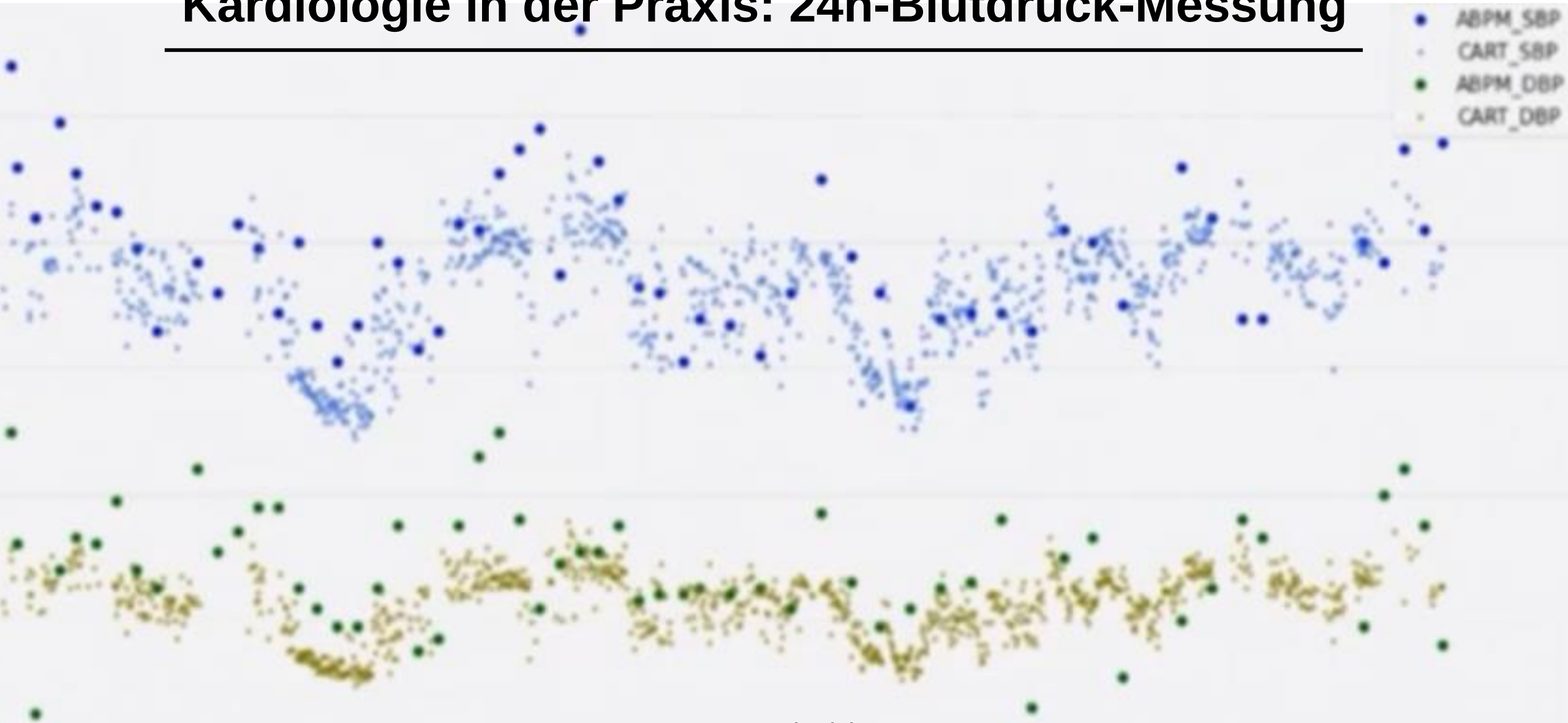
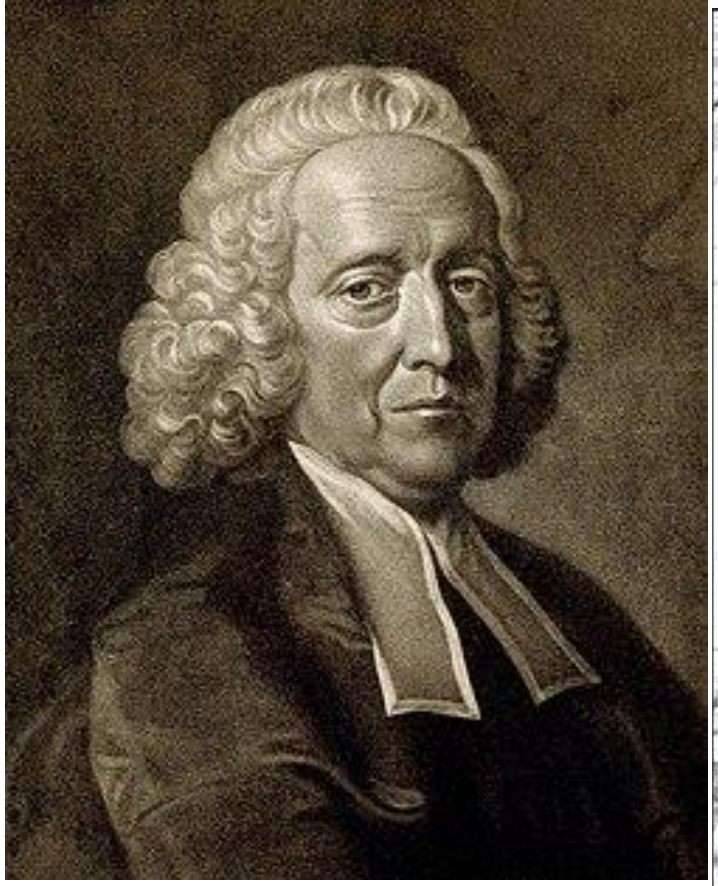
Kardiologie in der Praxis: 24h-Blutdruck-Messung



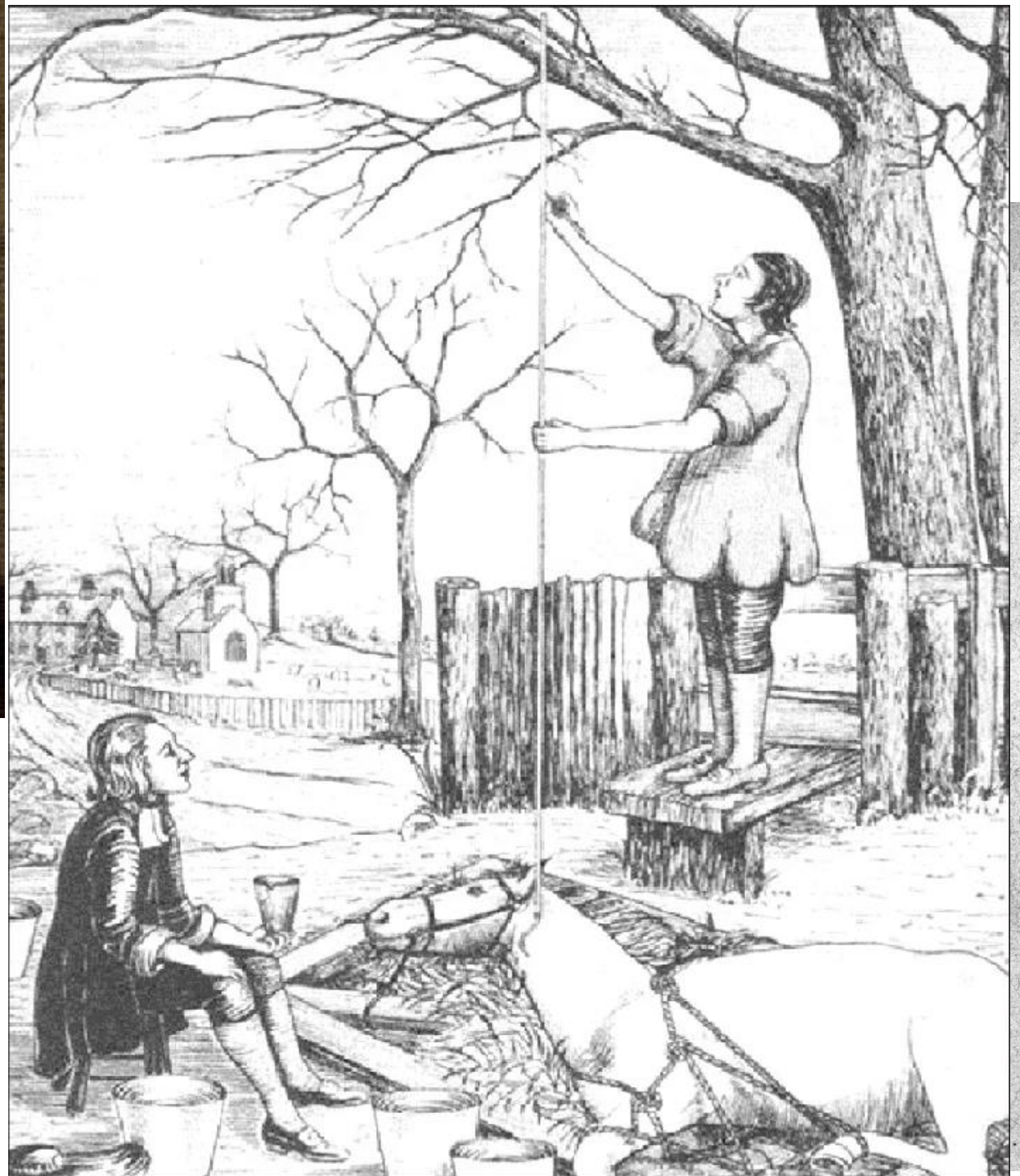
Dr. Peter Dietrich
LA Kardiologie
Letier Akutkardiologie/Weiterbildung/BD-Sprechstunde

