DE ABDIJMOLENS
16/11/2023

Regionaal ziekenhuis
Heilig Hart Leuven

PRACTICAL VIEW ON HYPERTENSION

Casuïstiek

Dr. Rik Celen

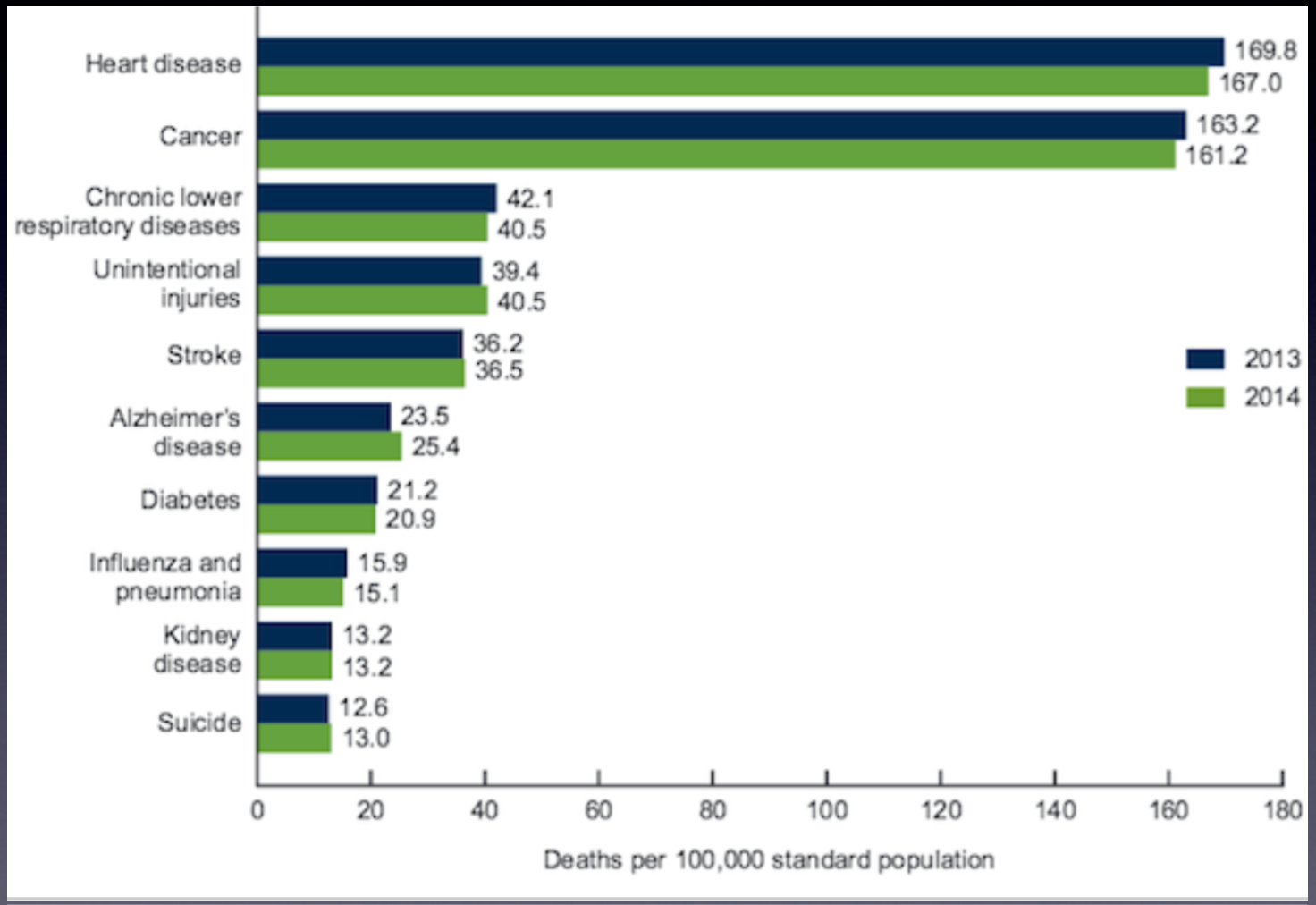
DISCLOSURE : MENARINI

INHOUD

- Inleiding: definitie ?
- Hoe meten ?
- ESC Richtlijnen 2018
- Casuïstiek : menti.com 5557 6031

- PDF presentatie www.cardiologie-bertem.be

Oorzaak dood



Primaire preventie

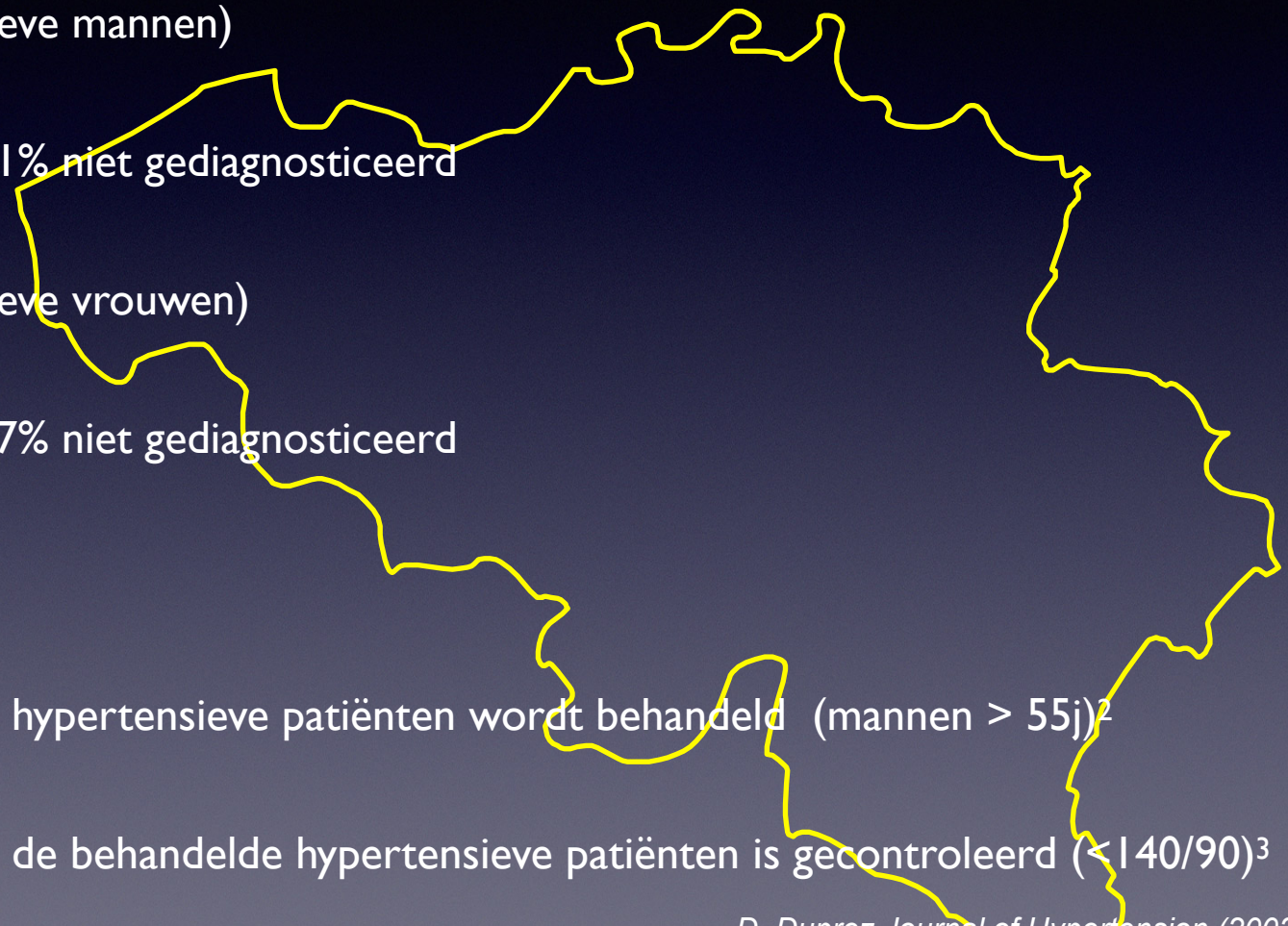
- Dieet en alcohol
- Lipidencontrole
- Duursport
- Hormonaal
- Genetica
- Diabetes
- Rookstop
- Arteriële hypertensie
- Psychologie (type D)
- Cultuur


24 HOUR
FITNESS

Wat is het beste wat we kunnen doen voor onze gezondheid?

- Blauw R/
- Groen ?
- Exercise/ wandelen 30-45 min 3 x week

Prevalentie van hypertensie in België [1] 2002



31.9% (actieve mannen)

- 71% niet gediagnosticeerd

23.3% (actieve vrouwen)

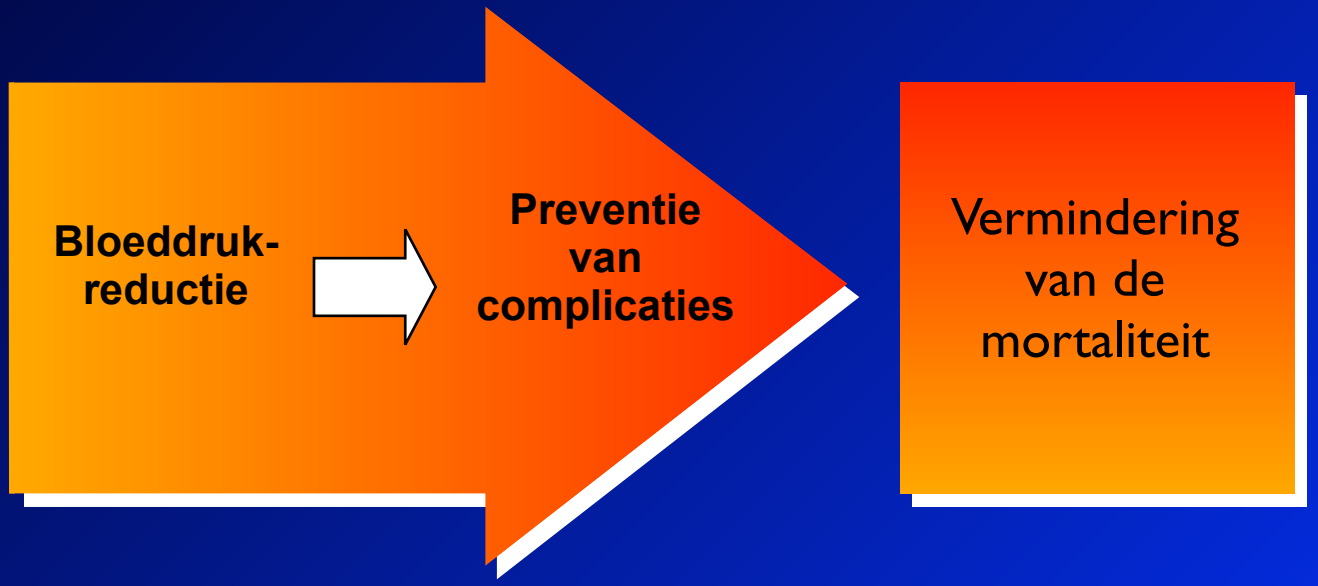
- 57% niet gediagnosticeerd

- 80 % van hypertensieve patiënten wordt behandeld (mannen > 55j)[2]
- 29 % van de behandelde hypertensieve patiënten is gecontroleerd (<140/90)[3]

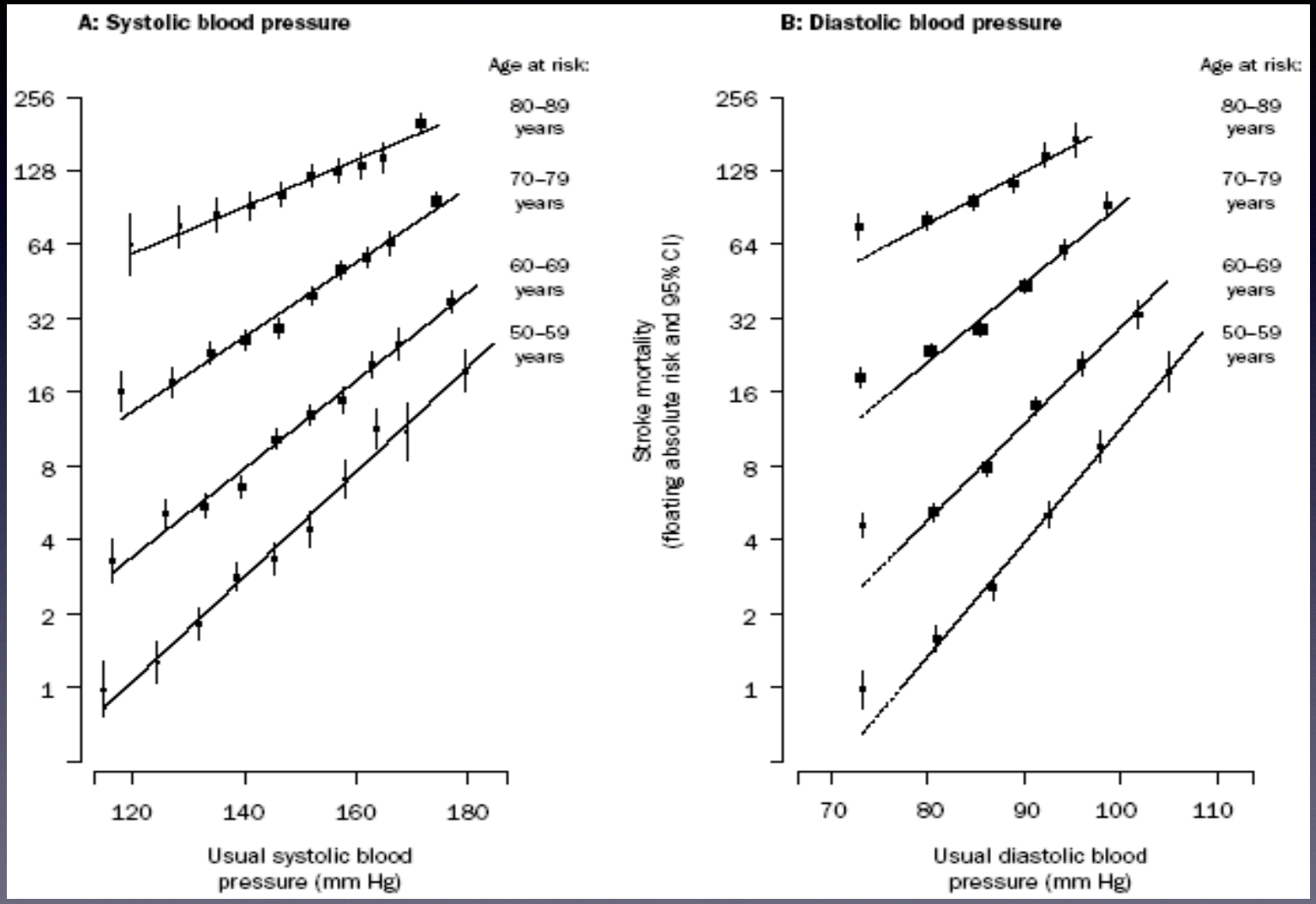
1. *D. Duprez Journal of Hypertension (2002) 16, 47-52*
2. *R. Fagard Journal of Hypertension 2002, 20:1297-1302*
3. *J. Krzesinski Journal of Hypertension v21 Sup 4 2003 p.S71*

Prevalentie : 50%regel

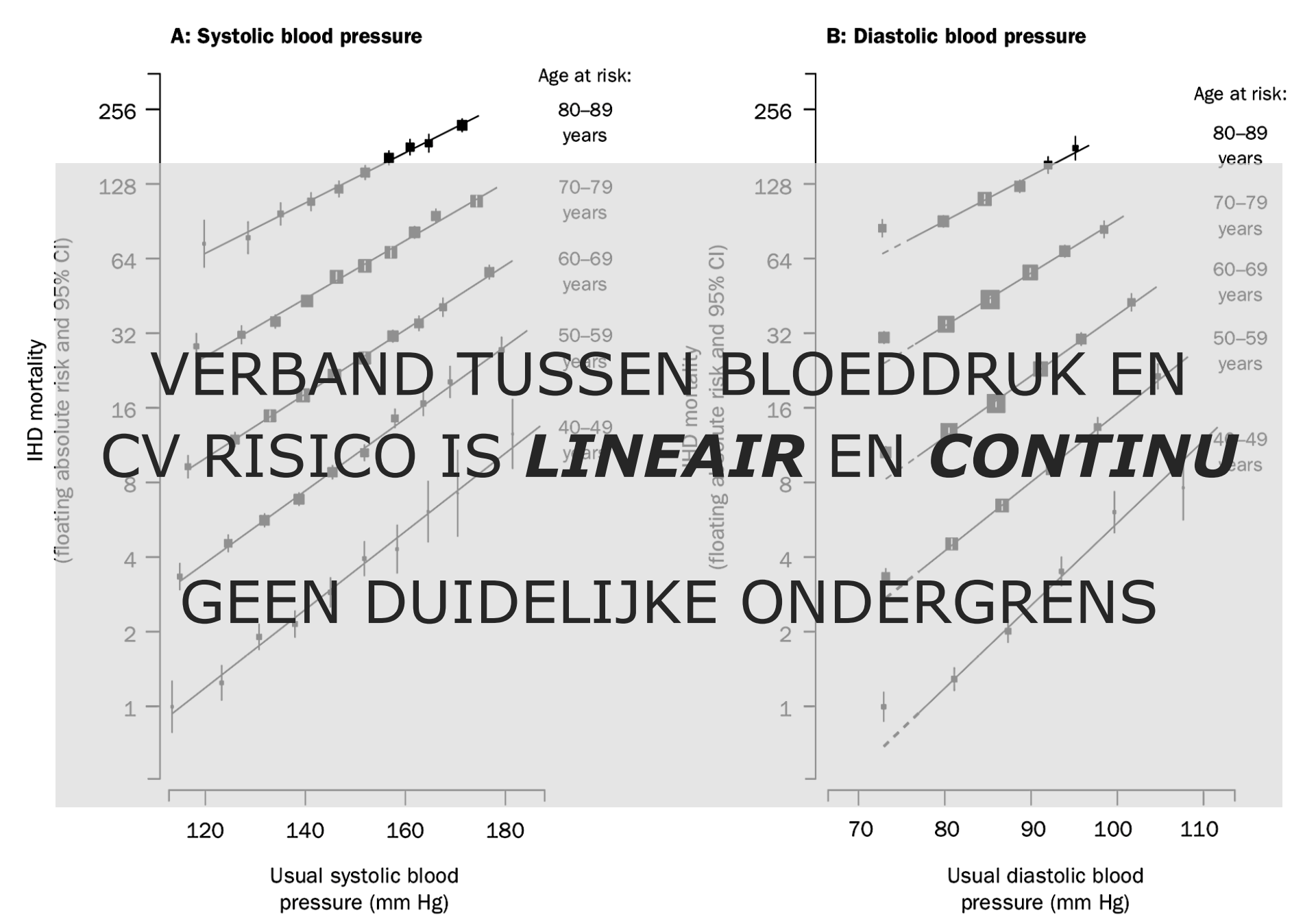
- 50% ontwikkeld ooit hypertensie
- 50% hieven weet t
- 50 % hiervan is goed behandeld


