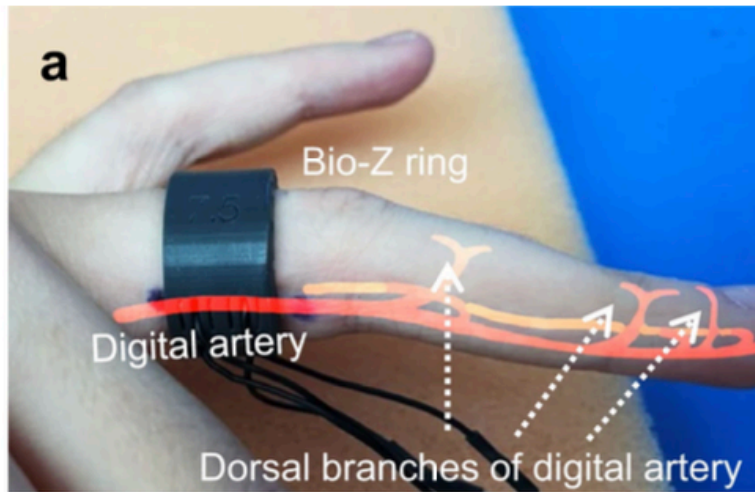


# Casus 7 addendum

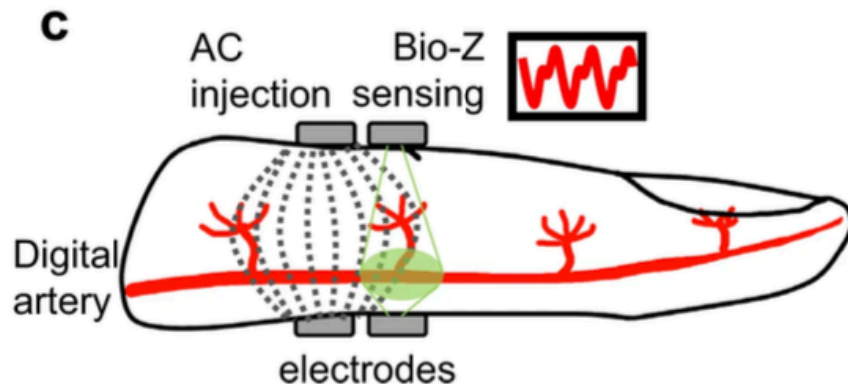
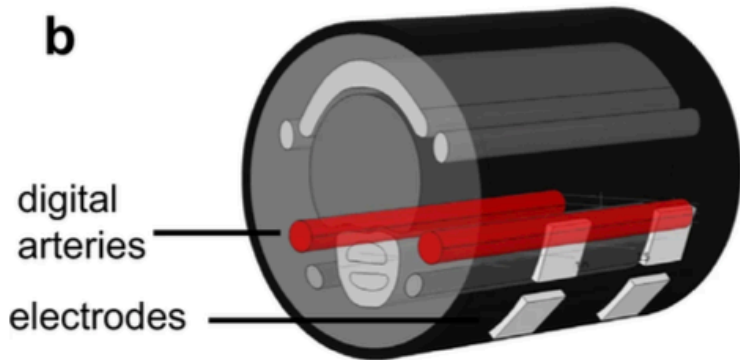
- Deze week spoed met paroxysmale vkf
- Regelmatig Extacy en cocaine gebruik
- Bloeddrukmedicatie wordt deze week opgestart : bètablokkers met olmesatan.

pressure sensing.

From: *Continuous cuffless blood pressure monitoring with a wearable ring bioimpedance device*



# Toekomst







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USERS

4.8 out of 5 star Authentic Customer  
reviews on the Aktiia product and  
App  
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# CE