Stadt Zürich
Stadtspital Triemli

No conflict of interests



Stephen Hales
1677 bis 1761



A N

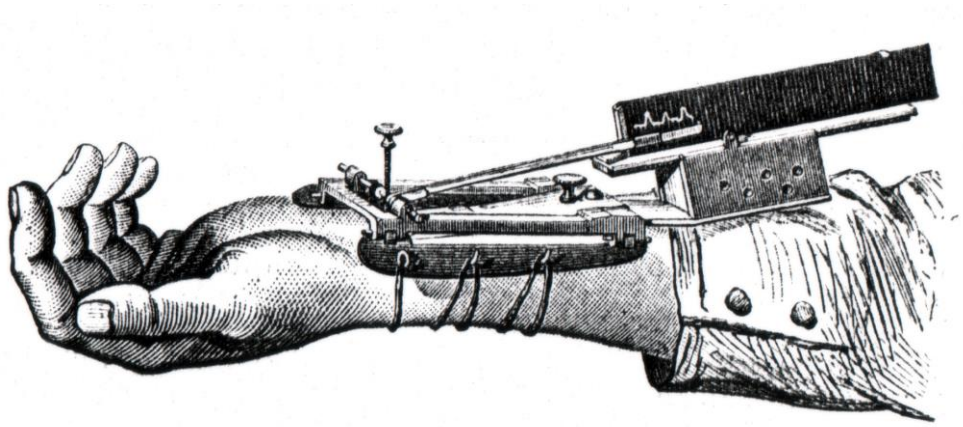
ACCOUNT

OF SOME

Hydraulick and Hydroſtatical Experiments made on the Blood and Blood-Veſſels of Animals.

Experiment I.

1. IN *December* I cauſed a Mare to be tied down alive on her Back, ſhe was fourteen Hands high, and about fourteen Years of Age, had a *Fiſtula* on her Withers, was neither very lean, nor yet luſty: Having laid open the left crural Artery about three Inches from her Belly, I inſerted into it a braſs Pipe whoſe Bore was one ſixth of an Inch in Diameter; and to that, by means of another braſs Pipe which was fitly adapted to it, I fixed a glaſs Tube, of nearly the ſame Diameter, which was nine Feet in Length: Then untying the Ligature on the Artery, the Blood roſe in the

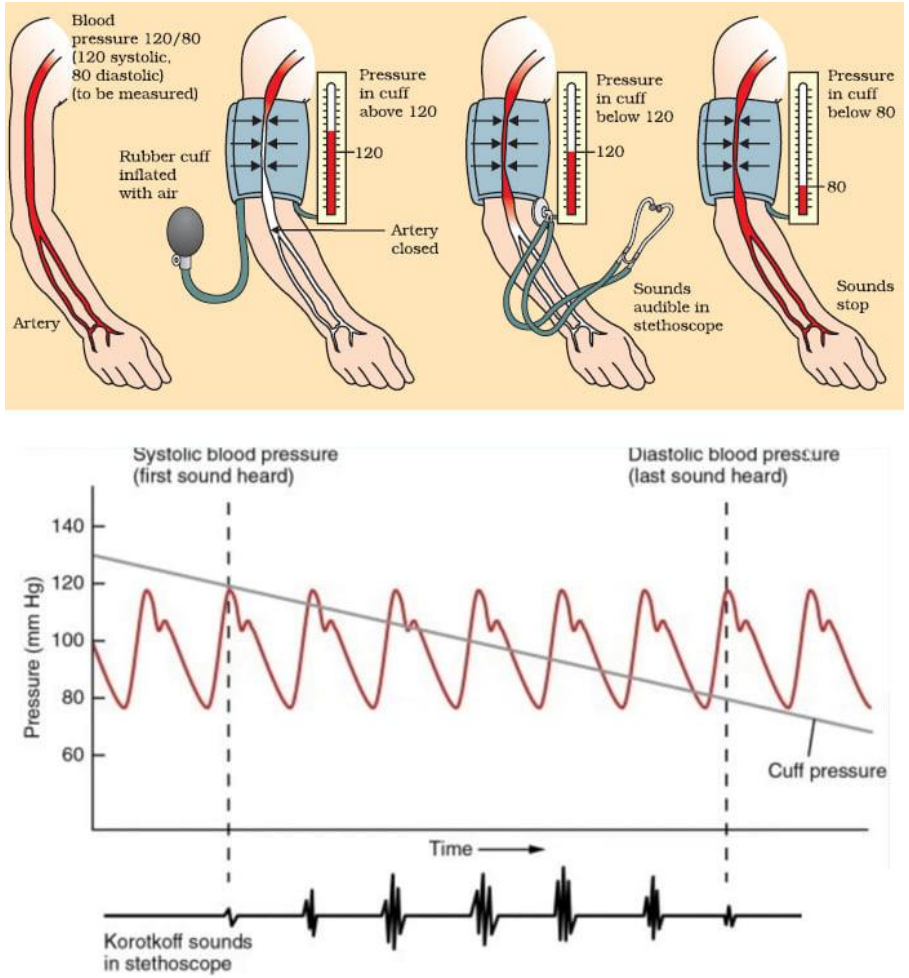


Marey‘s sphyngomanometer
1863

Riva-Rocci (RR)
1896

today

Two techniques to measure blood pressure



Auscultatory method (Krotokoff)

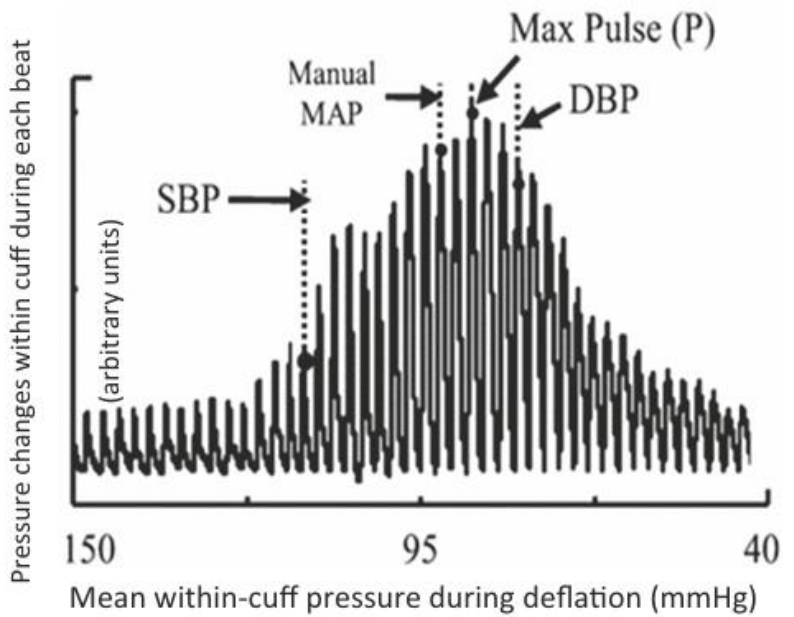


Fig. 2 Cuff pressure changes used to calculate blood pressure

Oscillometric method – cave Afib

Lewis et al 2019 J Hu Hyperten

How to measure blood pressure

REVIEWED APRIL 2024

CARDI·OH

Accurate Blood Pressure Measurement for Patients

The 5 R's

1. **Rest** for 5 minutes before blood pressure reading
2. **Refrain** (avoid) talking while resting and during blood pressure reading
3. **Remove** upper arm clothing
4. **Rest** arm on supported surface at heart level
5. **Rest** feet flat on floor in seated position

- ***TAKE 2 BLOOD PRESSURE READINGS 1 MINUTE APART***
- ***GOAL BLOOD PRESSURE IS LESS THAN 130/80***

The Ohio Cardiovascular and Diabetes Health Collaborative is funded by the Ohio Department of Medicaid and administered by the Ohio Colleges of Medicine Government Resource Center. The views expressed in this document are solely those of the authors and do not represent the views of the state of Ohio or federal Medicaid programs.