Bloeddruk-
reductie
Preventie
van
complicaties
Vermindering
van de
mortaliteit

Cardiovasculair risico hangt samen met het niveau van hypertensie



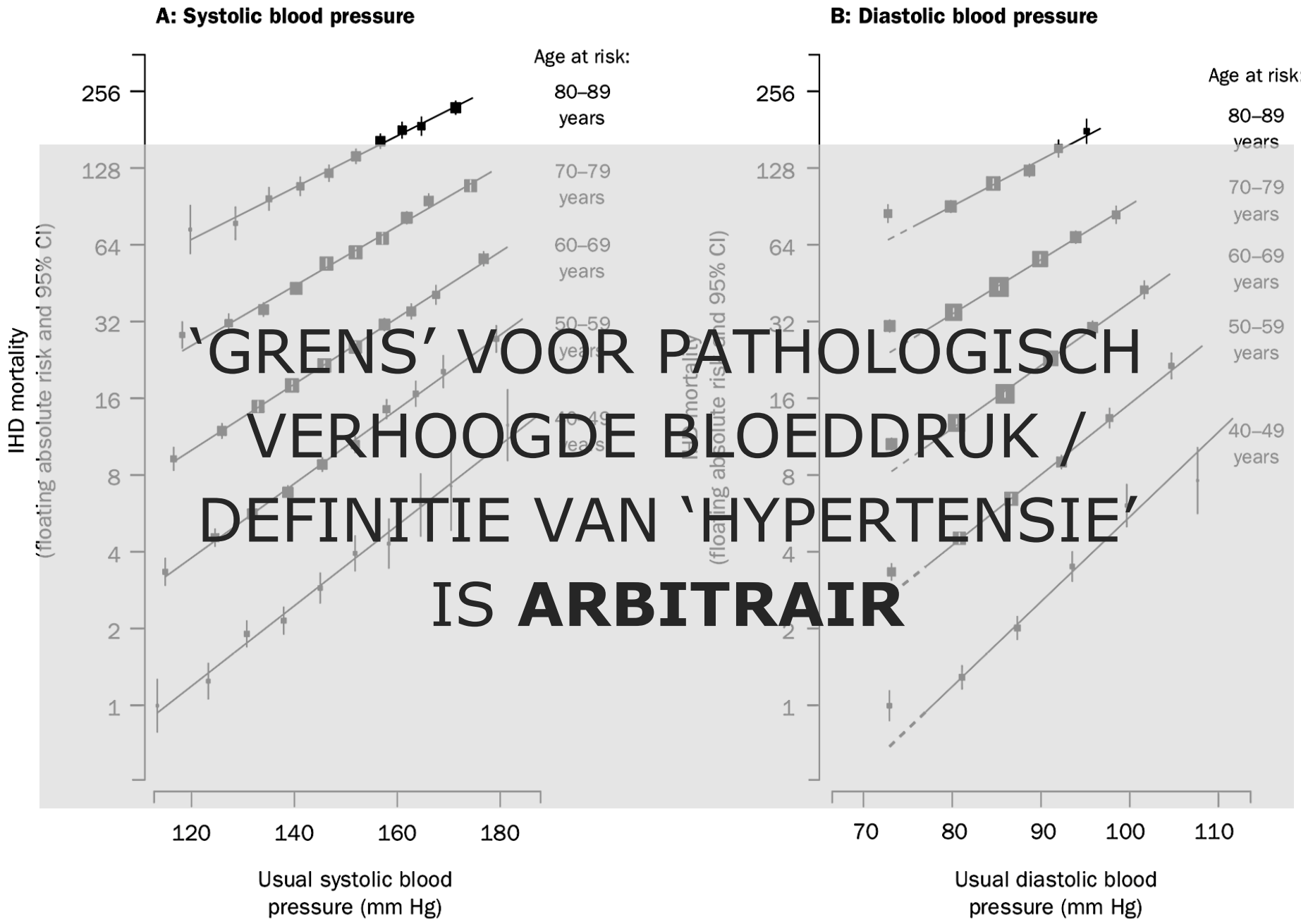
Lewington S, Clarke R, Qizilbash N, et al. Age-specific relevance of usual blood pressure to vascular mortality: a meta-analysis of individual data for one million adults in 61 prospective studies. Lancet. 2002; 360:1903-13.



VERBAND TUSSEN BLOEDDRUK EN CV RISICO IS ***LINEAIR*** EN ***CONTINU***

GEEN DUIDELIJKE ONDERGRENS

Lancet 2002; 360: 1903-12



'GRENS' VOOR PATHOLOGISCH VERHOOGDE BLOEDDRUK / DEFINITIE VAN 'HYPERTENSIE' IS **ARBITRAIR**

Lancet 2002; 360: 1903-12

Klinisch voordeel van bloeddrukcontrole

- Preventie van CVA:

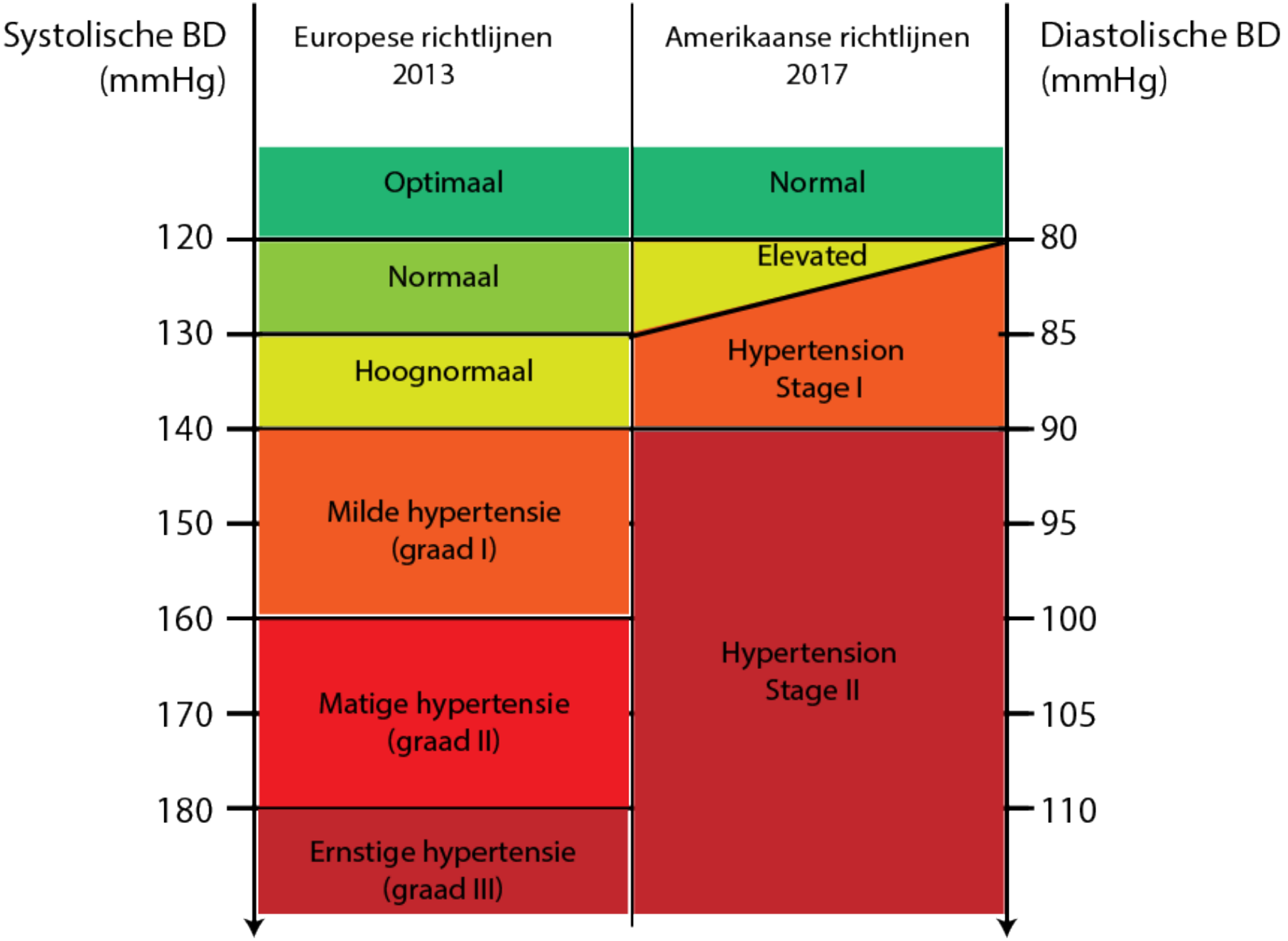
  -5 mm Hg = risicodaling van 34 %

- Preventie van AMI:

  -5 mm Hg = risicodaling van 21 %

  -20 mmhg = risicodaling van 50 %

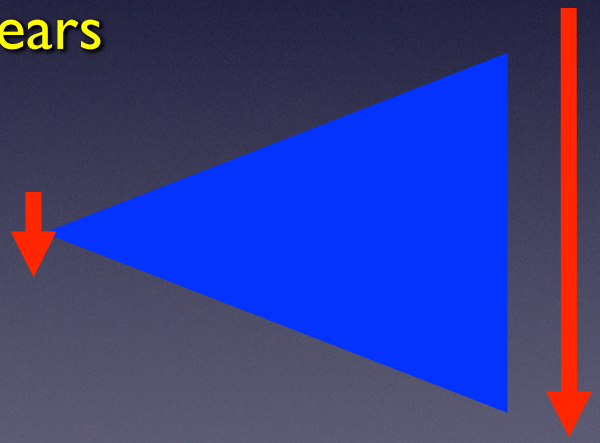
MacMahon et al. Lancet 1990 335, 765-774


Systolische BD (mmHg)
Europese richtlijnen 2013
Amerikaanse richtlijnen 2017
Diastolische BD (mmHg)
Optimaal
Normaal
Normaal
Hoognormaal
Elevated
Hypertension Stage I
Milde hypertensie (graad I)
Matige hypertensie (graad II)
Ernstige hypertensie (graad III)
Hypertension Stage II
120
130
140
150
160
170
180
80
85
90
95
100
105
110

		“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

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



2 mmHg decrease in mean SBP

7% reduction in risk of ischaemic heart disease mortality

10% reduction in risk of stroke mortality

Lewington et al. Lancet 2002;360:1903–13

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 ≥180 or DBP ≥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
	≥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 ≥4, or diabetes mellitus with organ damage	Very high risk	Very high risk	Very high risk	Very high risk

Strategie voor antihypertensieve behandeling

SBD 140-180 mmHg of DBD 90-110 mmHg bij verschillende metingen (graad 1 & 2 hypertensie)

Detectie van andere risicofactoren, DOB* en GA**

Veranderingen in levensstijl

Risicostratificatie

ZEER HOOG → medische behandeling

HOOG → medische behandeling

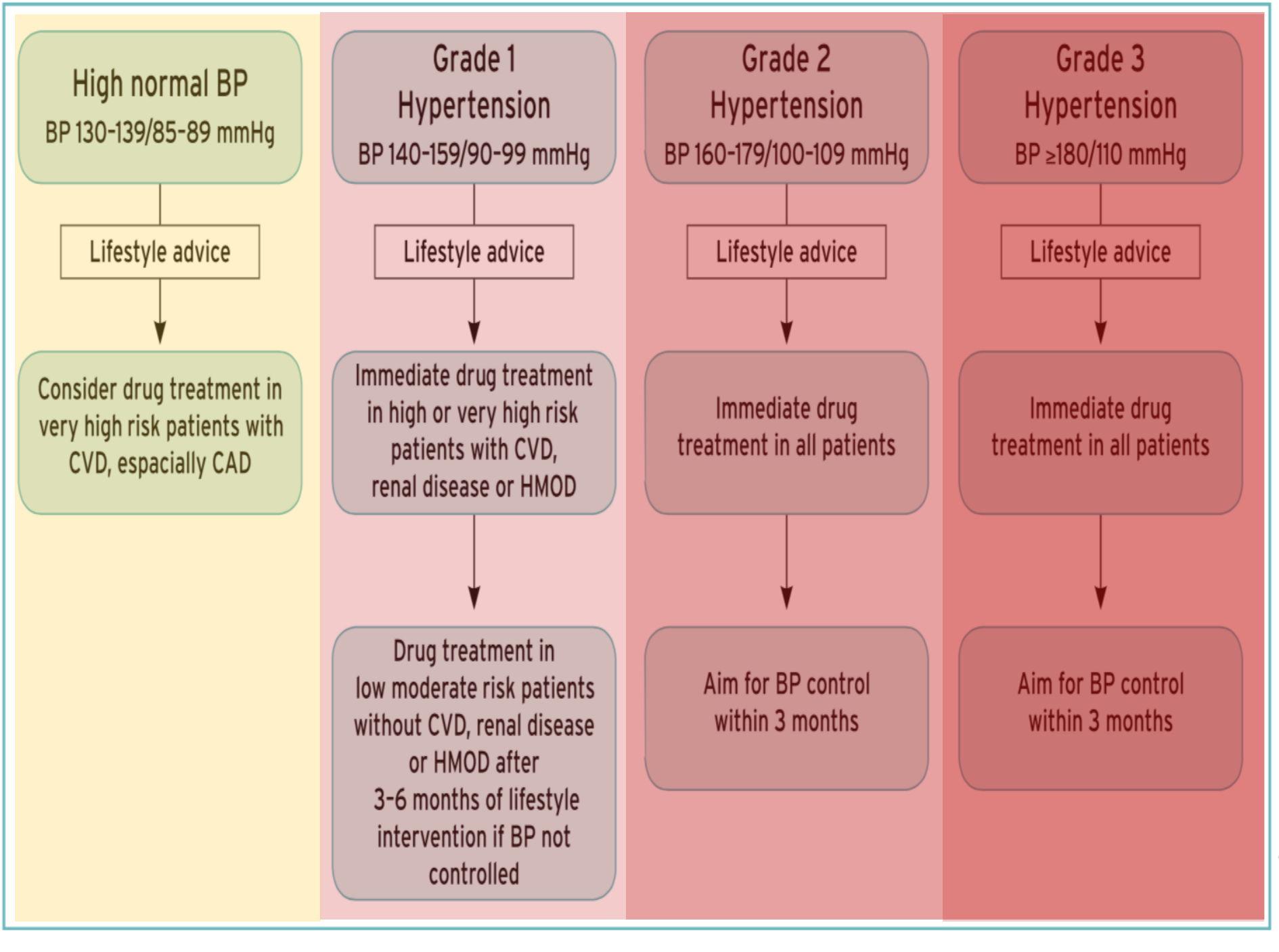
MATIG → monitoring BD en andere risicofactoren gedurende 3-6 maanden

- SBD > 140 of DBD > 90, → medische behandeling
- SBD < 140 of DBD < 90, → monitoring