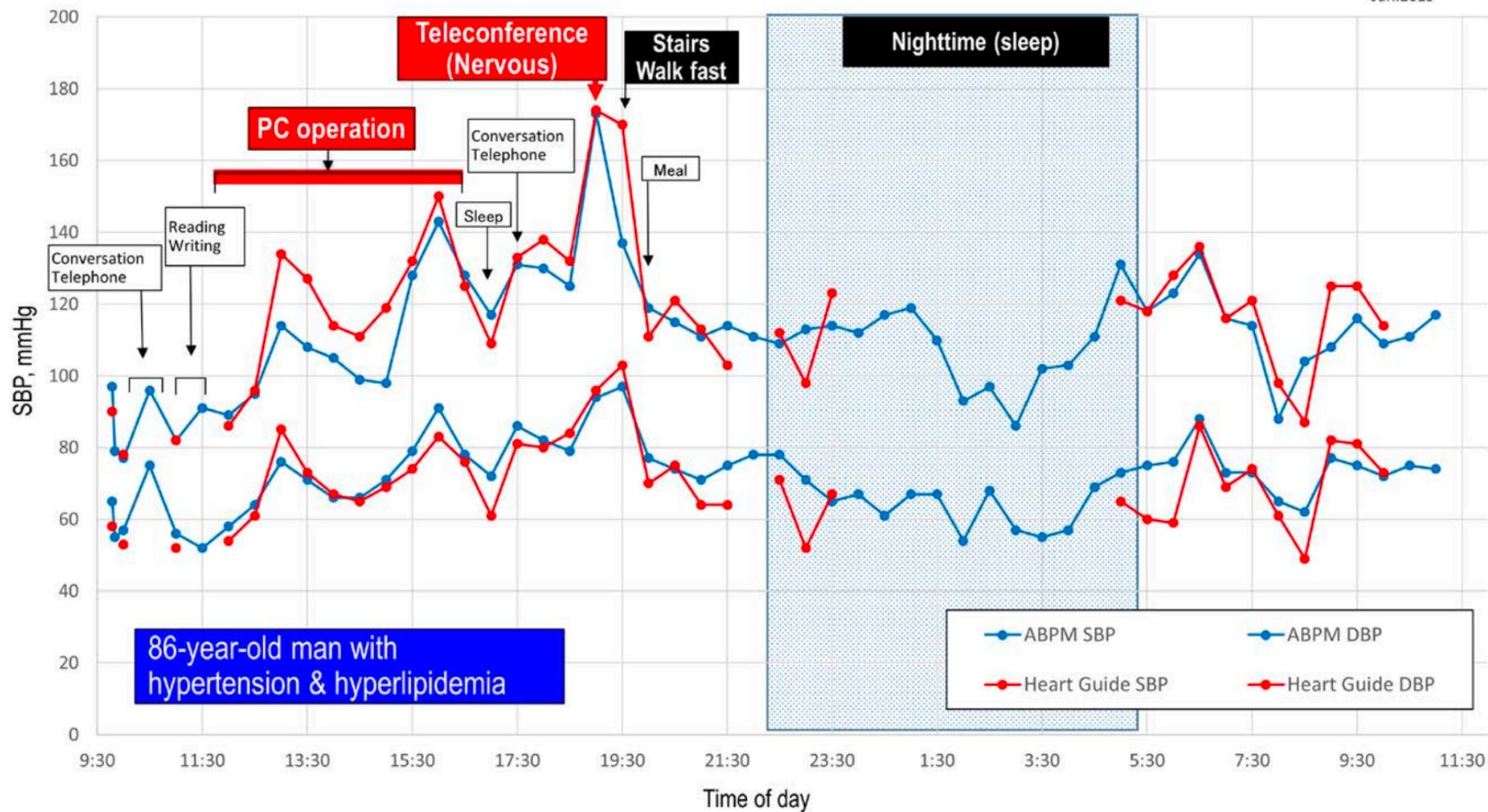
MEDICAL  
DEVICE

Class IIa  
Medical Device<sup>1</sup>

# HeartGuide™

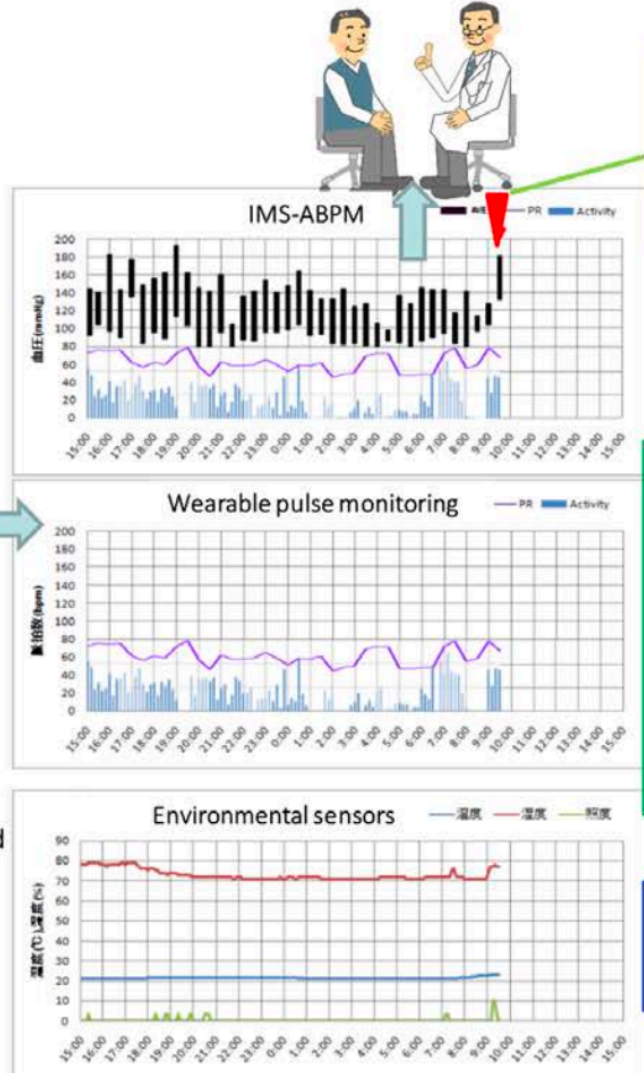
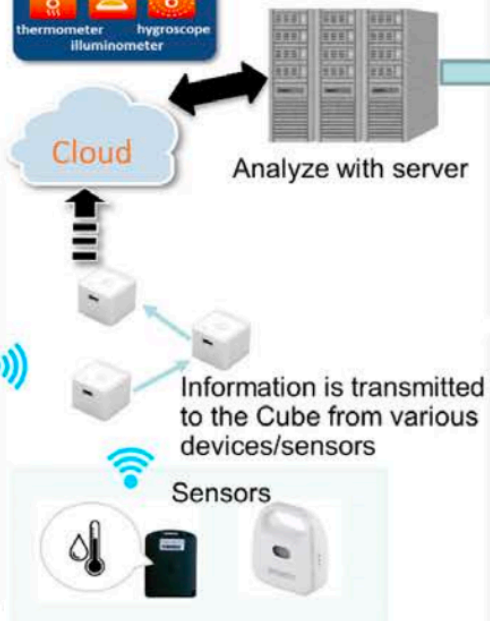
**BLOOD PRESSURE ANYTIME,  
ANYWHERE.**





**Figure 4.** Comparison showing simultaneous monitoring with a wearable device (HeartGuide; Omron Healthcare Co, Ltd) and ambulatory blood pressure monitoring (ABPM). DBP indicates diastolic blood pressure; PC, personal computer; and SBP, systolic blood pressure.

# ICT Multisensor environment blood pressure monitoring system



IMS-ABPM could be used as a screening for AF by analyzing the waveforms

- Biological signals**
- IMS-ABPM:**
- Ambulatory BP readings at 30-min intervals (occasional)
  - Home BP values
  - Pressure waveform
  - Activity, temperature, atmospheric pressure
- Wearable pulse monitoring:**
- Pulse (continuous)
  - Physical activity

- Environmental signals**
- Temperature
  - Illumination
  - Humidity



# Besluit

- Meten blijft een probleem
- Therapie starten in functie van definitie  
2003, 2018, 2024 : vroeger en meer rekening houden met risicofactoren ; the lower the better ?
- Combinatietherapie de regel
- Jonge mensen/ therapieresistentie : secundaire hypertensie ? Hoewel zeldzaam
- Gezond verstand : frailty? Valrisico ? Leeftijd ?

# Besluit : toekomst

- Ambulante BD monitoring met Smartphone-apps zijn nog niet bruikbaar en geen enkele is momenteel goedgekeurd door de Amerikaanse FDA of EMA
- Wachten op validatie .. vele studies lopende
- AI !!! Combinatie met telemetrie

# HOE RUZIES ONTSTAAN...