FOR MORE INFORMATION HEAD TO CARDI-OH.ORG

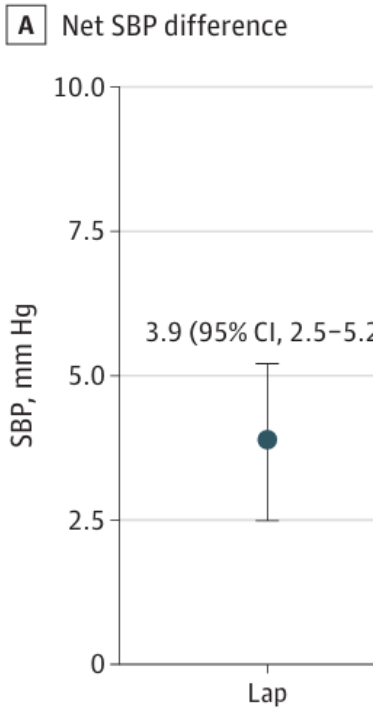
How to measure blood pressure

JAMA Internal Medicine | Original Investigation

Arm Position and Blood Pressure Readings
The ARMS Crossover Randomized Clinical Trial

Hairong Liu, MHS; Di Zhao, PhD; Ahmed Sabit, MS; Chathurangi H. Pathiravasan, MS, PhD; Junichi Ishigami, MD, MPH; Jeanne Charleston, RN, BSN; Edgar R. Miller III, MD, PhD; Kunihiro Matsushita, MD, PhD; Lawrence J. Appel, MD, MPH; Tammy M. Brady, MD, PhD

Figure 2. Difference-in-Differences Analysis for Blood Pressure Obtained With the Arm in Different Positions Compared to the Reference Standard



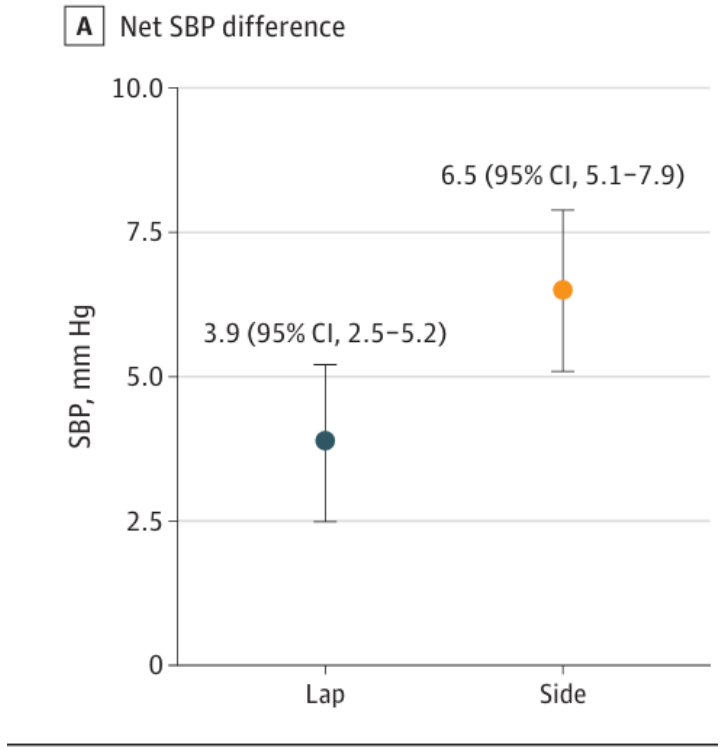
How to measure blood pressure

JAMA Internal Medicine | Original Investigation

Arm Position and Blood Pressure Readings
The ARMS Crossover Randomized Clinical Trial

Hairong Liu, MHS; Di Zhao, PhD; Ahmed Sabit, MS; Chathurangi H. Pathiravasan, MS, PhD; Junichi Ishigami, MD, MPH; Jeanne Charleston, RN, BSN; Edgar R. Miller III, MD, PhD; Kunihiro Matsushita, MD, PhD; Lawrence J. Appel, MD, MPH; Tammy M. Brady, MD, PhD

Figure 2. Difference-in-Differences Analysis for Blood Pressure Obtained With the Arm in Different Positions Compared to the Reference Standard



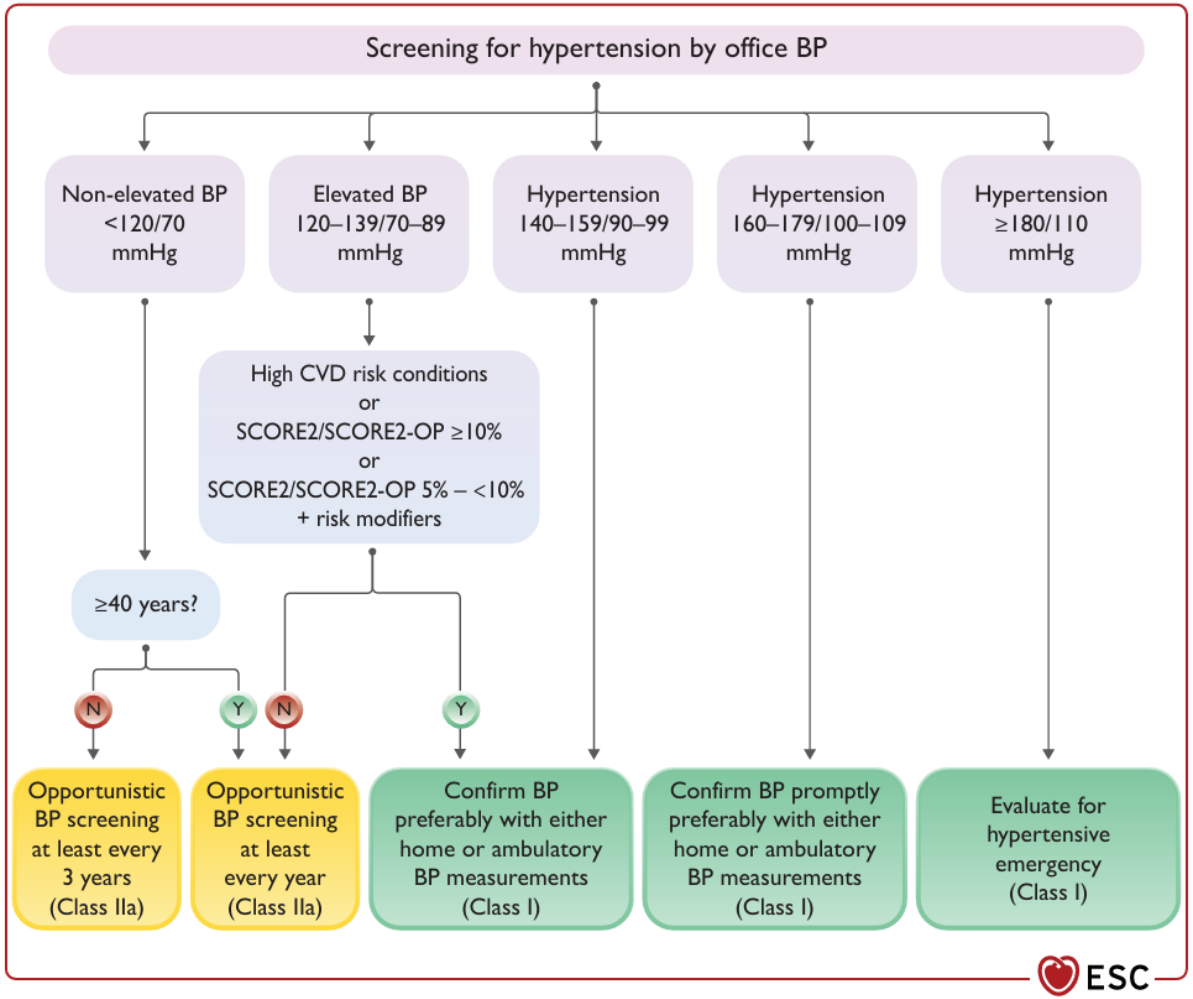


Figure 10 Protocol for confirming hypertension diagnosis. BP, blood pressure; CVD, cardiovascular disease; SCORE2, Systematic COronary Risk Evaluation 2; SCORE2-OP, Systematic COronary Risk Evaluation 2–Older Persons.