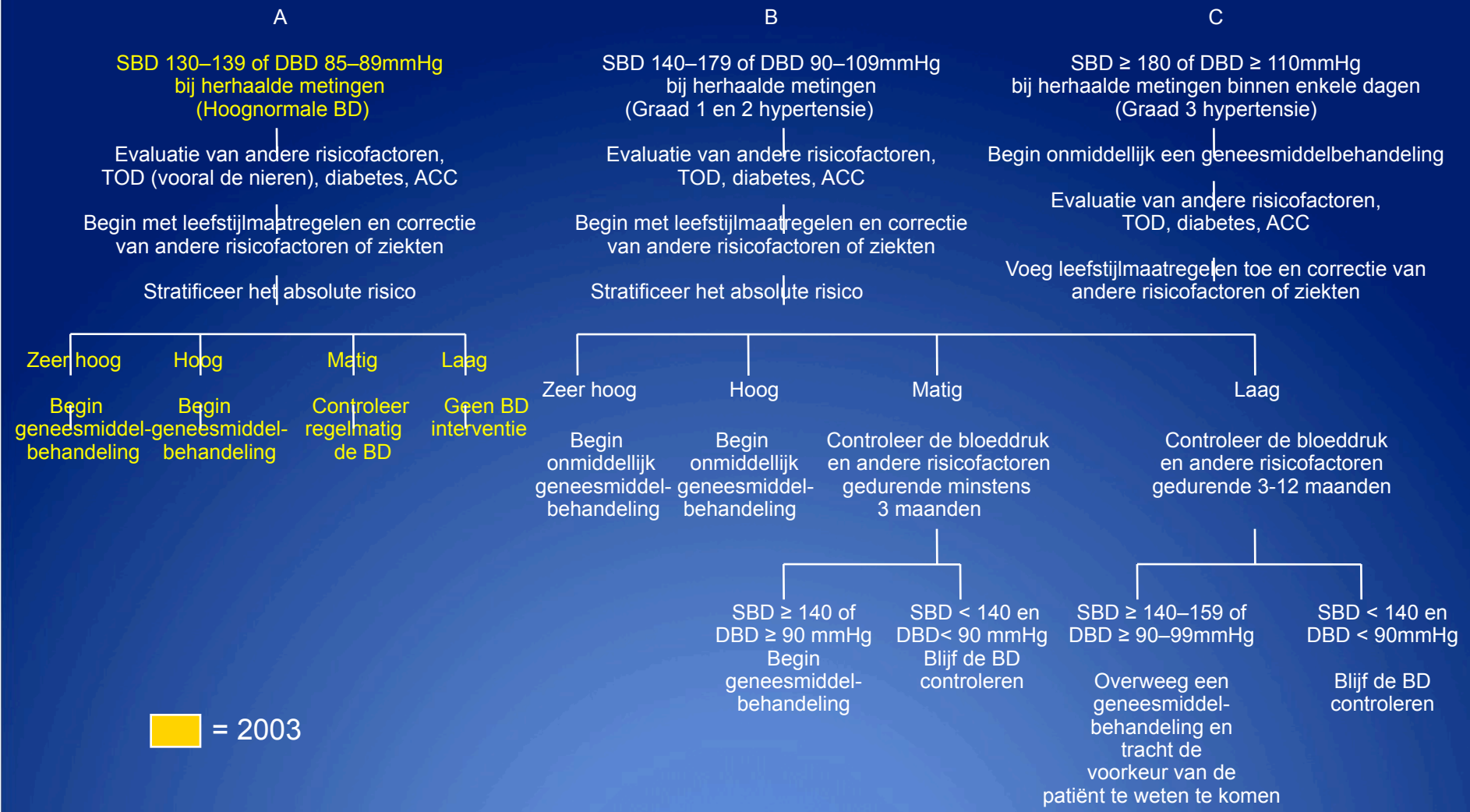
LAAG → monitoring BD en andere risicofactoren gedurende 6-12 maanden

- SBD >150 of DBD > 95, → medische behandeling
- SBD < 150 of DBD < 95, → monitoring

* DOB: doelwitorgaanbeschadiging
** GA: geassocieerde aandoeningen


High normal BP
BP 130-139/85-89 mmHg
Lifestyle advice
Consider drug treatment in very high risk patients with CVD, espacially CAD
Grade 1 Hypertension
BP 140-159/90-99 mmHg
Lifestyle advice
Immediate drug treatment in high or very high risk patients with CVD, renal disease or HMOD
Drug treatment in low moderate risk patients without CVD, renal disease or HMOD after 3-6 months of lifestyle intervention if BP not controlled
Grade 2 Hypertension
BP 160-179/100-109 mmHg
Lifestyle advice
Immediate drug treatment in all patients
Aim for BP control within 3 months
Grade 3 Hypertension
BP ≥180/110 mmHg
Lifestyle advice
Immediate drug treatment in all patients
Aim for BP control within 3 months
©ESC/ESH 2018

Instellen van een antihypertensieve behandeling



Streefwaarden bloeddruk

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

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)

2003 ESH/ESC Guidelines for the management of arterial hypertension. Journal of hypertension 2003; 21:1011-53.
2007 ESH/ESC Guidelines for the management of arterial hypertension. Eur Heart J 2007; 28:1462-1536

Ziekenhuis-, Thuis-, Ambulatoire (ABP) bloeddrukmeting : vergelijkende cijfers

	Limietwaarden voor hypertensie (mmHg)
Klinische bloeddruk	≥ 140 / 90*
Gemiddelde thuisbloeddruk	≥ 135 / 85**
Gemiddelde ABP overdag	≥ 135 / 85**
24-uurs gemiddelde ABP	≥ 130 / 80**

Chobanian V, et al. The JNC 7 Report. JAMA 2003; 289:2560-72.
2007 ESH/ESC Guidelines for the management of arterial hypertension. Eur Heart J 2007; 28:1462-1536

**: 130/80 in geval van diabetes / nierinsufficiëntie*
***: lager in geval van diabetes / nierinsufficiëntie*

Hoe meten ?

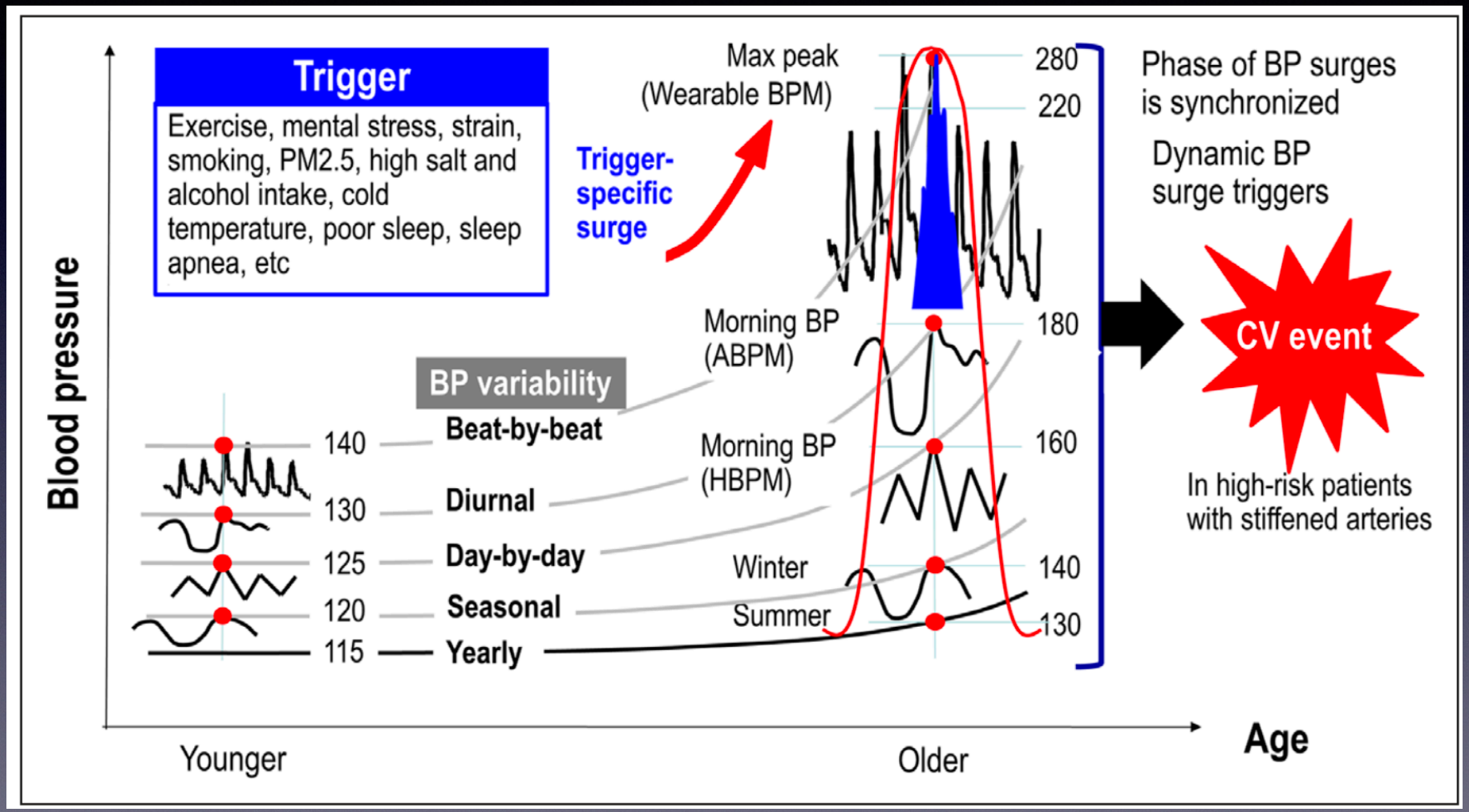
Spreekkamerbloeddruk (SKBD)

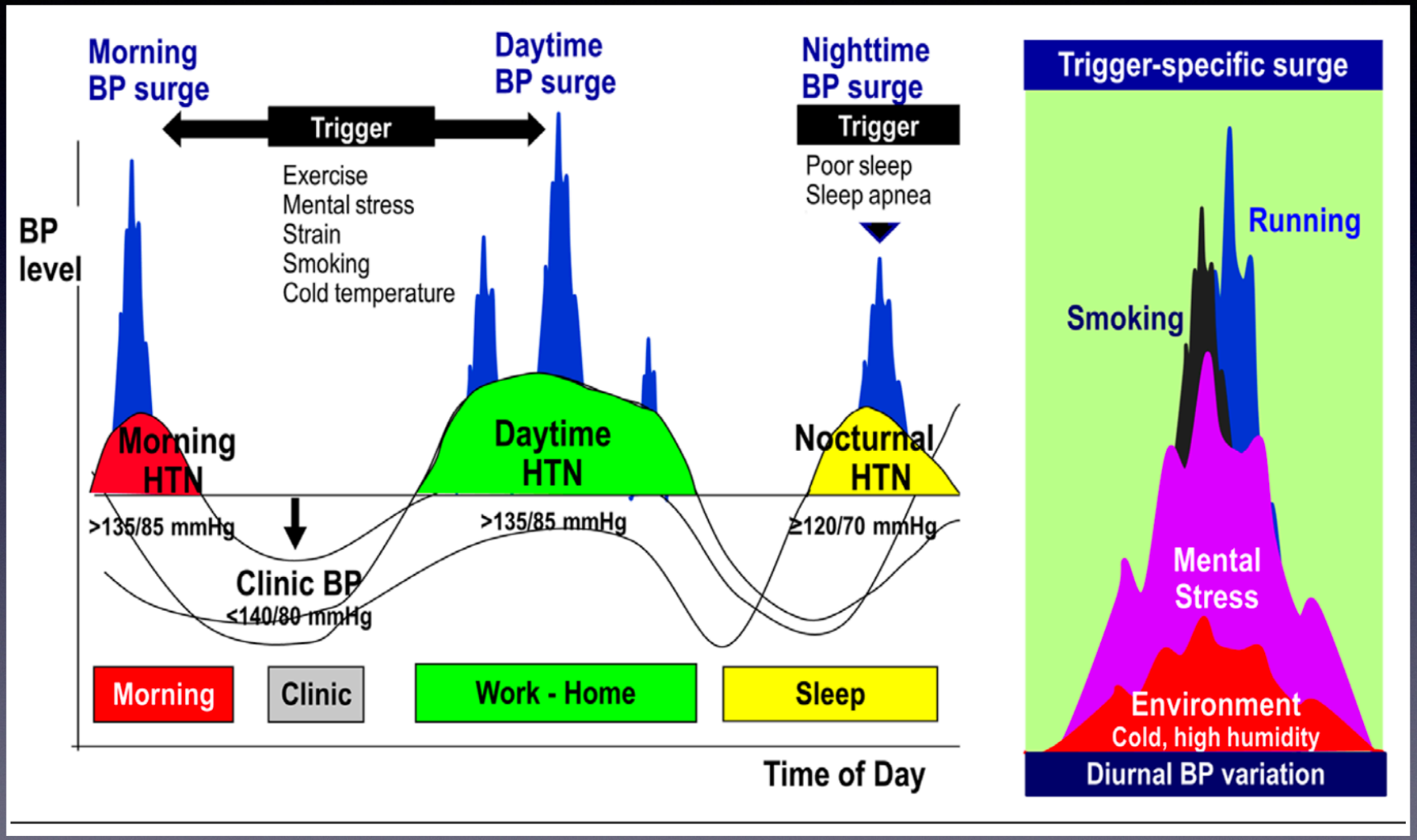
- SKBD-meting is de hoeksteenscreening voor hypertensie
- SKBD-meting heeft echter belangrijke beperkingen:
  - grote spontane variaties zowel overdag als tussen verschillende dagen, maanden en seizoenen.
  - onvoldoende reproduceerbaar
  - niet representatief voor de gemiddelde BD van de patiënt
  -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

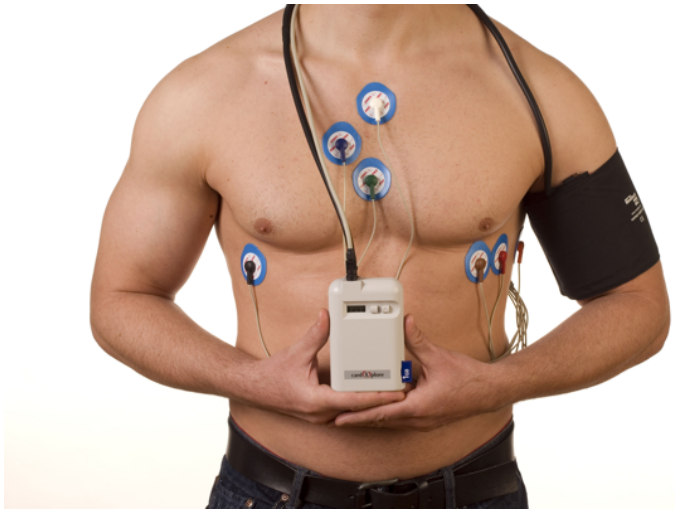
2007 ESH/ESC Guidelines for the management of arterial hypertension. Eur Heart J 2007; 28:1462-1536

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

Increases BP	Decreases BP	No effect on BP
Examinee	Examinee	Examinee
Soft Korotkoff sounds	Soft Korotkoff sounds	Menstrual phase
Pseudohypertension	Recent meal	Chronic caffeine ingestion
White-coat reaction	Missed auscultatory gap	Phenylephrine nasal spray
Paretic arm (due to stroke)	High stroke volume	Cuff self-inflation
Pain, anxiety	Habituation	Examinee and examiner
Acute smoking	Shock	Discordance in gender or race
Acute caffeine	Setting, equipment	Examination
Acute ethanol ingestion	Noisy environs	Thin shirtsleeve under cuff
Distended bladder	Faulty aneroid device	Bell vs. diaphragm
Talking, signing	Low mercury level	Cuff inflation per se
Setting, equipment	Leaky bulb	Hour of day (during work hours)
Environment noise	Examiner	Room temperature
Leaky bulb valve	Reading to next lowest 5 or 10 mm Hg, or expectation bias	
Blocked manometer vents	Impaired hearing	
Cold hands or stethoscope	Examination	
Examiner	Left vs. right arm	
Expectation bias	Resting for too long (25 min)	
Impaired hearing	Elbow too high	
Examination	Too rapid deflation	
Cuff too narrow	Excess bell pressure	
Cuff not centered	Parallax error (aneroid)	
Elbow too low		
Cuff too low		
Too-short rest period		
Arm, back unsupported		
Deflation too fast or slow		


Trigger
Exercise, mental stress, strain, smoking, PM2.5, high salt and alcohol intake, cold temperature, poor sleep, sleep apnea, etc
Trigger-specific surge
Max peak (Wearable BPM)
280
220
Phase of BP surges is synchronized
Dynamic BP surge triggers
Morning BP (ABPM)
180
CV event
BP variability
Beat-by-beat
Morning BP (HBPM)
160
Diurnal
Day-by-day
Winter
140
Seasonal
Summer
130
Yearly
In high-risk patients with stiffened arteries
140
130
125
120
115
Blood pressure
Younger
Older
Age


Morning
BP surge
Daytime
BP surge
Nighttime
BP surge
Trigger
Exercise
Mental stress
Strain
Smoking
Cold temperature
Trigger
Poor sleep
Sleep apnea
BP
level
Morning
HTN
>135/85 mmHg
Clinic BP
<140/80 mmHg
Daytime
HTN
>135/85 mmHg
Nocturnal
HTN
≥120/70 mmHg
Morning
Clinic
Work - Home
Sleep
Time of Day
Trigger-specific surge
Running
Smoking
Mental
Stress
Environment
Cold, high humidity
Diurnal BP variation



Conventioneel	Geautomatiseerd op consultatie	Ambulante bloeddrukmeting			Zelf-meting
		24u	dag	nacht	
≥ 140 of ≥ 90	≥ 135 of ≥ 85	≥ 130 of ≥ 80	≥ 135 of ≥ 85	≥ 120 of ≥ 70	≥ 135 of ≥ 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

Verbeck et a. JACC Vol. 46, No 5, 2005
G. Stergiou J Hypertens 18:1745-1751

Patiënteneducatie is belangrijk

- 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

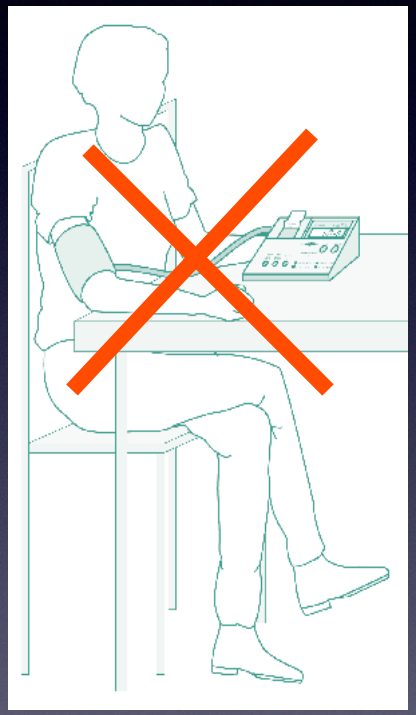
Asmar R and Zanchetti A. J hypertens 2000 ; 18(5):493-508.
Postel-Vinay N et al. La Revue du Praticien 2003; 632:1531-34.
O'Brien E et al; Journal of Hypertension 2005; 23:697-701.

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 tè 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

Postel-Vinay N et al; La Revue du Praticien 2003; 632:1531-34.

Patiënteneducatie is belangrijk : contraindicaties



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

Postel-Vinay N, et al. La Revue du Praticien 2003; 632:1531-34.
O'Brien E et al. Journal of Hypertension 2005; 23:697-701.

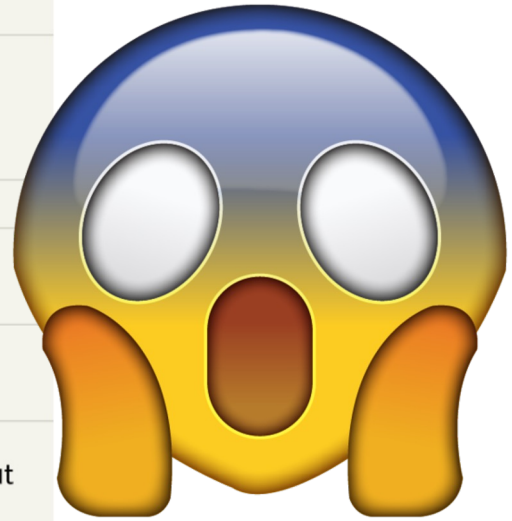
Thuisbloeddrukmeting

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

Problemen:50 % stopt medicatie

Table 6. Guideline Comparisons of Goal BP and Initial Drug Therapy for Adults With Hypertension

Guideline	Population	Goal BP, mm Hg	Initial Drug Treatment Options
2014 Hypertension guideline	General ≥60 y	<150/90	Nonblack: thiazide-type diuretic, ACEI, ARB, or CCB; black: thiazide-type diuretic or CCB
	General <60 y	<140/90	
	Diabetes	<140/90	
	CKD	<140/90	ACEI or ARB
ESH/ESC 2013[37]	General nonelderly	<140/90	Diuretic, β-blocker, CCB, ACEI, or ARB
	General elderly <80 y	<150/90	
	General ≥80 y	<150/90	
	Diabetes	<140/85	ACEI or ARB
	CKD no proteinuria	<140/90	ACEI or ARB
	CKD + proteinuria	<130/90	
CHEP 2013[38]	General <80 y	<140/90	Thiazide, β-blocker (age <60y), ACEI (nonblack), or ARB
	General ≥80 y	<150/90	
	Diabetes	<130/80	ACEI or ARB with additional CVD risk ACEI, ARB, thiazide, or DHPCCB without additional CVD risk
	CKD	<140/90	ACEI or ARB
ADA 2013[39]	Diabetes	<140/80	ACEI or ARB
KDIGO 2012[40]	CKD no proteinuria	≤140/90	ACEI or ARB
	CKD + proteinuria	≤130/80	
NICE 2011[41]	General <80 y	<140/90	<55 y: ACEI or ARB
	General ≥80 y	<150/90	≥55 y or black: CCB
ISHIB 2010[42]	Black, lower risk	<135/85	Diuretic or CCB
	Target organ damage or CVD risk	<130/80	

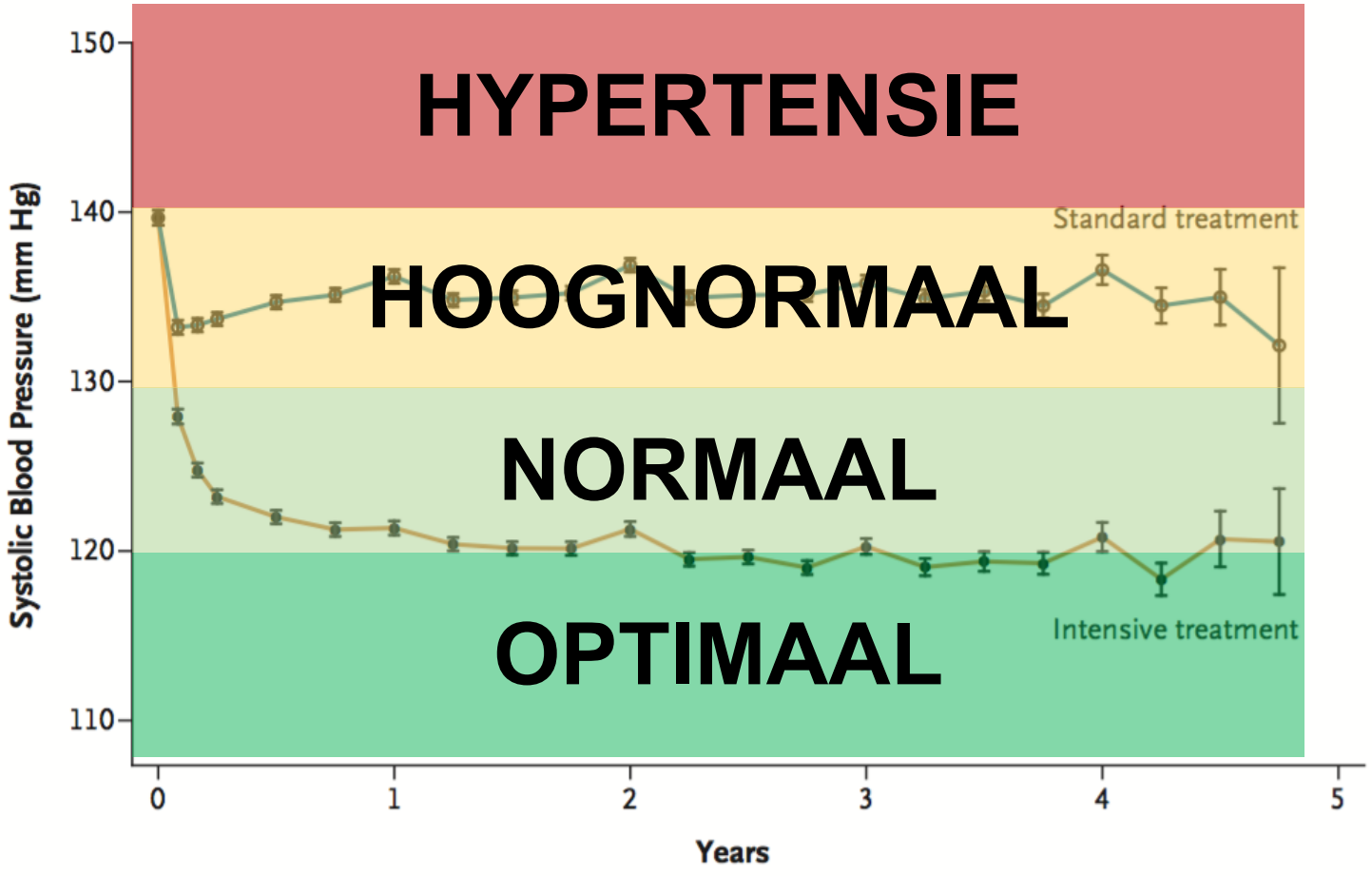


The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

A Randomized Trial of Intensive versus Standard Blood-Pressure Control

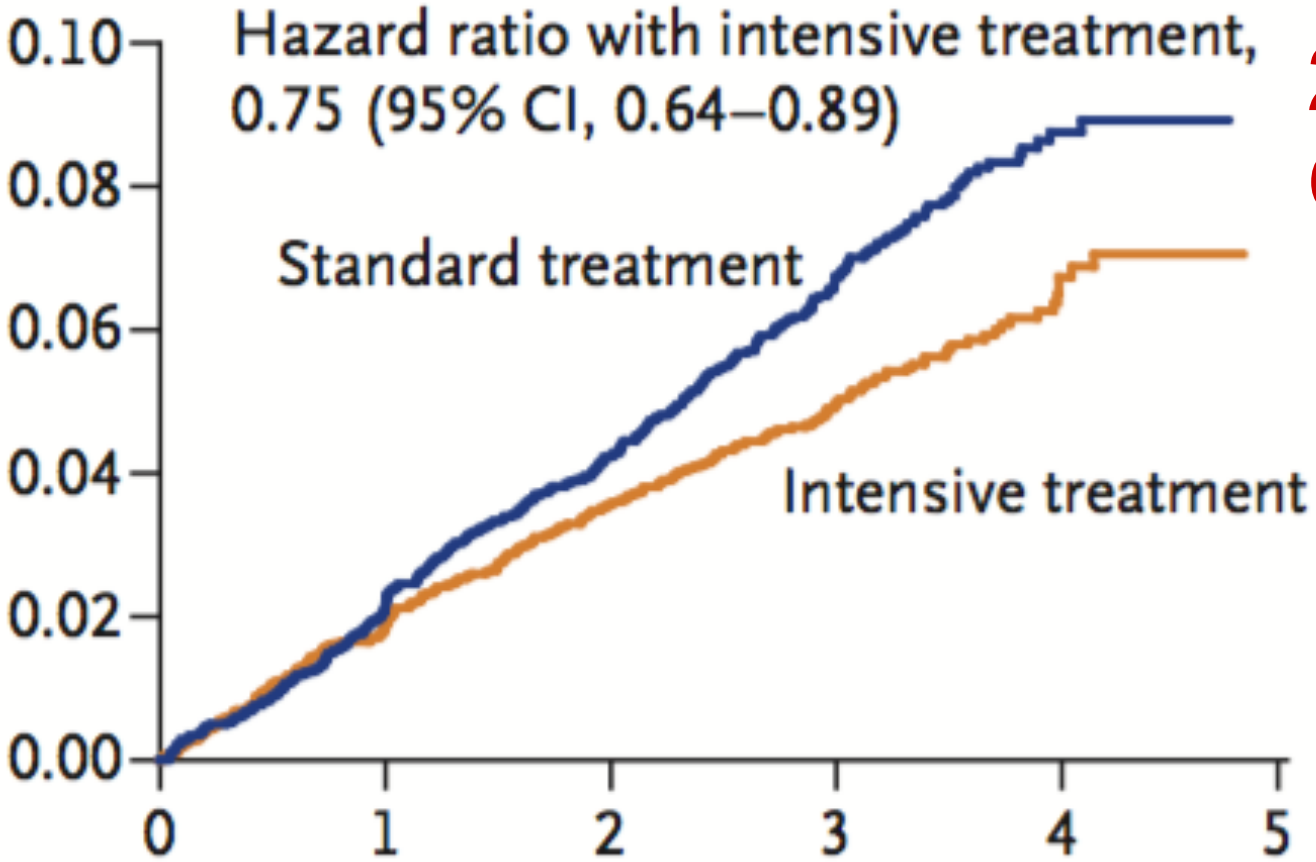
The SPRINT Research Group*



No. with Data										
Standard treatment	4683	4345	4222	4092	3997	3904	3115	1974	1000	274
Intensive treatment	4678	4375	4231	4091	4029	3920	3204	2035	1048	286
Mean No. of Medications										
Standard treatment	1.9	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.9
Intensive treatment	2.3	2.7	2.8	2.8	2.8	2.8	2.8	2.8	2.8	3.0

INTENSIEVE BEHANDELINGSGROEP

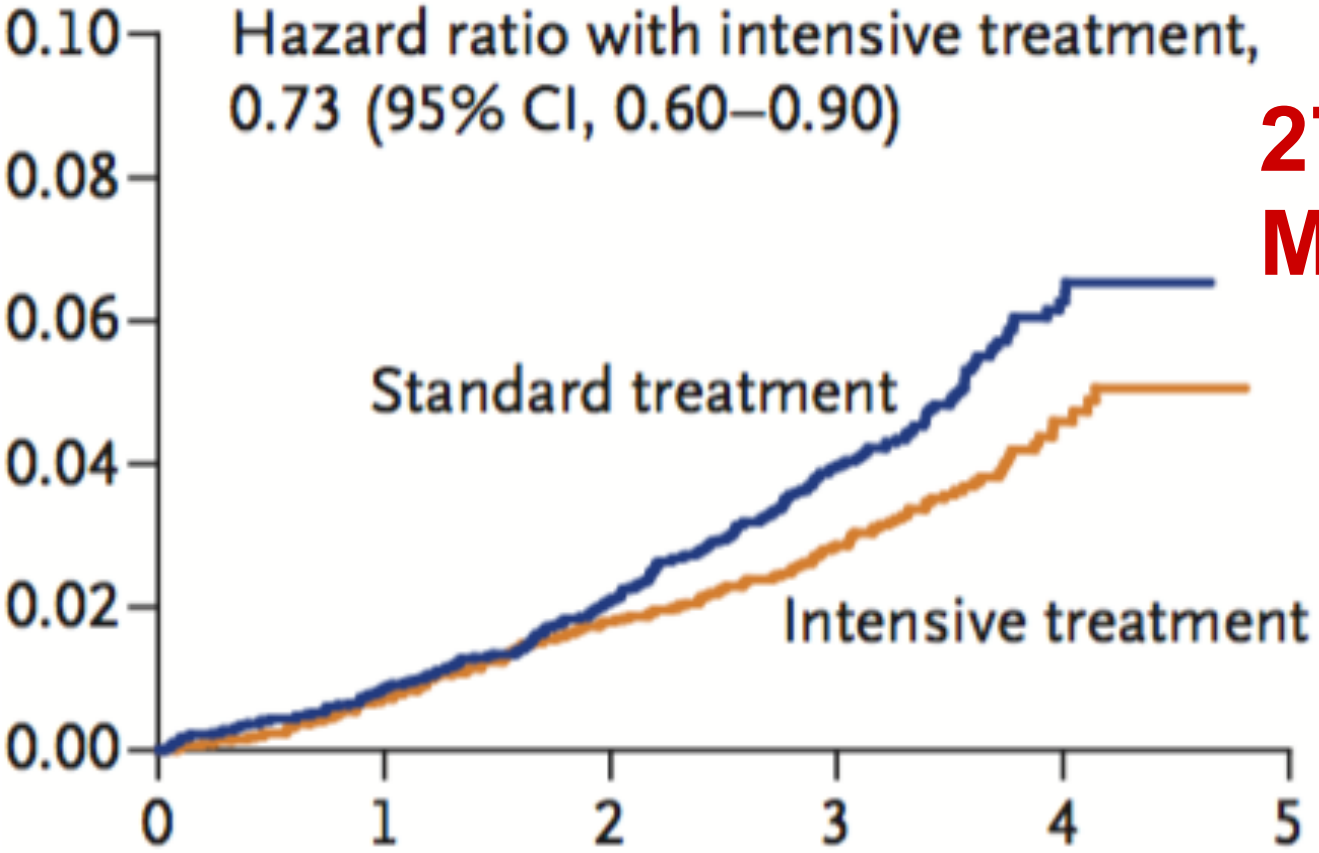
GEMIDDELD 1 ANTIHYPERTENSIVUM EXTRA



25% minder CV EVENTS

INTENSIEVE BEHANDELINGSGROEP

GEMIDDELD 1 ANTIHYPERTENSIVUM EXTRA



27% minder MORTALITEIT

BIJ PATIËNTEN MET **HOOG CV RISICO**

INCLUSIEF OUDEREN EN PATIËNTEN MET VERMINDERDE NIERFUNCTIE

INTENSIEVE BLOEDDRUKCONTROLE

120/80MMHG IPV 130/90MMHG;

OF GEMIDDELD 1 EXTRA MEDICAMENT

25% MINDER CV EVENTS (NNT 61 / 3J)

OOK (VOORAL) BIJ OUDEREN

27% LAGERE MORTALITEIT (NNT 83 / 3J)

43% LAGERE CV MORTALITEIT (NNT 167 / 3J)

GEEN PATIËNTEN MET VG VAN BEROERTE, GEEN DIABETICI, GEEN PATIËNTEN MET MATIG OF LAAG CV RISICO

GEBRUIK VAN AUTOMASTICHE OFFICE BD-METING; WAARDEN GEM. 5-10MMHG LAGER DAN CONVENTIONELE BD-METING

MEER NEVENEFFECTEN: ACHTERUITGANG NIERFUNCTIE, ORTHOSTATISME,...

IS INTENSIEVE BEHANDELING BETER?