Trauen Sie einer einzelnen Messung nicht!

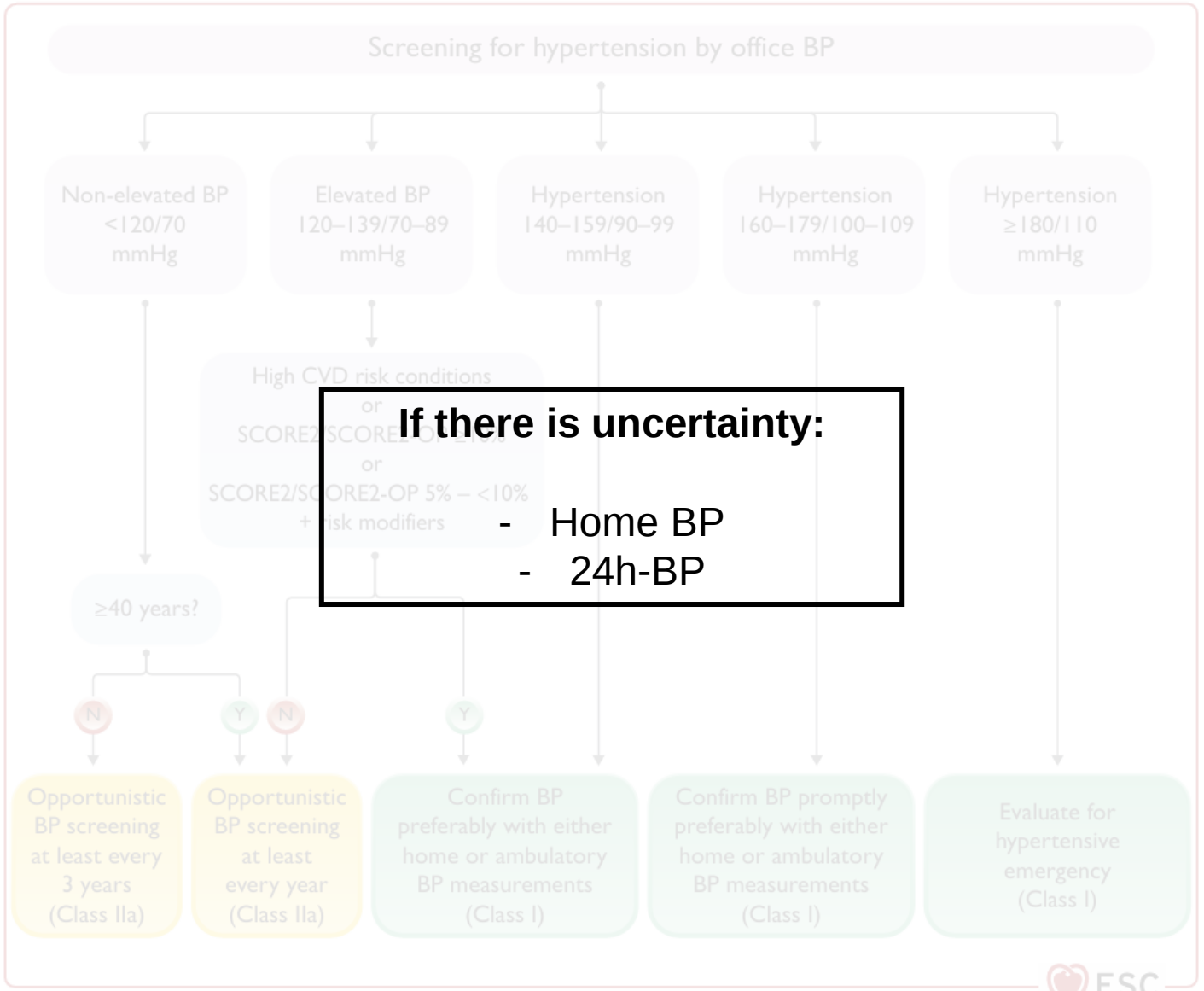


Figure 10 Protocol for confirming hypertension diagnosis. BP, blood pressure; CVD, cardiovascular disease; SCORE2, Systematic COronary Risk Evaluation 2; SCORE2-OP, Systematic COronary Risk Evaluation 2–Older Persons.

Circulation Research
Volume 124, Issue 7, 29 March 2019; Pages 990-1008
https://doi.org/10.1161/CIRCRESAHA.118.313219

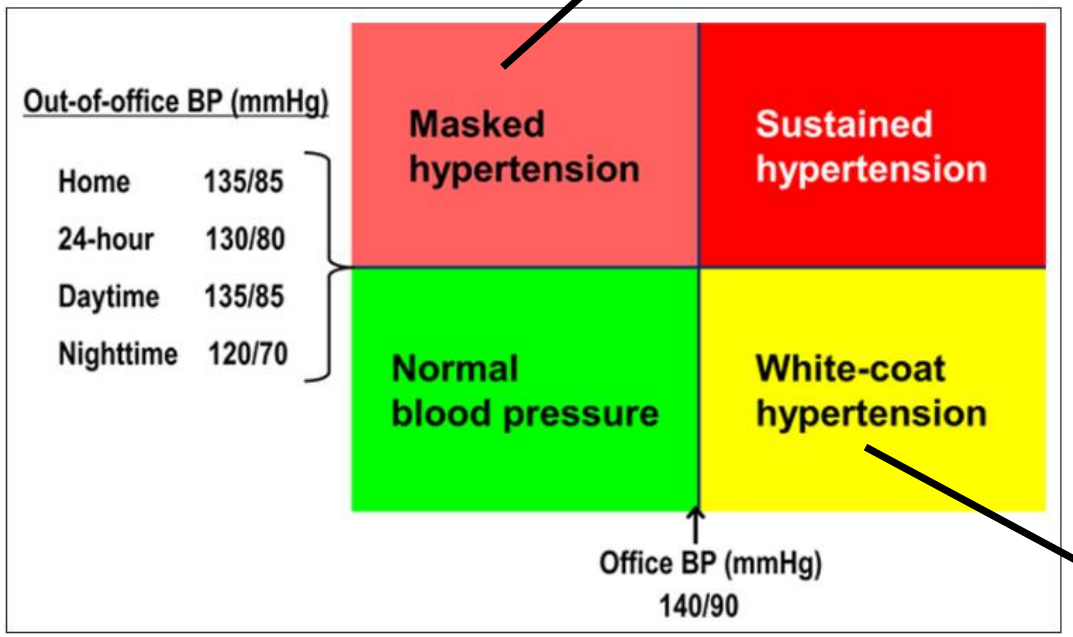
COMPENDIUM ON THE PATHOPHYSIOLOGY AND TREATMENT OF HYPERTENSION

Blood Pressure Measurement and Treatment Decisions

Masked and White-Coat Hypertension

Kazuomi Kario, Lutgarde Thijs, and Jan A. Staessen

15% aller normotensiven BD-Werte
= masked hypertension



24% aller hypertensiven BD-Werte
= white coat hypertension

Wonach suchst du?

Gesamtsortiment > Beauty + Gesundheit > Gesundheit > Gesundheitsmessgeräte > Blutdruckmessgerät > Beurer BM 27

6 Bilder

21.70
Beurer BM 27

0.65 sparen
Geprüfte Rückgabe für 21.05

Bewertungen
★★★★½ 981

Marke
Mehr von Beurer

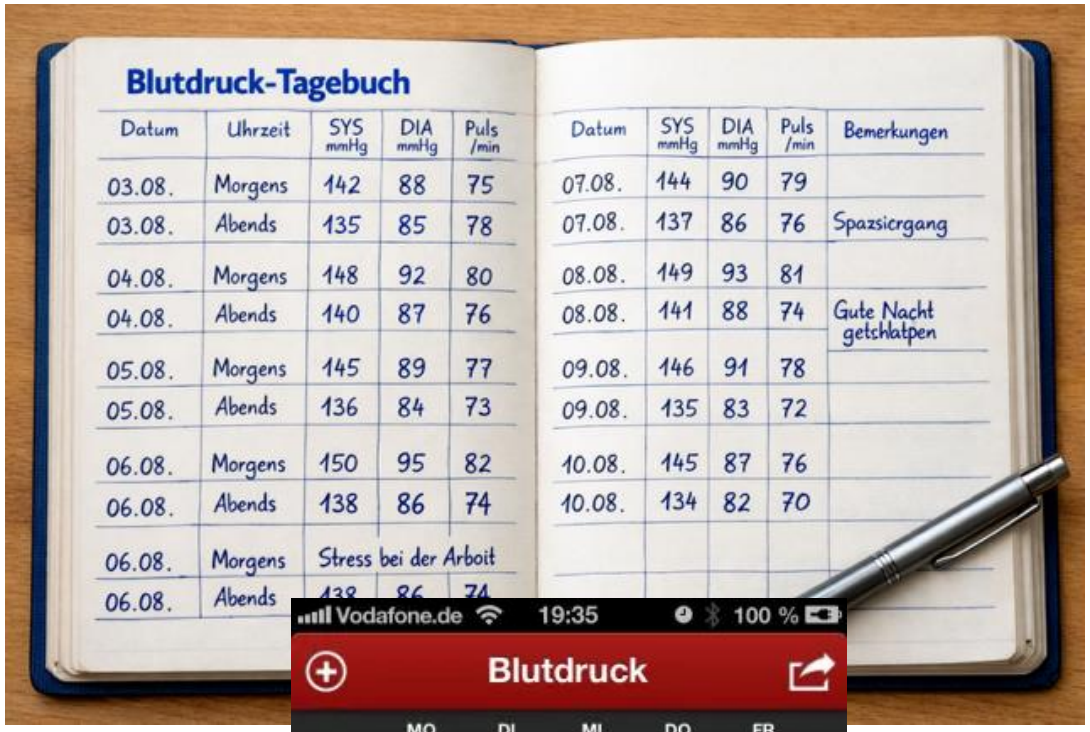
Testberichte
Sehr gut bei 1 Test

Mi, 8.4. geliefert
Mehr als 10 Stück an Lager

In den Warenkorb

Vergleichen | Merken

Kostenloser Versand ab 50.– i



Source: chatgpt.

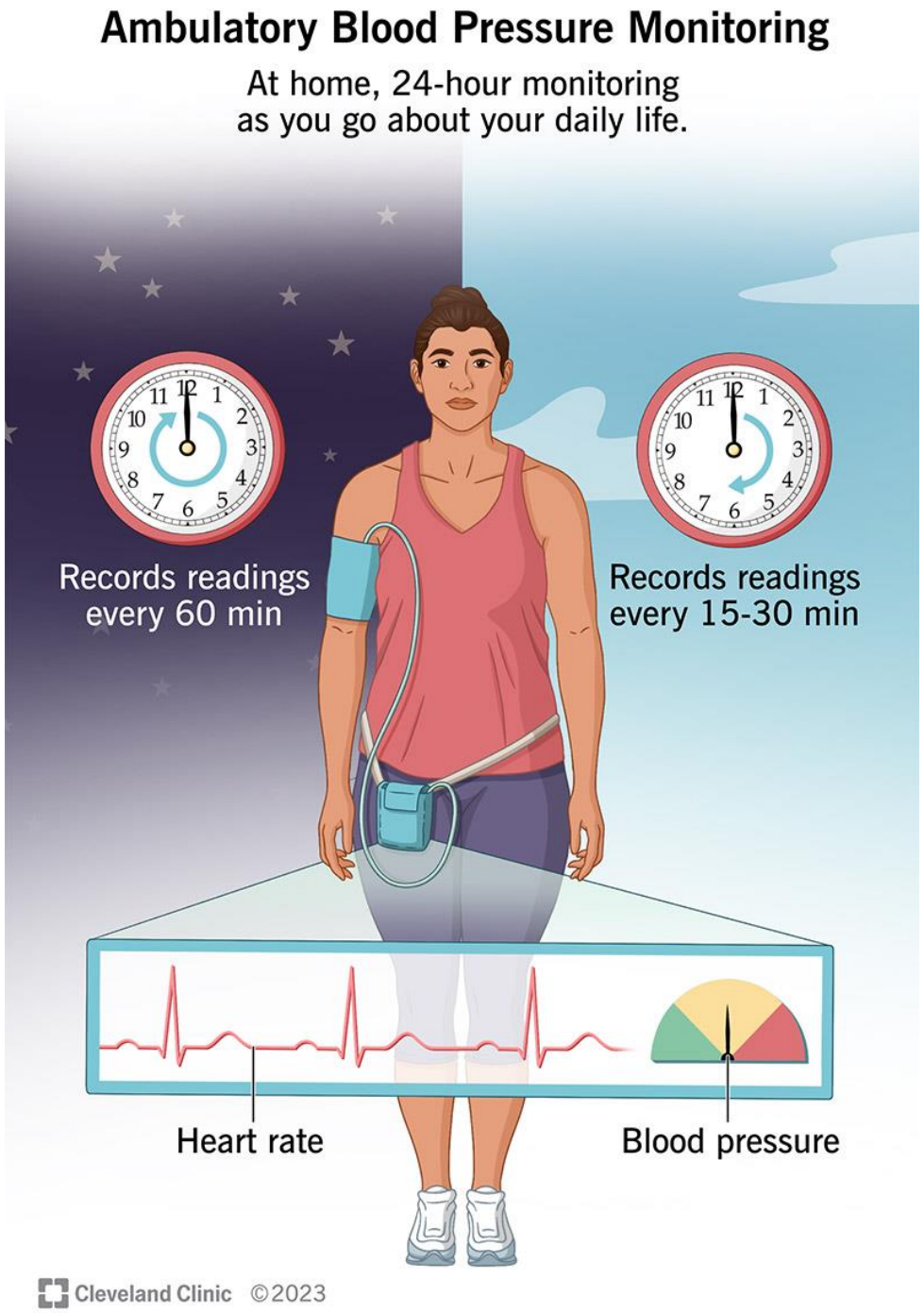
Blutdruck-Tagebuch

Datum	Uhrzeit	SYS mmHg	DIA mmHg	Puls /min
Montag	Morgen	142	88	77
	Mittag	136	85	76
	Abend	138	86	75
Mittwoch	Morgen	145	90	78
	Mittag	139	87	76
	Abend	140	86	74
Freitag	Morgen	144	89	76
	Mittag	137	85	75
	Abend	138	86	73

Datum	SYS mmHg	DIA mmHg	Puls /min	Bemerkungen

In der Woche vor jedem Arztbesuch:
9 Werte messen

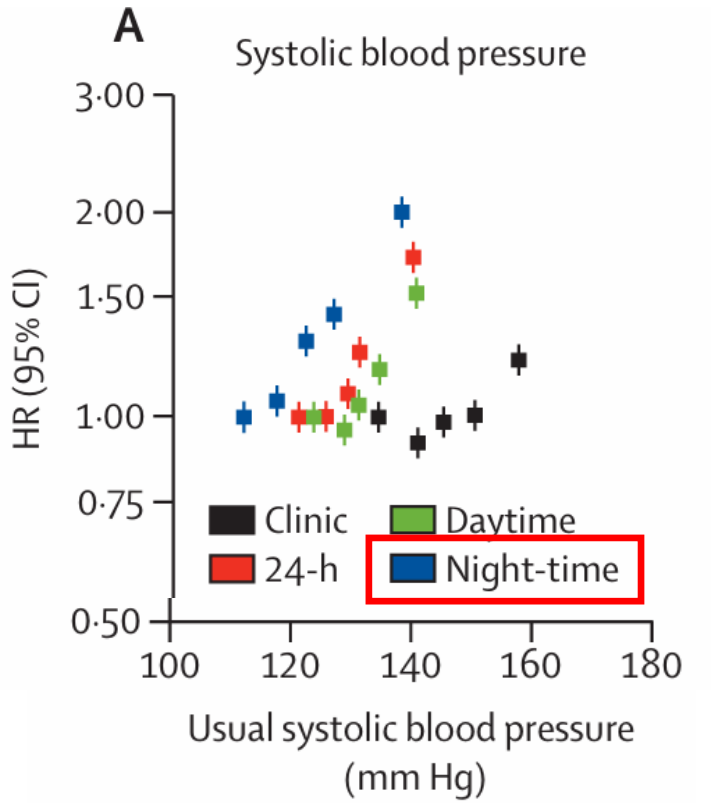
Source: chatgpt.



Wann und Wieso ???