WAARSCHIJNLIJK WEL

MAAR TE KADEREN IN:

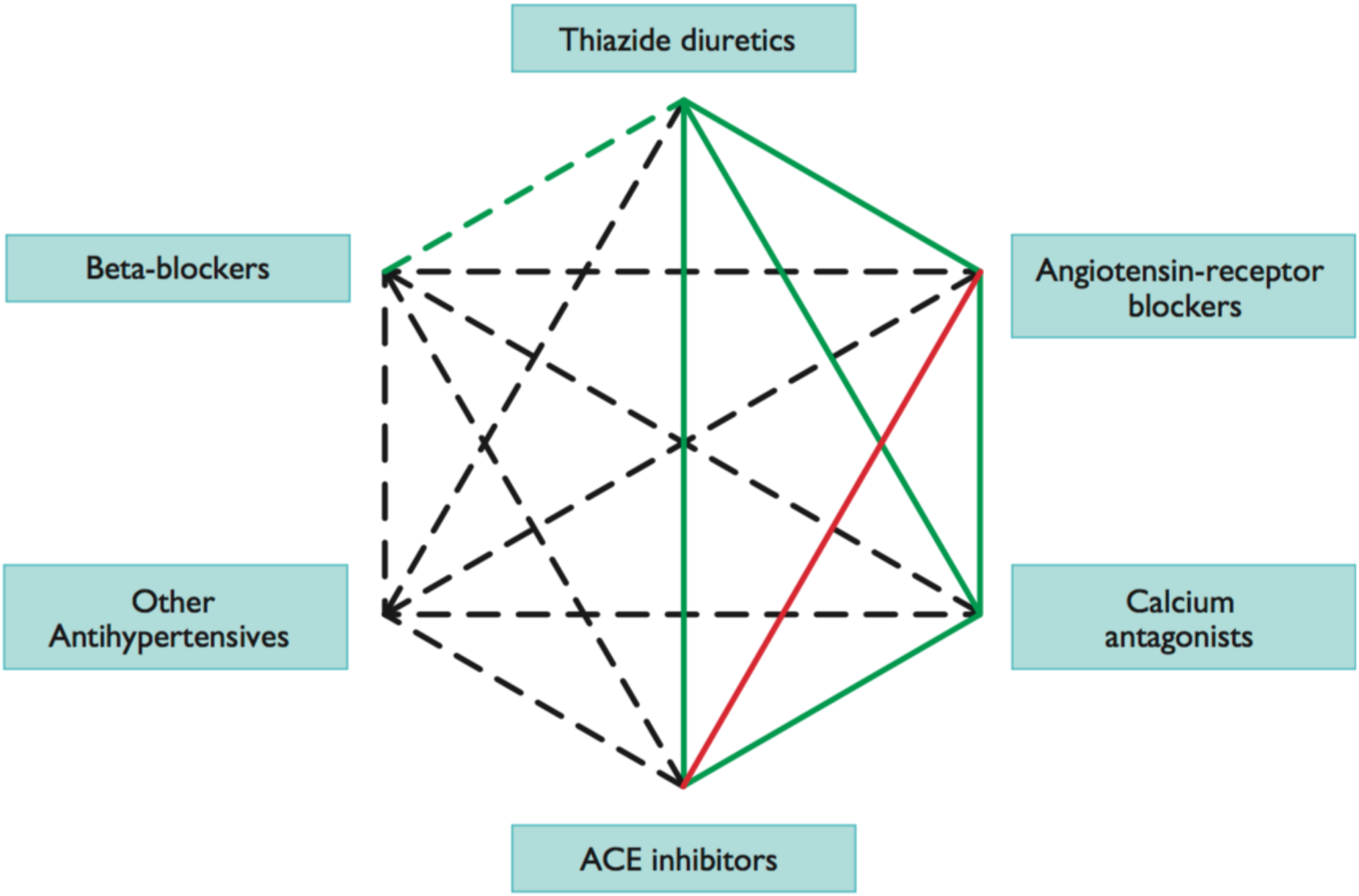
- GLOBALE CV RISICO
- NEVENEFFECTEN EN FRAGILITEIT PATIËNT

ESC
European Society of Cardiology
European Heart Journal (2018) **39**, 3021–3104
doi:10.1093/eurheartj/ehy339

ESC/ESH GUIDELINES

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)

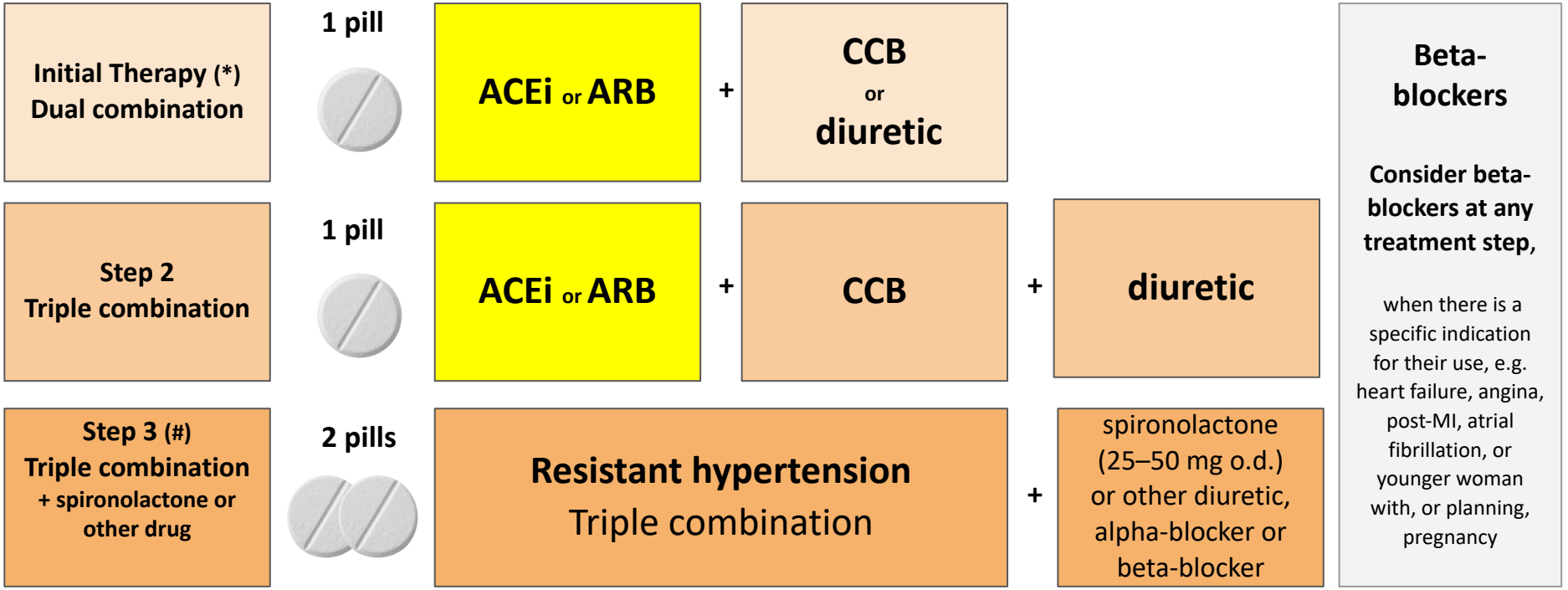


ACE = angiotensin-converting enzyme.

ACEi of Sartaan: ESC/ESH Guidelines 2018

2018 ESC/ESH Guidelines for the management of arterial hypertension: core drug treatment strategy for uncomplicated hypertension [1]

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



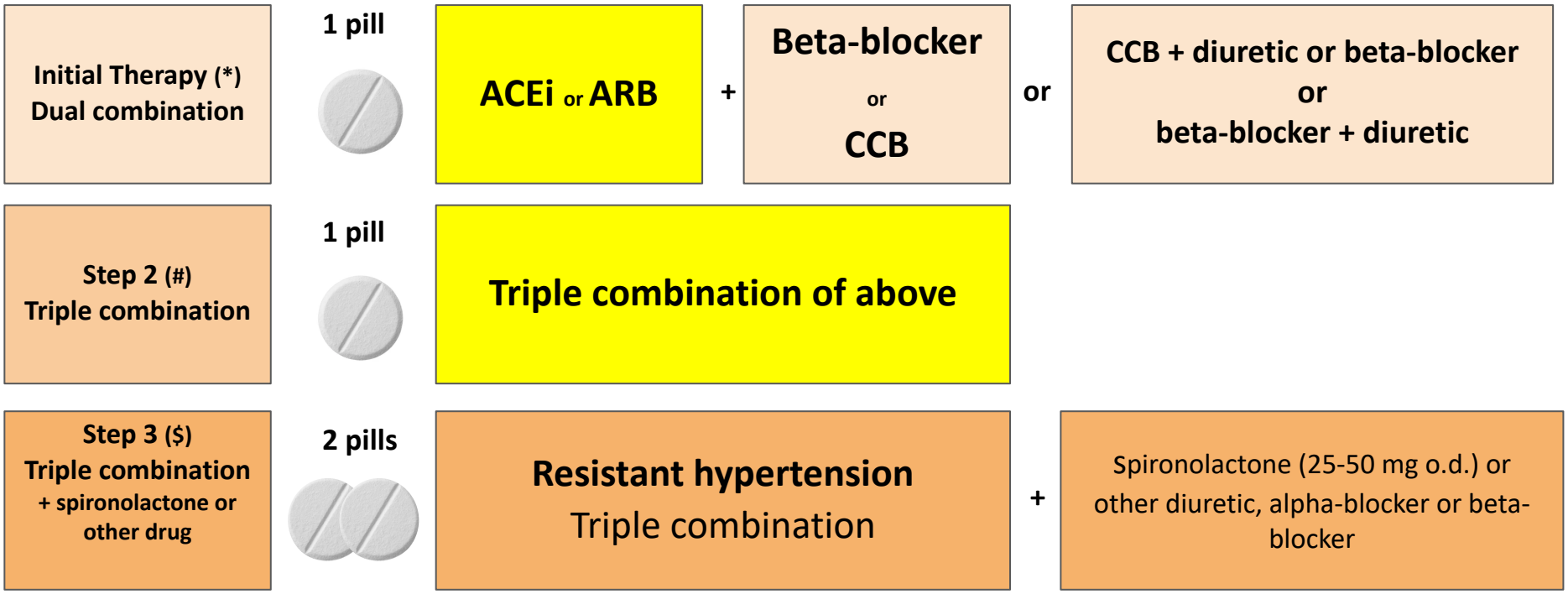
Adapted from Figure 4 (Core drug treatment strategy for uncomplicated hypertension) ref. 1 Williams B. et al., ESC Scientific Document Group, 2018 ESC/ESH Guidelines for the management of arterial hypertension: The Task Force for the management of arterial hypertension of the European Society of Cardiology (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.

Eur Heart J. 2018, 39: 3021-3104

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[1]



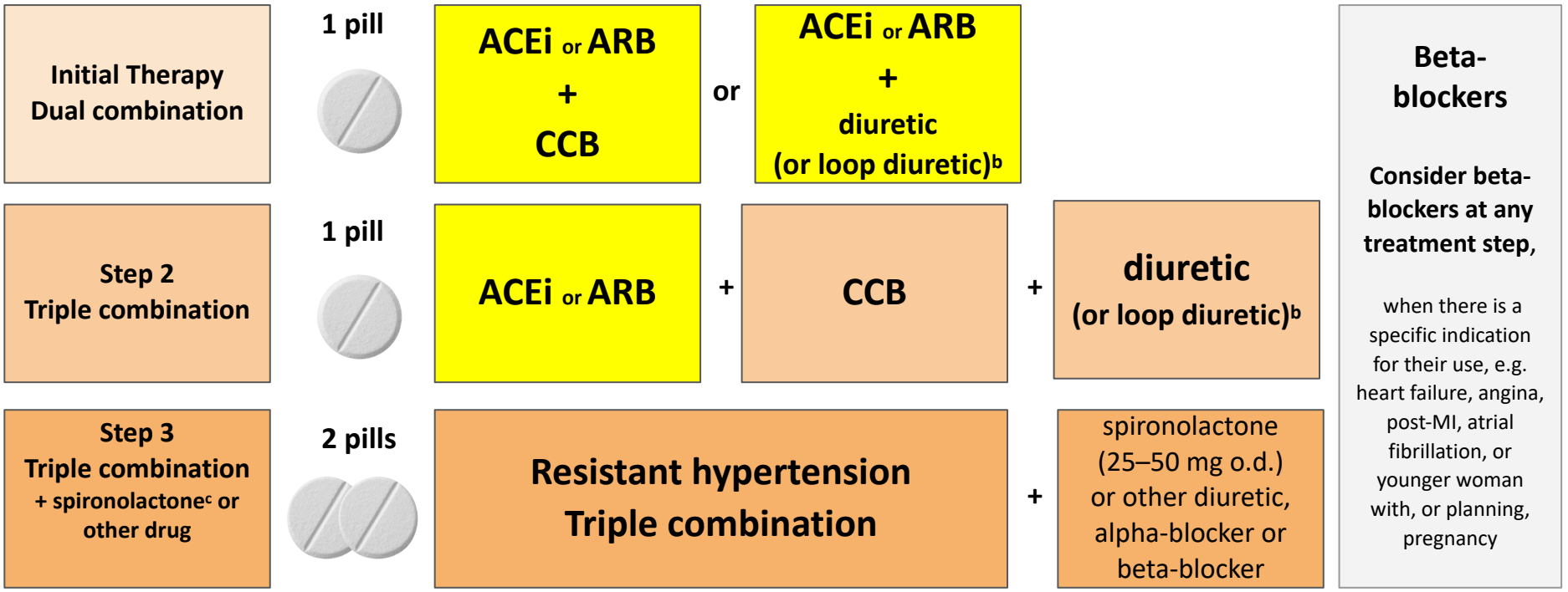
Adapted from Figure 5 (Drug treatment strategy for hypertension and coronary artery disease) ref. 1 Williams B. et al., ESC Scientific Document Group, 2018 ESC/ESH Guidelines for the management of arterial hypertension: The Task Force for the management of arterial hypertension of the European Society 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)

Eur Heart J. 2018, 39: 3021-3104

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 (1)



A reduction in eGFR and rise in serum creatinine is expected in patients with CKD[a] 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). [a]CKD is defined as an eGFR <60 mL/min/1.72 m^2 with or without proteinuria. [b]Use loop diuretics when eGFR is <30 mL/min/1.72 m^2, because thiazide/thiazide-like diuretics are much less effective/ineffective when eGFR is reduced to this level. [c]Caution: risk of hyperkalaemia with spironolactone, especially when eGFR is <45 mL/min/1.72 m^2 or baseline $K^+ \geq 4.5$ mmol/L.

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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 (1)

Initial Therapy Dual combination	**ACEi or ARB[a]**	+	**diuretic[b] (or loop diuretic)**	+	**beta-blocker**	
Step 2	**ACEi or ARB[a]**	+	**diuretic[b] (or loop diuretic)**	+	**beta-blocker**	+ **MRA[c]**

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. [a]Consider an angiotensin receptor/neprilysin inhibitor instead of ACEi or ARB per ESC Heart Failure Guidelines.[b]Diuretic refers to thiazide/thiazide-like diuretic. Consider a loop diuretic as an alternative in patients with oedema. [c]MRA (spironolactone or eplerenone).

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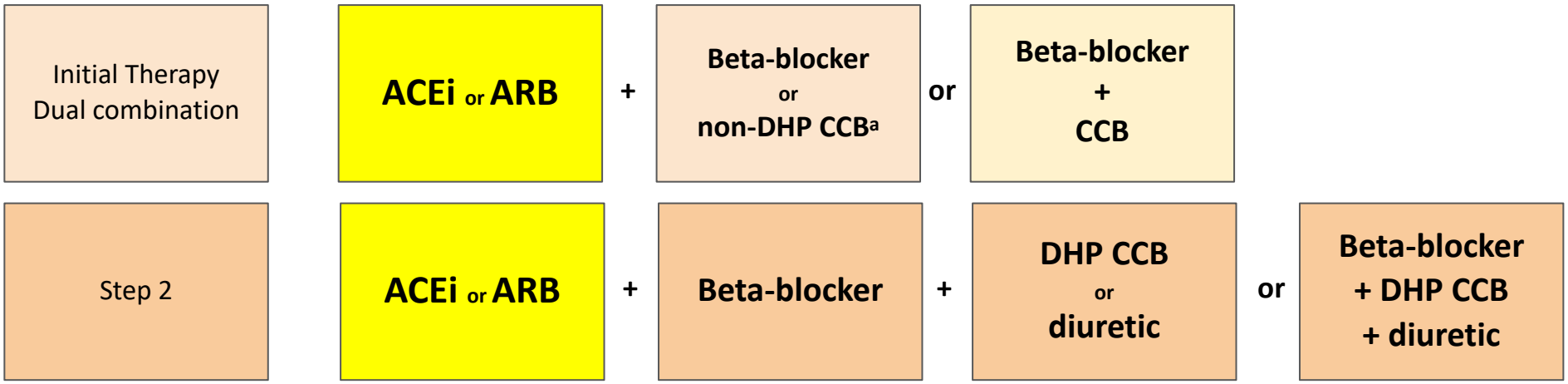
ACEi of Sartaan: ESC/ESH Guidelines 2018

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



Add oral anticoagulation when indicated according to the CHA_2DS_2-VASc score, unless contraindicated.

[a]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_2DS_2-VASc = CHA_2DS_2-VASc = Cardiac failure, Hypertension, Age >_75 (Doubled), Diabetes, Stroke (Doubled) – Vascular disease, Age 65–74 and Sex category (Female); DHP = dihydropyridine.

[a]Non-DHP CCB (non-DHP CCB, e.g. verapamil or diltiazem).