Die 24h Blutdruckmessung

Spanish ABPM Registry 59124 patients mit 24-h-BD, prognostische Information über 10 Jahre (multivariat kontrolliert)



Nächtliche BD der beste prädiktive Faktor für Tod

Staplin N et al Lancet 2023

24h-BD: raw data: 15min tags, 30min nachts

Nr	Zeit	HF	Systolisch	Diastolisch	MAD	PD	RPP	Methode	Kommentare
1	09:05	97	**176**	**108**	135	68	17072	AUSC	
2	09:15	112	**193**	**130**	155	63	21616	AUSC	
3	09:30	96	133	72	93	61	12768	OSC	
4	09:45	111	**179**	**119**	143	60	19869	AUSC	
5	10:00	124	**190**	**108**	141	82	23560	AUSC	
6	10:15	121	**180**	**110**	138	70	21780	AUSC	
7	10:30	103	**182**	**114**	141	68	18746	AUSC	
8	10:45	108	**199**	**119**	151	80	21492	AUSC	
9	11:00	111	**198**	**114**	148	84	21978	AUSC	
10	11:15	102	**202**	**115**	150	87	20604	AUSC	
11	11:30	92	**192**	**106**	140	86	17664	AUSC	
12	11:45	98	**192**	**115**	146	77	18816	AUSC	
13	12:00	112	**194**	**121**	150	73	21728	AUSC	
14	12:15	111	**195**	**120**	150	75	21645	AUSC	
15	12:30	110	**195**	**128**	155	67	21450	AUSC	
16	12:45	119	**207**	**129**	160	78	24633	AUSC	
17	13:00	111	**208**	**129**	161	79	23088	AUSC	
18	13:15	113	**200**	**127**	156	73	22600	AUSC	
19	13:30	102	**192**	**131**	160	61	19584	OSC	
20	13:45	116	**227**	**151**	181	76	26332	AUSC	
21	14:15	121	**178**	**121**	143	57	21538	OSC	
22	14:30	109	**201**	**120**	152	81	21909	OSC	
23	14:45	101	**180**	**116**	144	64	18180	OSC	
24	15:00	103	119	86	99	33	12257	AUSC	
25	15:45	128	**156**	**124**	135	32	19968	OSC	
26	16:00	110	**192**	**126**	152	66	21120	OSC	
27	16:15	114	**193**	**134**	161	59	22002	OSC	
28	16:30	118	**154**	**131**	140	23	18172	AUSC	
29	17:00	106	**186**	**124**	149	62	19716	OSC	
30	17:15	116	**175**	**139**	156	36	20300	OSC	
31	17:30	125	**177**	**120**	143	57	22125	AUSC	
32	17:45	119	**172**	**140**	153	32	20468	OSC	
33	18:15	117	**175**	**111**	135	64	20475	OSC	
34	18:30	111	**184**	**112**	141	72	20424	OSC	
35	18:45	119	**220**	**126**	164	94	26180	OSC	
36	19:00	109	**187**	**121**	147	66	20383	OSC	
37	19:15	109	**183**	**118**	144	65	19947	AUSC	
38	19:30	114	**186**	**118**	145	68	21204	AUSC	

Nr	Zeit	HF	Systolisch	Diastolisch	MAD	PD	RPP	Methode
39	20:00	111	**186**	**118**	145	68	20646	AUSC
40	20:15	99	**183**	**109**	139	74	18117	AUSC
41	20:30	101	**186**	**110**	140	76	18786	AUSC
42	20:45	103	**173**	**103**	131	70	17819	AUSC
43	21:00	105	**163**	**101**	126	62	17115	AUSC
44	21:15	104	**164**	**104**	128	60	17056	AUSC
45	21:30	100	**167**	**99**	126	68	16700	AUSC
46	21:45	96	**172**	**108**	134	64	16512	AUSC
47	22:00	105	**157**	**105**	126	52	16485	AUSC
48	22:30	102	**161**	**110**	130	51	16422	AUSC
49	23:00	98	**178**	**109**	137	69	17444	AUSC
50	23:30	98	**164**	**111**	132	53	16072	AUSC
51	00:00	88	**176**	**98**	129	78	15488	AUSC
52	00:30	79	**138**	80	103	58	10902	AUSC
53	01:00	82	**143**	84	108	59	11726	AUSC
54	01:30	95	**139**	**104**	118	35	13205	AUSC
55	02:00	87	**145**	**98**	117	47	12615	AUSC
56	02:30	95	**130**	69	93	61	12350	AUSC
57	03:00	88	**158**	**102**	124	56	13904	AUSC
58	03:30	94	**172**	**100**	129	72	16168	AUSC
59	04:00	96	**161**	**98**	123	63	15456	AUSC
60	04:30	106	**149**	**107**	124	42	15794	AUSC
61	05:00	95	**182**	**117**	138	65	17290	OSC
62	05:30	93	**177**	**109**	138	68	16461	OSC
63	06:00	91	**153**	**90**	115	63	13923	AUSC
64	06:30	94	**147**	**97**	117	50	13818	AUSC
65	07:00	95	**156**	**98**	121	58	14820	AUSC
66	07:30	80	**145**	74	102	71	11600	AUSC
67	08:00	97	**156**	**93**	118	63	15132	AUSC
68	08:15	88	**162**	**96**	122	66	14256	AUSC
69	08:30	61	**149**	70	102	79	9089	AUSC
70	08:45	102	**169**	**108**	132	61	17238	AUSC
71	09:00	93	**173**	**107**	133	66	16089	AUSC

Diastolischer Blutdruck

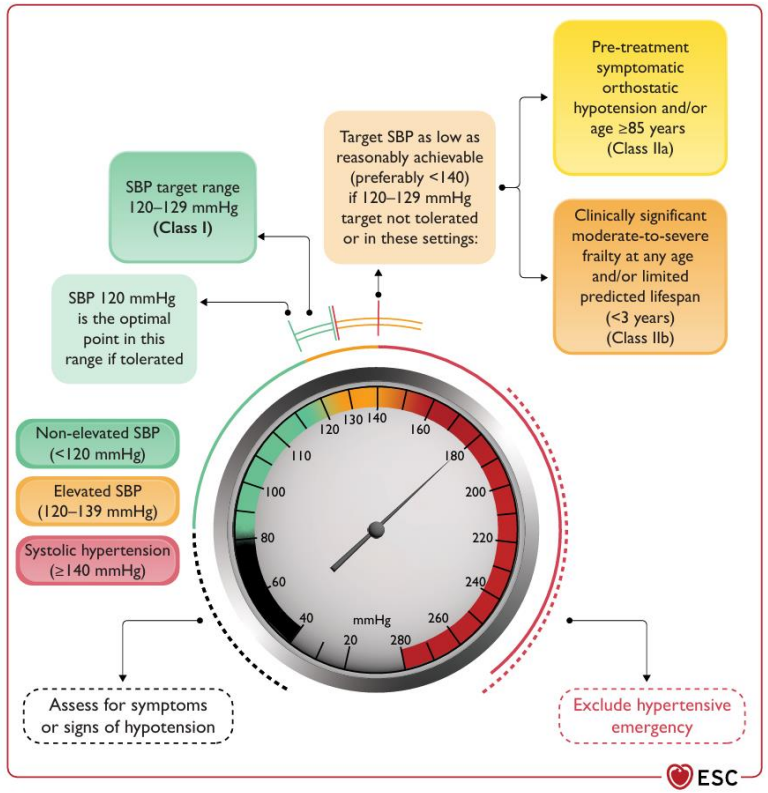


Figure 20 Systolic blood pressure categories and treatment target range. BP, blood pressure; SBP, systolic blood pressure.

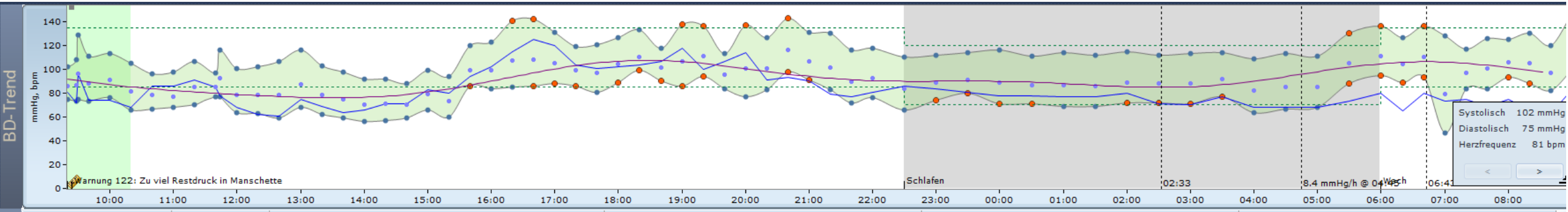
In cases where on-treatment systolic BP is at or below target (120–129 mmHg) but diastolic BP is not at target (≥80 mmHg), intensifying BP-lowering treatment to achieve an on-treatment diastolic BP of 70–79 mmHg may be considered to reduce CVD risk.	IIb	C

ESC guidelines 2024

Über 24h: <130mmHg SBP (average)

tags: <135mmHg SBP (average)

nachts: <120mmHg SBP (average)



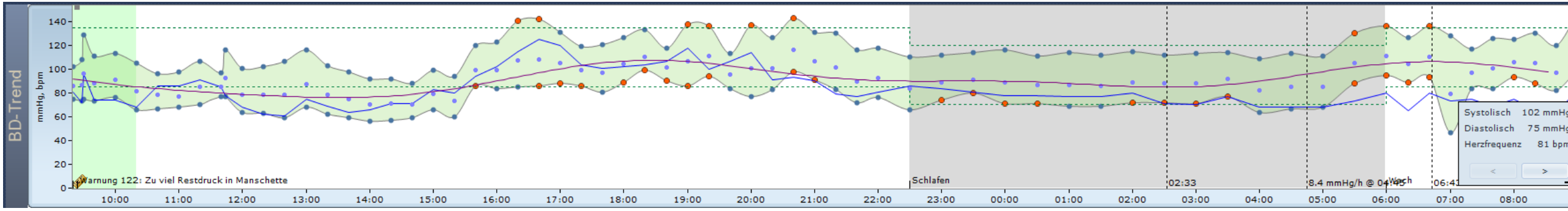
BD-Statistik

		Gesamt				Wach				Schlafen				Erste Stunde			
Abschnitt		10:20 - 09:00				10:20 - 22:30 / 06:00 - 09:00				22:30 - 06:00				09:20 - 10:20			
Dauer		23:40				16:10				07:29				01:00			
Messwerte		61 / 61 (100 %)				46 / 46 (100 %)				15 / 15 (100 %)				6 / 6 (100 %)			
Sys Grenze	mmHg					135				120							
Dia Grenze	mmHg					85				70							
		mittel	SD	max	min	mittel	SD	max	min	mittel	SD	max	min	mittel	SD	max	min
Systolisch	mmHg	117	+/- 13	146	88	118	+/- 15	146	88	115	+/- 6	136	109	113	+/- 7	129	102
Diastolisch	mmHg	76	+/- 12	99	47	78	+/- 13	99	47	**73**	+/- 7	95	64	75	+/- 1	76	66
MAD	mmHg	92	+/- 12	118	70	94	+/- 13	118	70	89	+/- 6	111	82	90	+/- 3	97	82
HF	bpm	82	+/- 15	125	61	86	+/- 17	125	61	76	+/- 5	86	68	77	+/- 7	96	68
PD	mmHg	41	+/- 8	81	20	41	+/- 10	81	20	42	+/- 3	46	34	38	+/- 6	54	27
BD-Last	Systolisch	16% (10) > Tag/Nacht Schwellwerte				20% (9) > 135 mmHg				7% (1) > 120 mmHg							
BD-Last	Diastolisch	43% (26) > Tag/Nacht Schwellwerte				37% (17) > 85 mmHg				60% (9) > 70 mmHg							
Nachtabsenkung	Systolisch	3% Senkung während Schlaf															

42y indischstämmiger Patient

In-office BP: 156/100mmHg
Unter Exforge HCT
Keine Selbstmessung
Sprachbarriere!

Resistant hypertension
Malcompliance
White-coat effect?

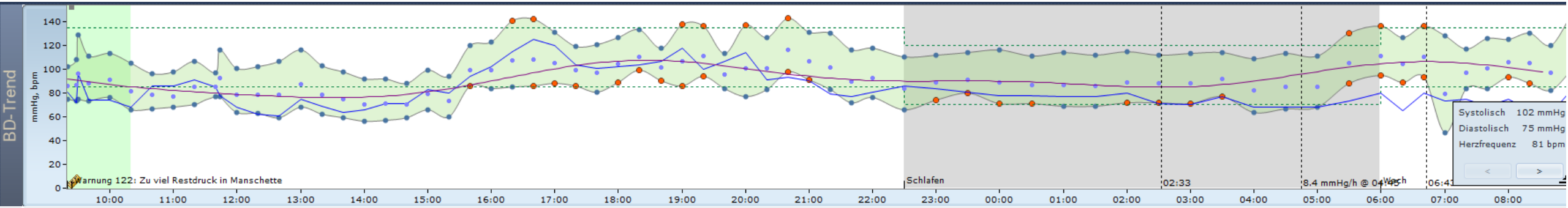


		mittel	SD	max	min
Systolisch	mmHg	117	+/- 13	146	88

42y indischstämmiger Patient

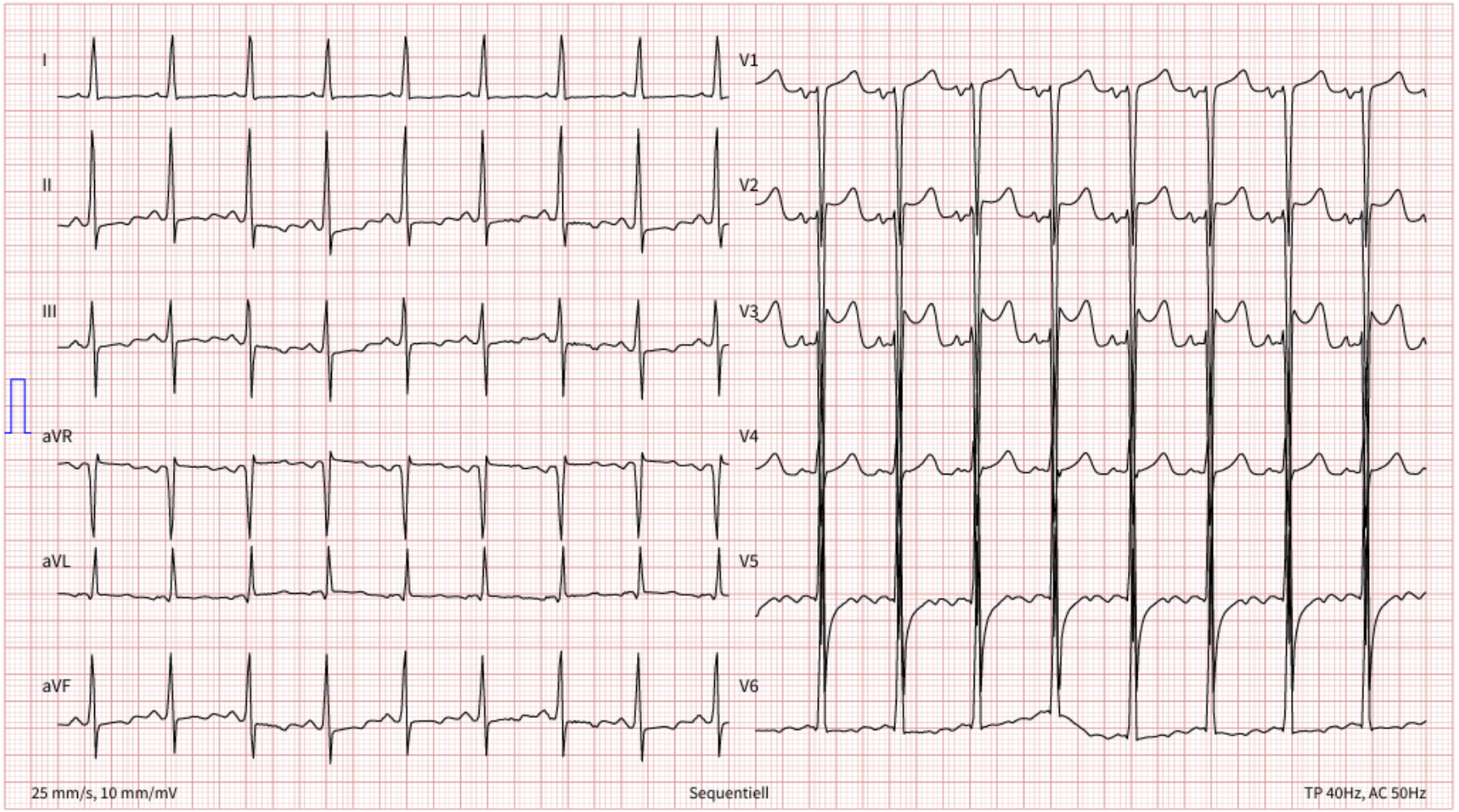
In-office BP: 156/100mmHg
Unter Exforge HCT
Keine Selbstmessung
Sprachbarriere?