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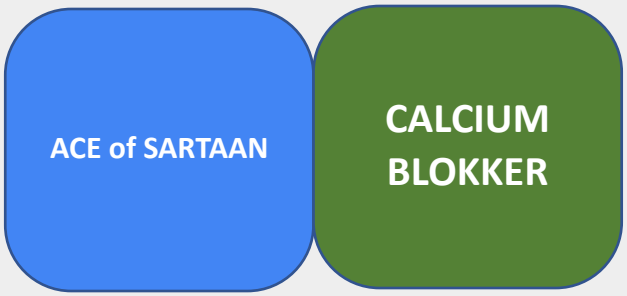

OF

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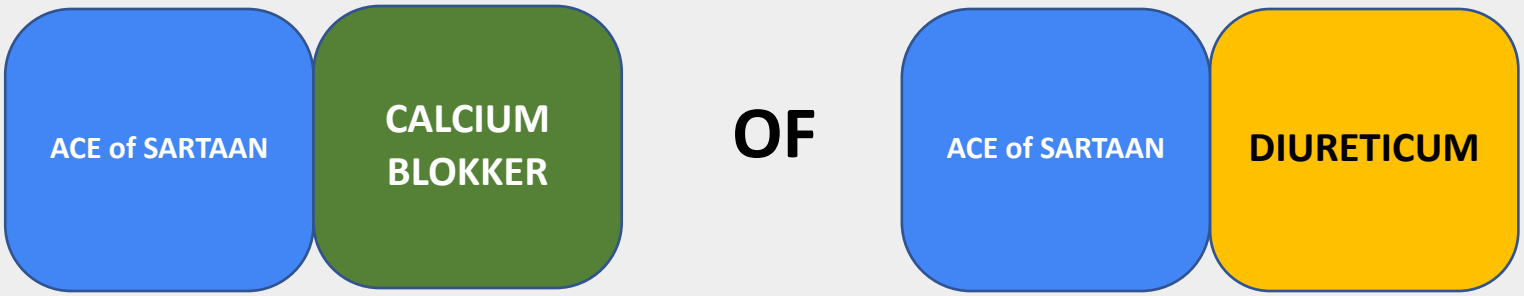

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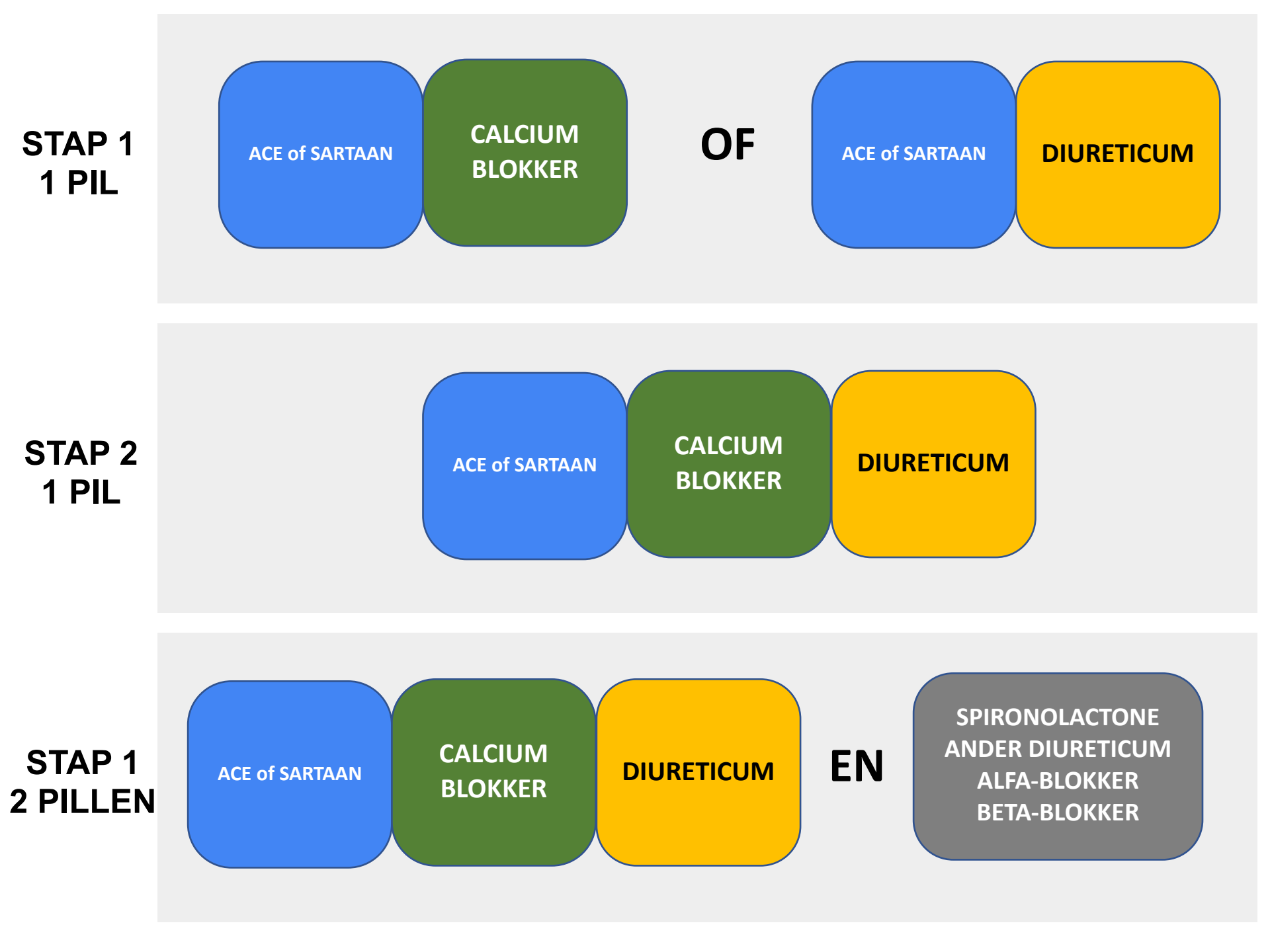
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ANDER DIURETICUM
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BETA-BLOKKER

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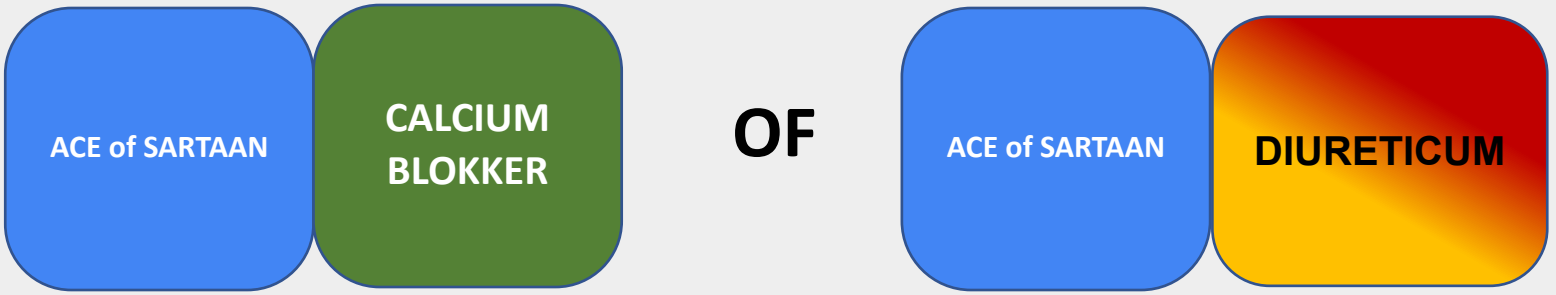

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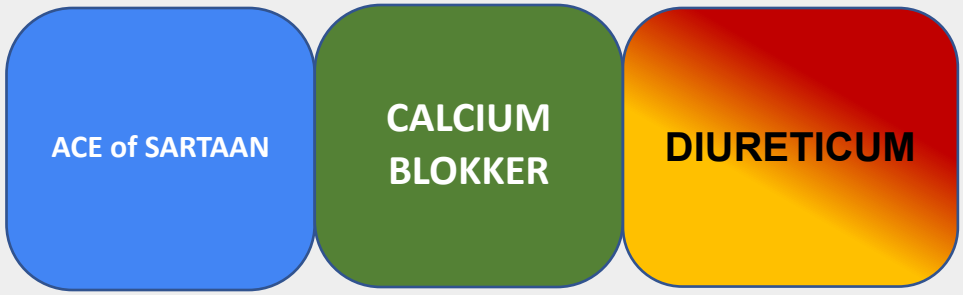

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STAP 1
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STAP 2
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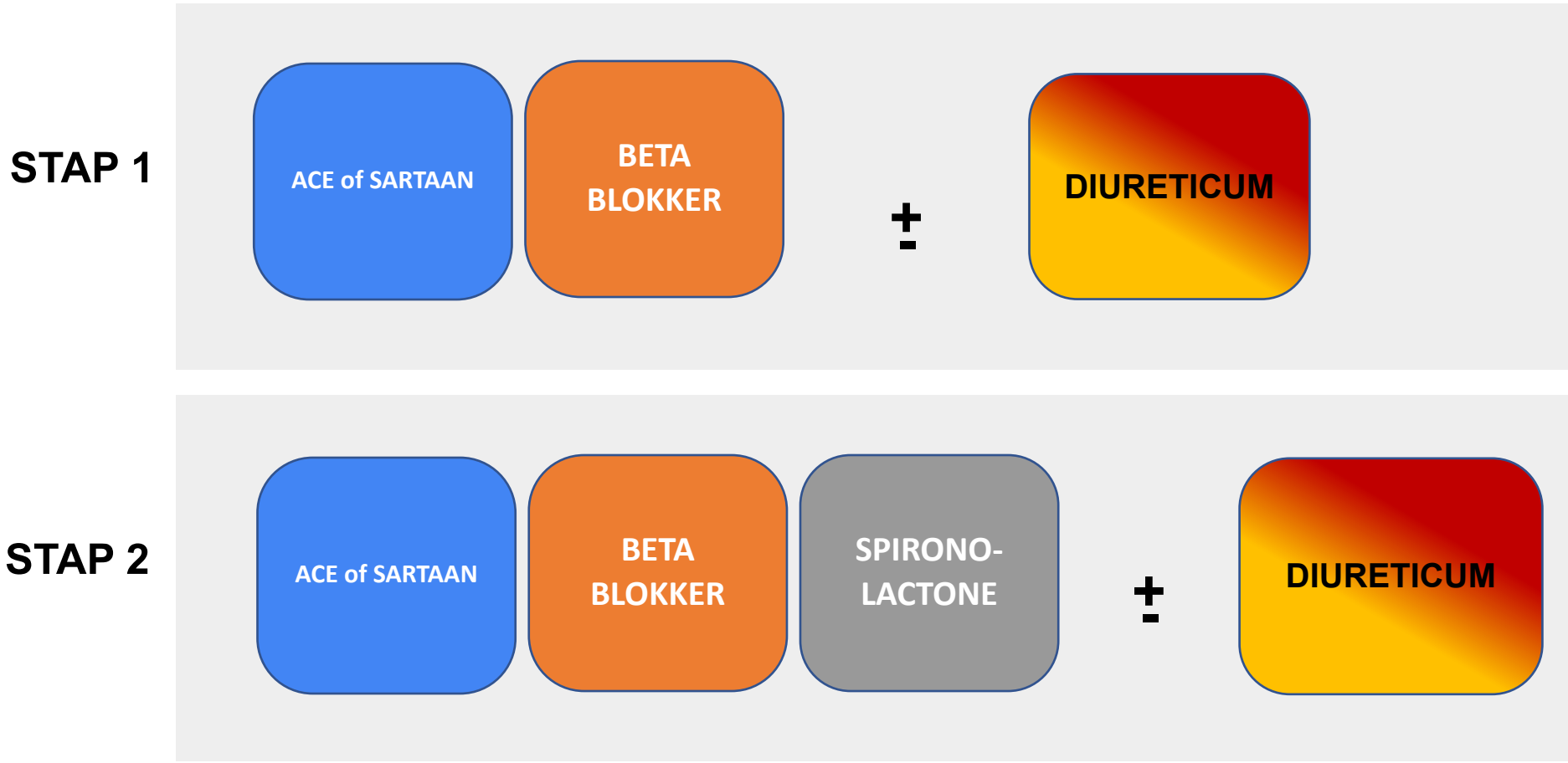
ZELFDE COMBINATIES, MAAR LISDIURETICUM IPV THIAZIDE BIJ RESISTENTE OVERVULLING

(SYSTOLISCH) HARTFALEN



(SYSTOLISCH) HARTFALEN

HARTFALENTHERAPIE = BETABLOKKER + ACE/ARB + SPIRONOLACTONE;

DIURETICUM BIJ CONGESTIE

STAP 1

STAP 2

Cause	Prevalence in hypertensive patients	Suggestive symptoms and signs	Screening Investigations
uctive sleep apnoea	5–10%	Snoring; obesity (can be present in non-obese); morning headache; daytime somnolence	Epworth score and ambulatory polygraphy
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
vascular disease			
osclerotic 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
muscular dysplasia		Younger; more common in women; abdominal bruit	
crine causes			
ry 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
ochromocytoma	<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
ng's syndrome	<1%	Moon face, central obesity, skin atrophy, striae and bruising; diabetes; chronic steroid use	24 h urinary-free cortisol
id disease (hyper- or hyroidism)	1 - 2%	Signs and symptom of hyper- or hypothyroidism	Thyroid function tests
rparathyroidism	<1%	Hypercalcaemia, hypophosphataemia	Parathyroid hormone, Ca^{2+}
r causes			
ctation of the aorta	<1%	Usually detected in children or adolescence; different BP (≥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

Sec hypertensie

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

Age group	Per cent with underlying cause	Typical caus
Young children (<12 years)	70 - 85	• Renal parenchymal disease • Coarctation of the aorta • Monogenic disorders
Adolescents (12–18 years)	10–15	• Renal parenchymal disease • Coarctation of the aorta • Monogenic disorders
Young adults (19–40 years)	5–10	• Renal parenchymal disease • Fibromuscular dysplasia (espe • Undiagnosed monogenic disc
Middle-aged adults (41–65 years)	5–15	• Primary aldosteronism • Obstructive sleep apnoea

Leeftijd en secundaire hypertensie

Table 28 Medications and other substances that may increase blood presssure

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

Geval 1

- 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)

Klinisch geval 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 (≤140/90)

Thuis-BD

Gemiddelde TBD: 139/86 mmHg → Boven normaal (≤135/85)

Gemiddelde 's ochtends: 144/90 mmHg
Gemiddelde 's avonds: 133/.83 mmHg

Ongecontroleerde patiënt

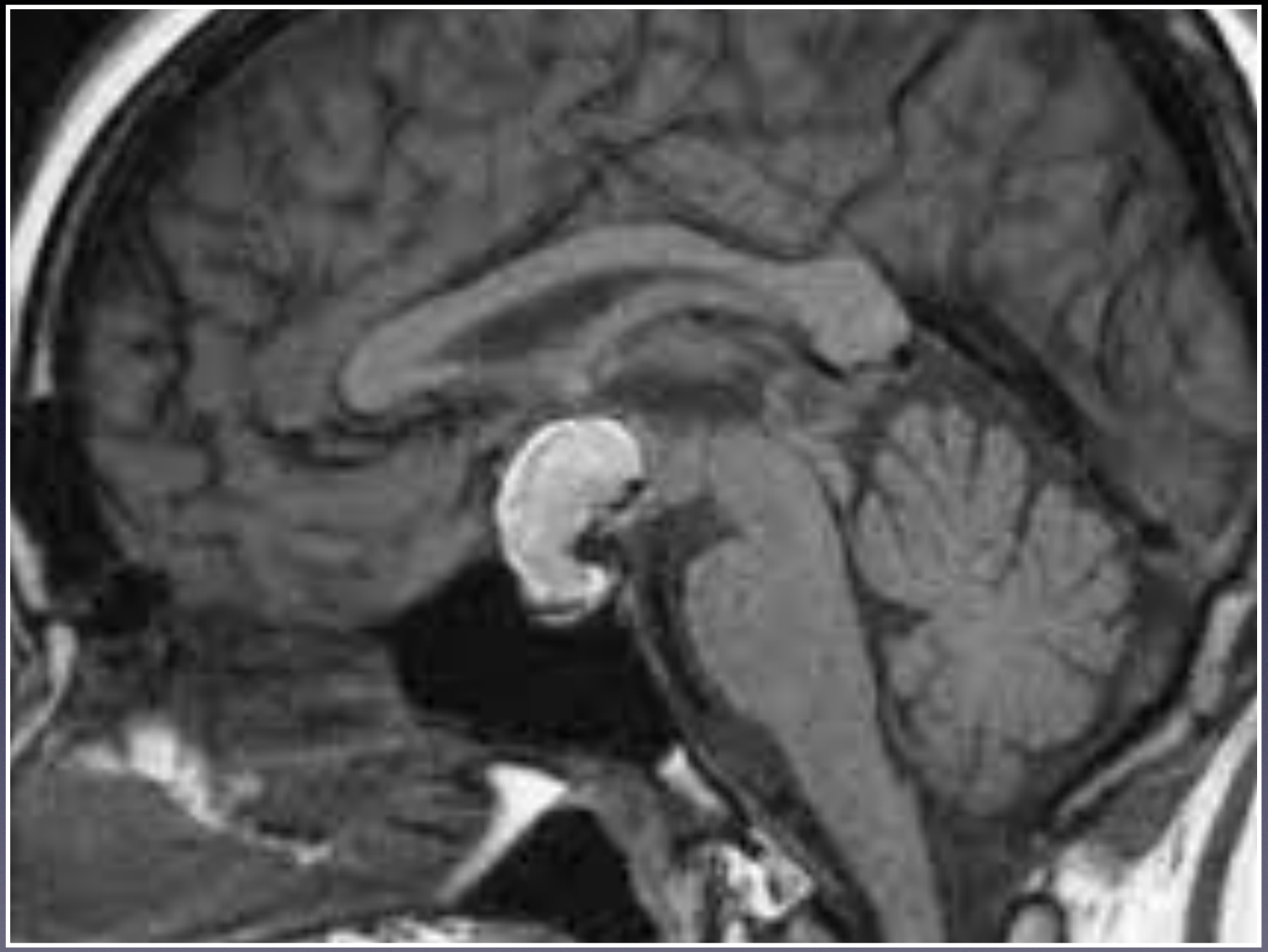
BD niet gecontroleerd in de spreekkamer en thuis
Belangrijk verschil tussen ochtend en avond

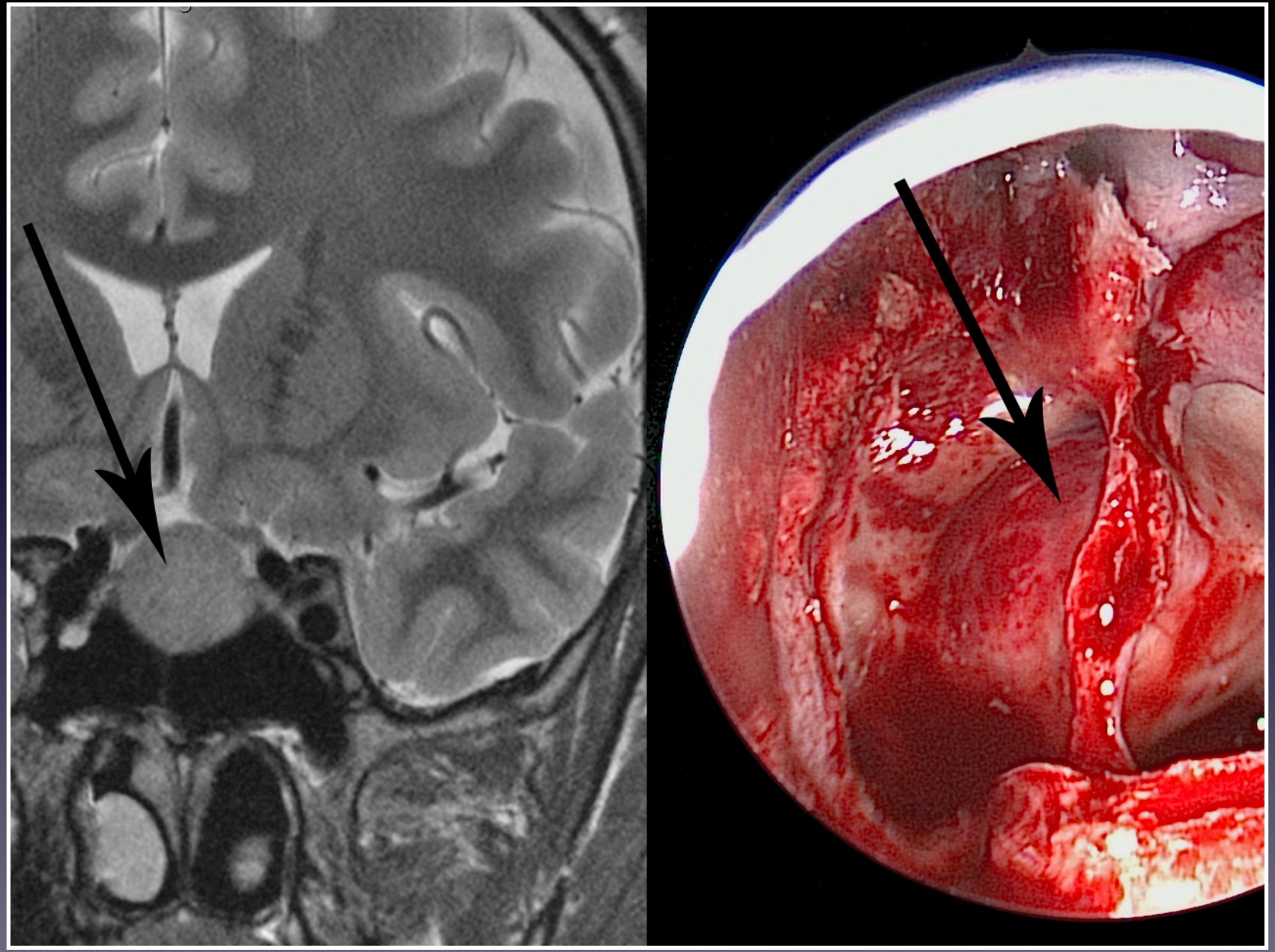
Therapeutische beslissing

Wijziging behandeling (posologie / medicament)
Wijziging levensstijl

Klinisch geval 1

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





Klinisch geval 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

Klinisch geval 2

Spreekkamer-BD met behandeling: 140/85 mmHg

		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 (≤140/90)**

Thuis-BD

Gemiddelde TBD: 126/80 mmHg → **Normaal (≤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

Klinisch geval 3

- Jonge man 17 j : verwijzing wegens BD 180/90 mmg apparaat moeder
- Systolische souffle , 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 (≤140/90)

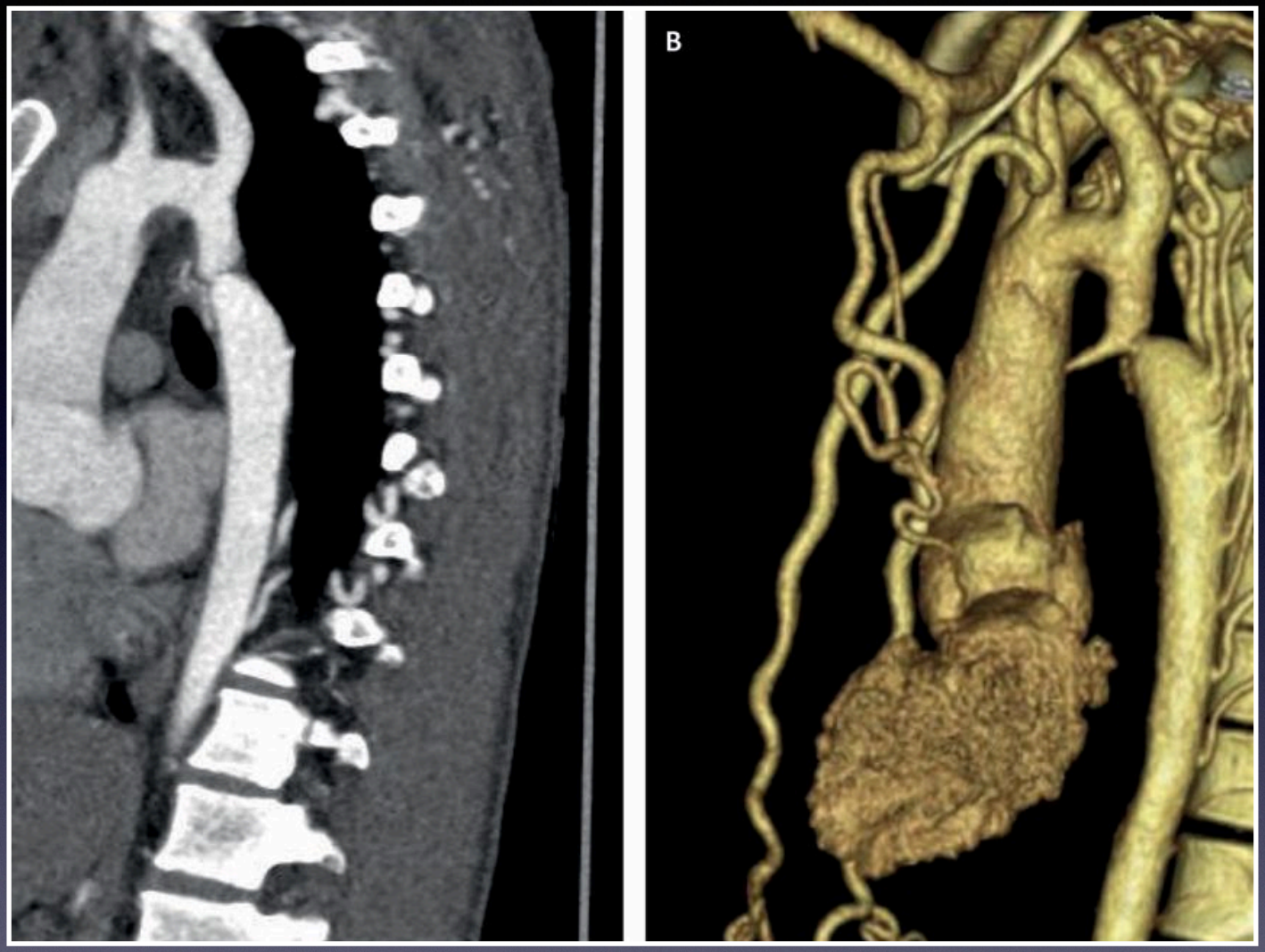
Thuis-BD

Gemiddelde TBD: 142/89 mmHg → Boven normaal (≤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 ?



Wat zien we ?

Klinisch geval 3 : 17 j

- 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 (≤140/90)**

Thuis-BD

Gemiddelde TBD: 153/90 mmHg → **Normaal (≤135/85)**

Gemiddelde ‘s ochtends: 155/92 mmHg
Gemiddelde ‘s avonds: 152/89 mmHg

↓

Ongecontroleerd

Therapeutische beslissing
?

Klinisch geval 4

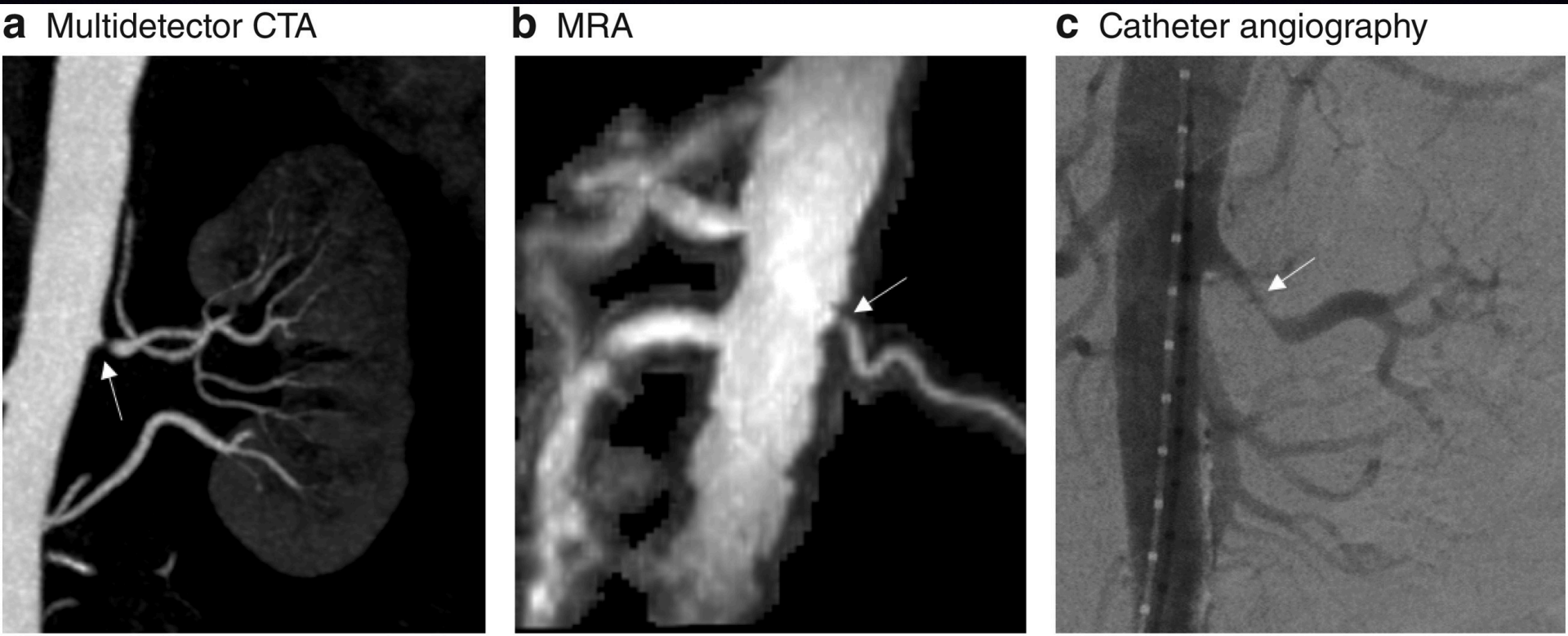
- Start spironolactone 25 mg
- Bloeddruk na 4 weken Spreekkamer 146/80 mmhm

Klinisch geval 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, shuffle femoralis re en li
- TTE LVhypertrofie. Cyclo negatief

Klinisch geval 5

- BD Spreekkamer : 170/95 mmhg
- Welke Onderzoeken ?
- Medicatie ?



NMR nier aterien

Klinisch geval 5

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

Casus 6 80 j

- 1991: diabetes mellitus.
- 1991: acuut antero-apicaal infarct waarvoor medicamenteus beleid en sedertdien Marcoumar.
- Nierontsteking.
- 2011: vermoeden van residuele angor; Cycloergometrie klinisch positief en electrocardiografisch verdacht; myocardscintigrafie: geen argumenten voor ischemie; conservatief beleid.
- 2011: duplex onderzoek van de carotiden; vertebralis; wandonregelmatigheden en calcificaties thv de carotis bifurcatie; geen flowrestrictieve stenoses.
- 2013: Permanente voorkamerfibrillatie Holter: VKF 22-171/min, gemiddeld 73/min.; 250 pauzes tot 3.6 seconden, brady-tachysyndroom.
- 2014: implantatie Biotronik Eviua DR-T in DDD modus; programmatie in VVI modus omwille van VKF. starten Emconcor 5 mg 2x/dag.
- Stopzeten ACE -I wegens hypotensie.
- 2016: Hydroureteronefrose tgv globe vesicale. Ontregelde glycemies, BHP, blaassonde plaatsing verwikkeld met hematurie
- 2016: ernstig gedilateerde cardiomyopathie met achteruitgang van linkerventrikel systolische functie; LVEF 34%; nausea onder Digoxinespiegel van 1.0. Stopzetten Digitalis. Chronische nierinsufficiëntie CDK stadium 3b. Stopzetten Metformine.
- Opstarten nepresol, Intolerantie digitalis, ACE-I stopzetten wegens nierinsufficientie
- 2018 : permanente voorkamerfibrillatie ; NYHA klasse II

Oude medicatie casus 6

- - Emconcor, 2.5 mg (dagdosis), 2/d
- - Insuline lantus, 8 E (dagdosis), SC, 817u
- - Insuline novorapid (penfill), ? E (dagdosis), SC, 3/d, 8u 12u 17u
- >6E-5E-5E
- - Marcoumar, 1.5 mg (dagdosis), 8u
- >Volgens INR, momenteel 0.75co/d
- Woensdag volledige tablet
- - Coversyl 5 mg
- - Promagnor (zakje), 1 zakje, 2/d
- >ander produkt van magnesium.
- - Totalip, 40 mg (dagdosis), 20u

TTE Casus 6

- Echogeniciteit: normaal
- Linker ventrikel:
- - globaal aspect: gedilateerde cardiomyopathie ; EDD 55 mm
- - regionaal aspect: akinesie anterior, hypokinesie overige segmenten.
- - wanddikte: normaal
- - systolische functie: ernstig verminder; LVEF=38 % (geschat)
- - diastolische functie (doppler): restrictie, voorkamerfibrillatie
- Rechter ventrikel:
- - globaal aspect: normaal.
- Atria: linker en rechter atrium fors gedilateerd, meer dan 50 mm.
- Aorta ascendens: normaal; pericardvocht: afwezig.
- Arteria pulmonalis: normaal; pulmonale hypertensie: afwezig.
- Klepmorfologie en -excursie 4 natieve kleppen: aortaklepsclerose, lichte aortaklepstenose ; piekgradiënt tot 1.8 /0.9meter /s
- Klepinsufficiënties (doppler): tricuspiedinsufficiëntie 1-2/4 met PAP-systolisch 31 mm Hg + CVD (5 mmhg)

Kliniek Casus 6

- Crea 2,1 GFR 35, INR >4
- Hg 9, Ferritine 90, Ijzerbindingscapaciteit 10 %
- BD SK 170/80 mmhg
- NYHA II tot III

Casus 6 80 j

Therapeutisch opties ?
Join at **menti.com** use code **5557 6031**

Thuismedicatie Casus 6

- - Bactroban (huidzalf 15 g), 1 appl, LOC uitw
- - Bisoprolol mylan, 5 mg
- - Entresto (tabl 24-26 mg), 1 tabl, 2/d, 8u 20u
- - Forxiga, 10 mg, 8u
- - Insuline lantus (solostar pen), ? E, SC, 817u
- >6 's morgens, 5 's avonds
- - Insuline novorapid (penfill), ? E (dagdosis), SC, 3/d, 8u 12u 17u
- >6E-5E-5E
- - Lixiana, 60 mg, 1/d, 8u
- - Tobradex (collyre 5 ml), 1 drup, LOC oog bilateraal
- - Totalip, 40 mg (dagdosis), 20u

- Gevalideerd door Hendrik Celen op 12-10-2022 11:35.

Labo

	2/22	7/22	10/22
Krea	2,1	1,4	1,2
GFR	33	53	63
K	4,8	4,7	5,0
NYHA	3	2	2

Casus 7

- Jonge vrouw 32 j, partner van profvoetballer
- Bloeddruk spreekkamer : 160/100 mmhg
- BMI 23, labo normaal
- ECG normaal, sinustachycardie 110/min
- 3x week uitgaan, slaapt weinig, 5 uur per nacht
- Therapie ? Onderzoeken ?

Casus 7

Onderzoeken ? TTE normaal
Therapeutische opties
Join at menti.com use code 5557 6031

Casus 8

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

Casus 8

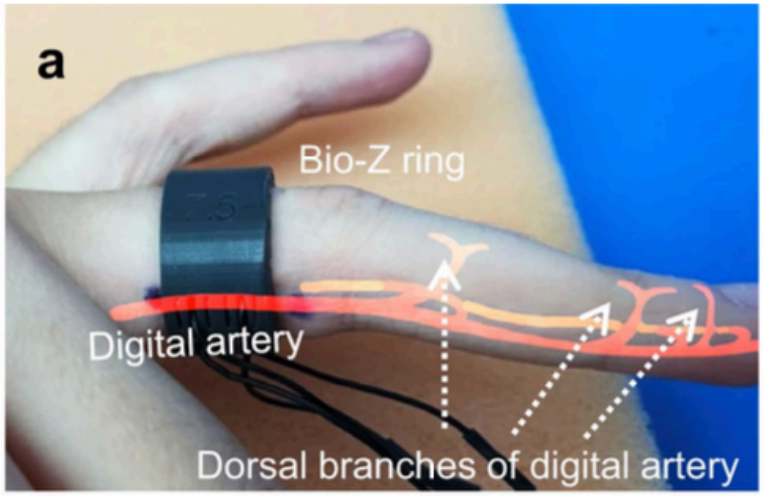
Onderzoeken ? TTE Lv hypertrofie

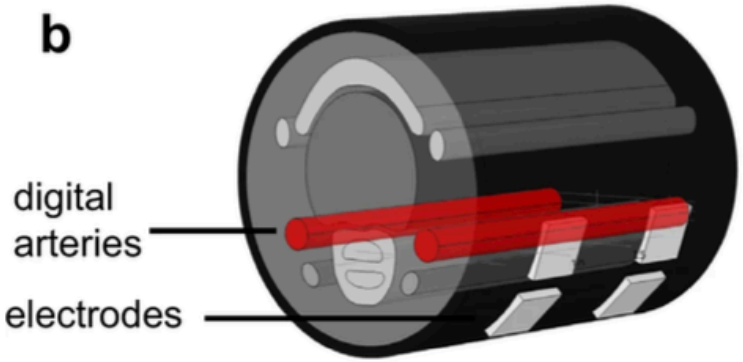
Therapeutische opties

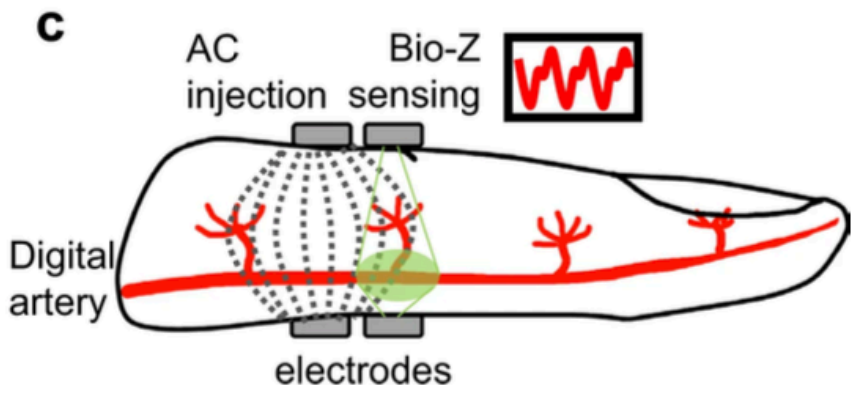
Join at **menti.com** use code **5557 6031**

pressure sensing.

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







Toekomst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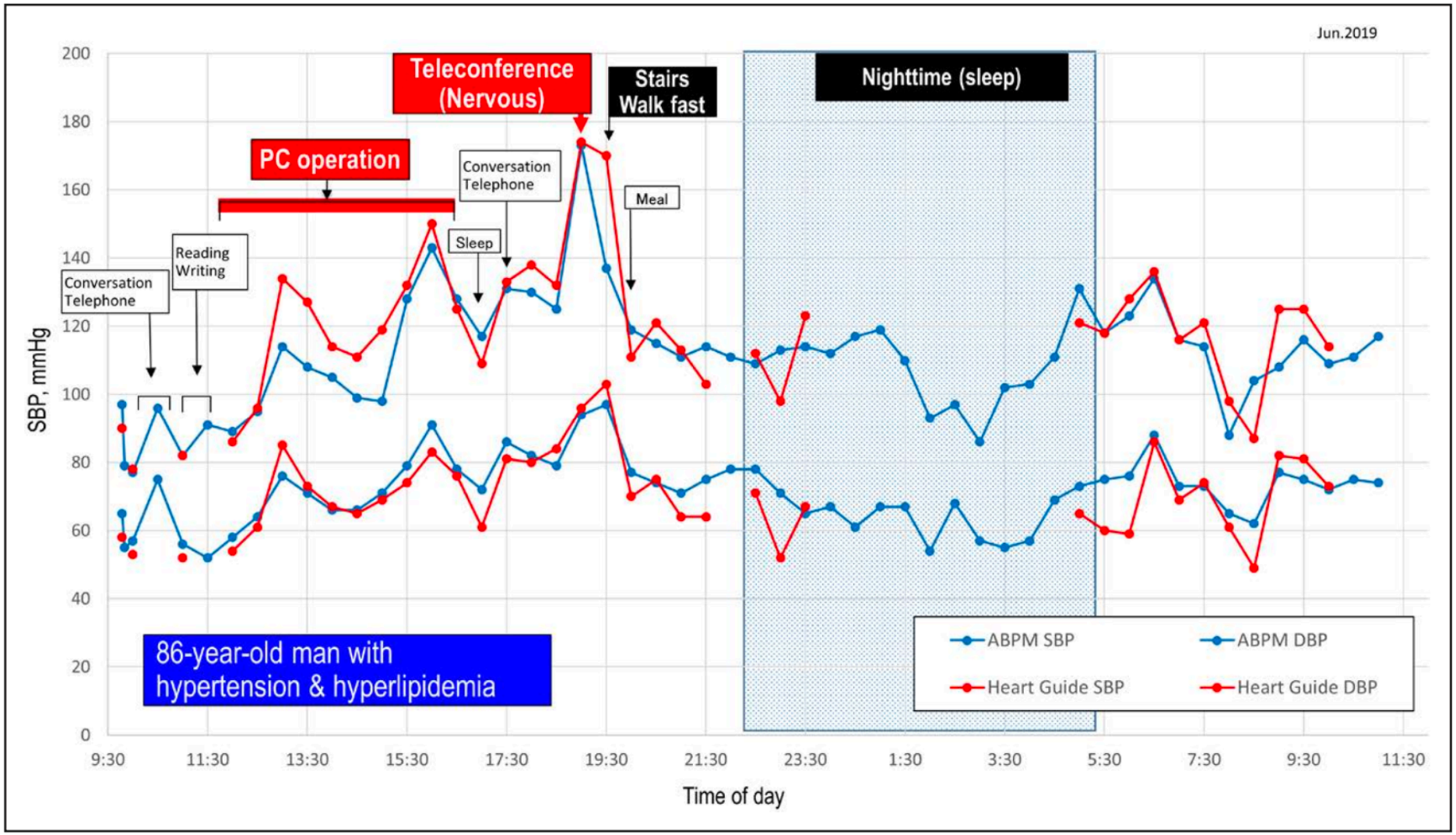
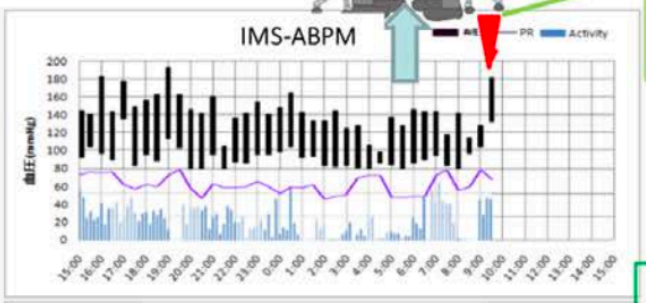
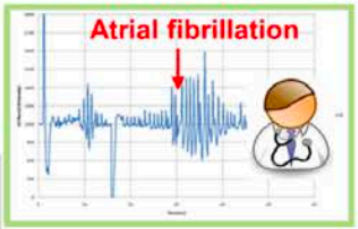


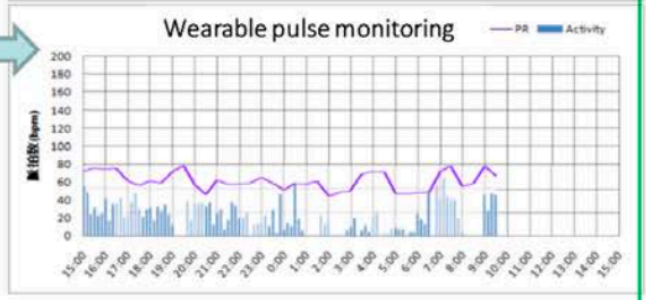
Figure 4. Comparison showing simultaneous monitoring with a wearable device (HeartGuide; Omron Healthcare Co, Ltd) and ambulatory blood pressure monitoring (ABPM). DBP indicates diastolic blood pressure; PC, personal computer; and SBP, systolic blood pressure.

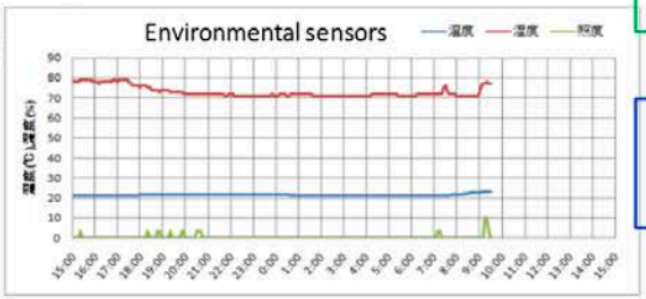
ICT Multisensor environment blood pressure monitoring system





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





Analyze with server

Cloud

Information is transmitted to the Cube from various devices/sensors

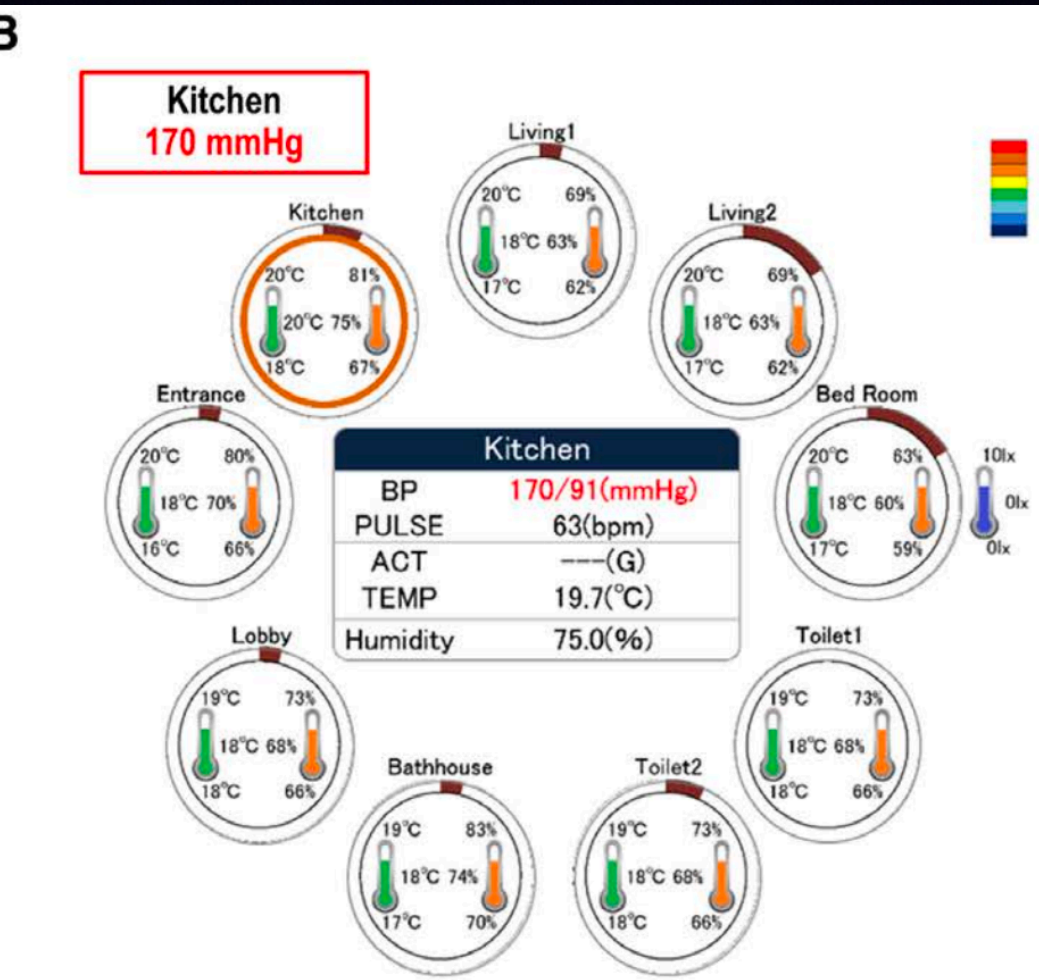
Biological signals

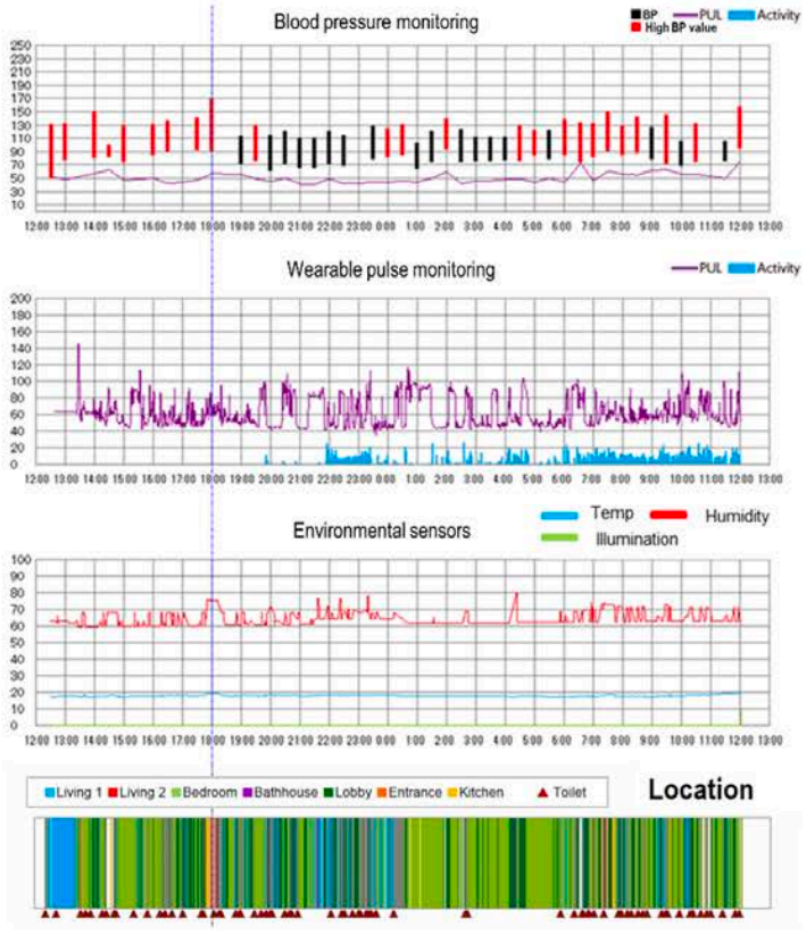
IMS-ABPM:
- Ambulatory BP readings at 30-min intervals (occasional)
- Home BP values
- Pressure waveform
- Activity, temperature, atmospheric pressure

Wearable pulse monitoring:
- Pulse (continuous)
- Physical activity

Environmental signals
- Temperature
- Illumination
- Humidity

Temp, lokatie , vochtigheid





Besluit : toekomst

- Ambulante BD monitoring met Smartphone-apps zijn nog niet bruikbaar en geen enkele is momenteel goedgekeurd door de Amerikaanse FDA of de Europese Commissie
- 113 Recente studies tonen echter aan dat draagbare apparaten geproduceerd door bedrijven die gespecialiseerd zijn in bloeddrukmonitoringtechnologie gevalideerd en betrouwbaar benaderingen van bloeddrukmetingen buitenshuis
- AI !!! Combinatie met telemetrie

HOE RUZIES ONTSTAAN...

ORIGINAL RESEARCH ARTICLE

Angiotensin-converting enzyme inhibitors and angiotensin receptor blockers in high vascular risk (2)

Louis Potier,[1,2,3] Ronan Roussel,[1,2,3] Yedid Elbez,[4] Michel Marre,[1,2,3] Uwe Zeymer,[5] Christopher M Reid,[6] Magnus Ohman,[7] Kim A Eagle,[8] Deepak L Bhatt,[9] Philippe Gabriel Steg,[2,4,10] on behalf of the REACH Registry Investigators*

CONCLUSION

"**ARB use appears to be associated with 10% lower rates of CV events** compared with ACEIs, especially in patients with established CV disease. Our results suggest that **ARBs may provide superior protection against CV events than ACEIs** in high-risk patients in real-world practice."

ARBs: angiotensin receptor blockers, CV: cardiovascular

Heart 2017; 103: 1339-1346.

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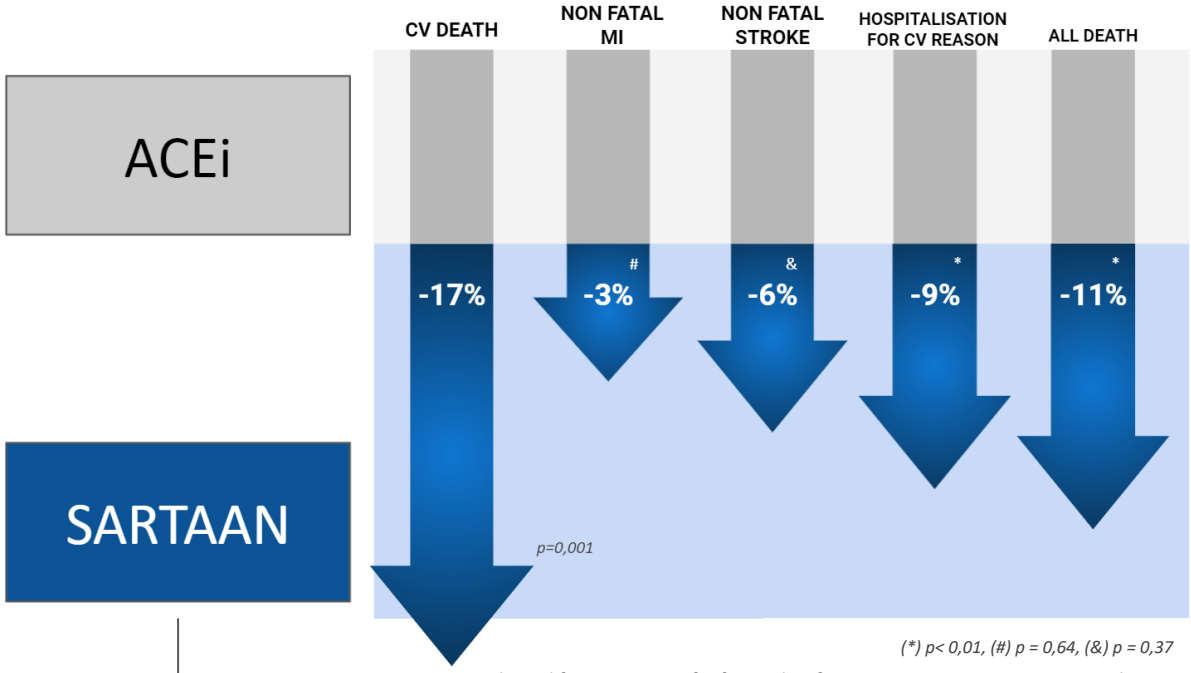

Adapted from Figure 2 of ref.6 : Risks of outcomes in ACEIs versus ARBs cohorts, in propensity score-adjusted analysis.

Bijkomende daling cardiovasculair risico "in real world practice" [2]

IEC/ACEi: Angiotensin-converting-enzyme inhibitors, ARBs: angiotensin receptor blockers, CV: cardiovascular

Heart 2017; 103: 1339-1346.

Patienten educatie ?