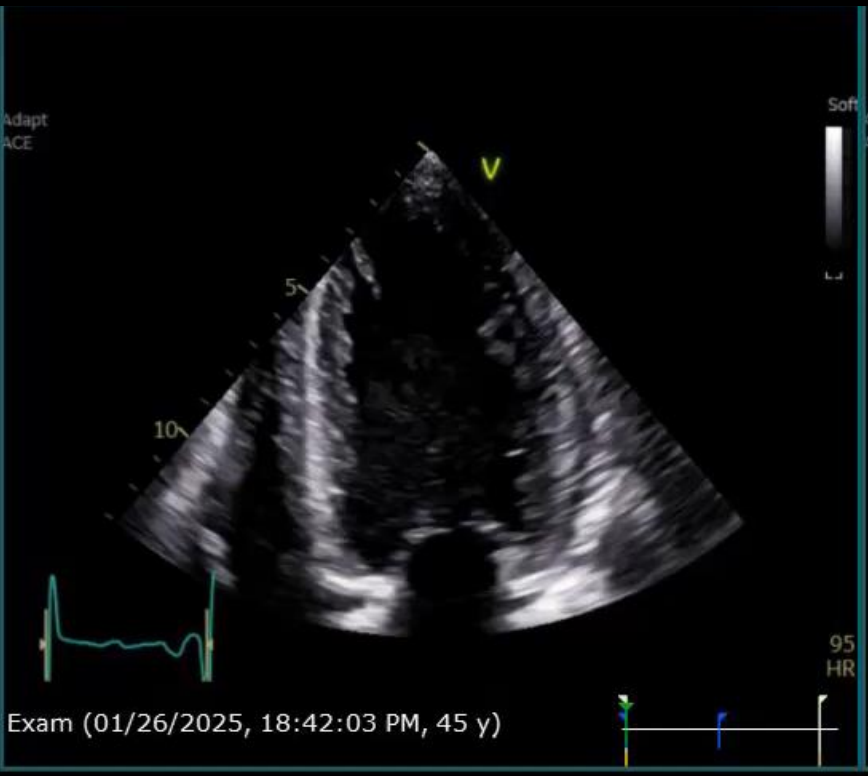
Resistant hypertension
Malcompliance
White-coat effect!!!!

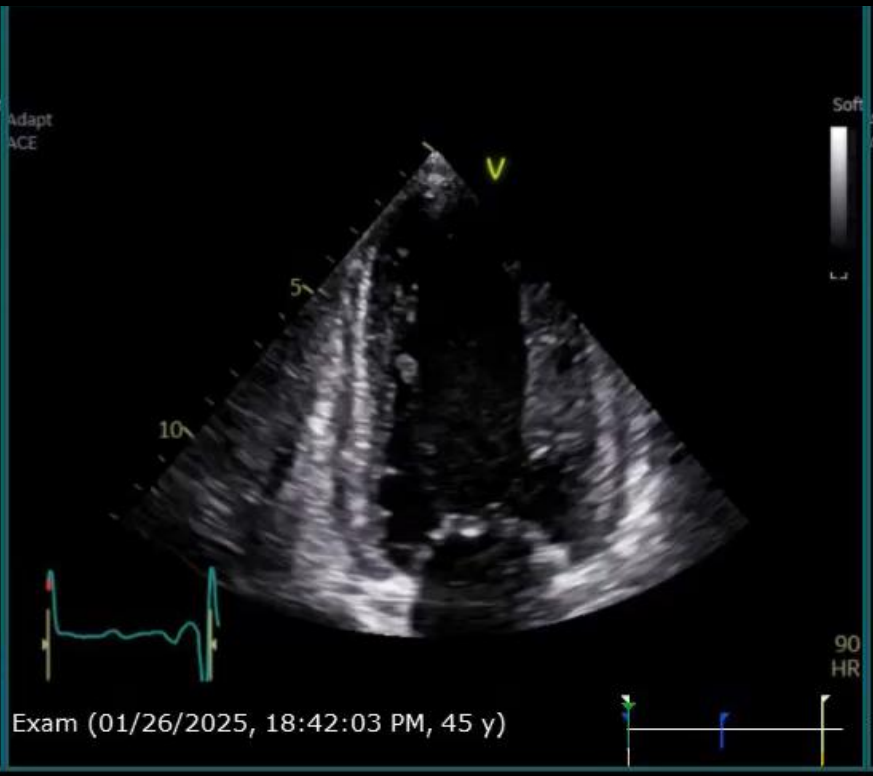


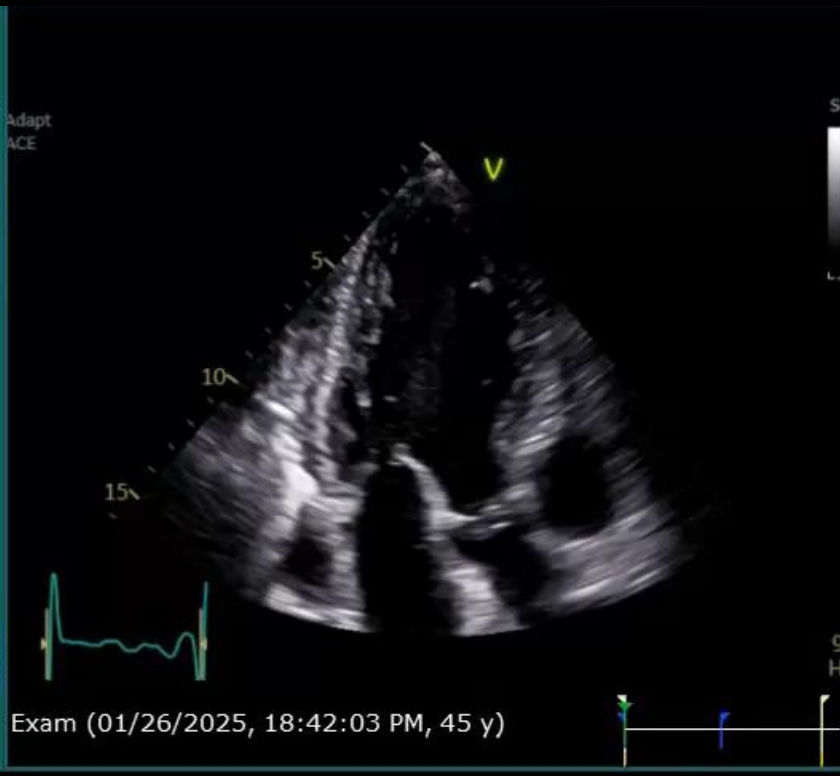
		mittel	SD	max	min
Systolisch	mmHg	117	+/- 13	146	88

45y old male:
Vollbild hypertensive Herzkrankheit



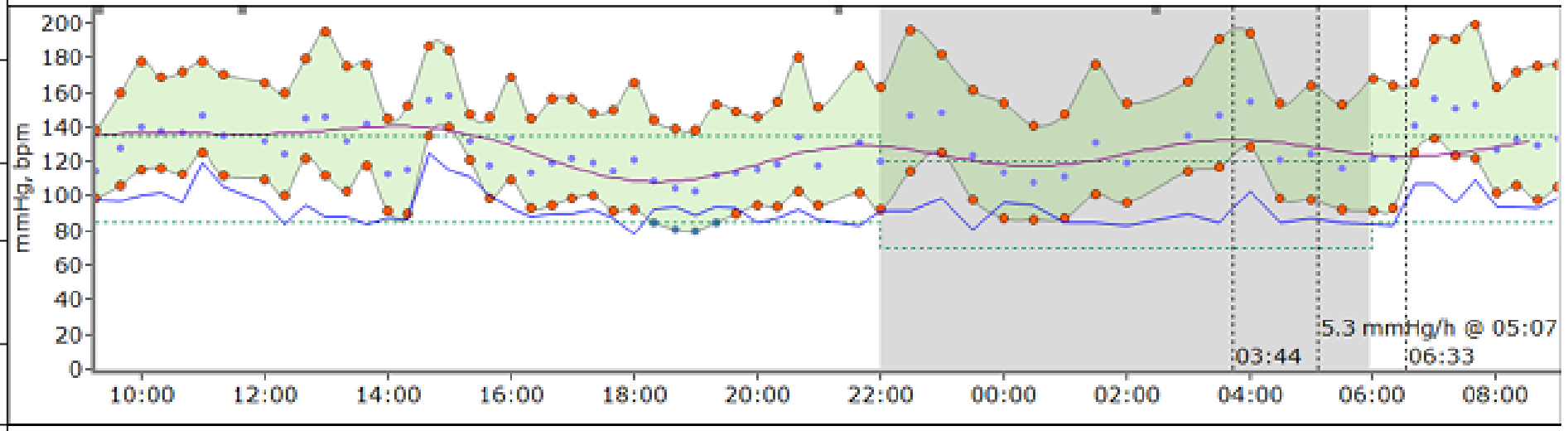

Adapt
ACE
Soft
V
5
10
95
HR
Exam (01/26/2025, 18:42:03 PM, 45 y)


Adapt
ACE
Soft
V
5
10
90
HR
Exam (01/26/2025, 18:42:03 PM, 45 y)

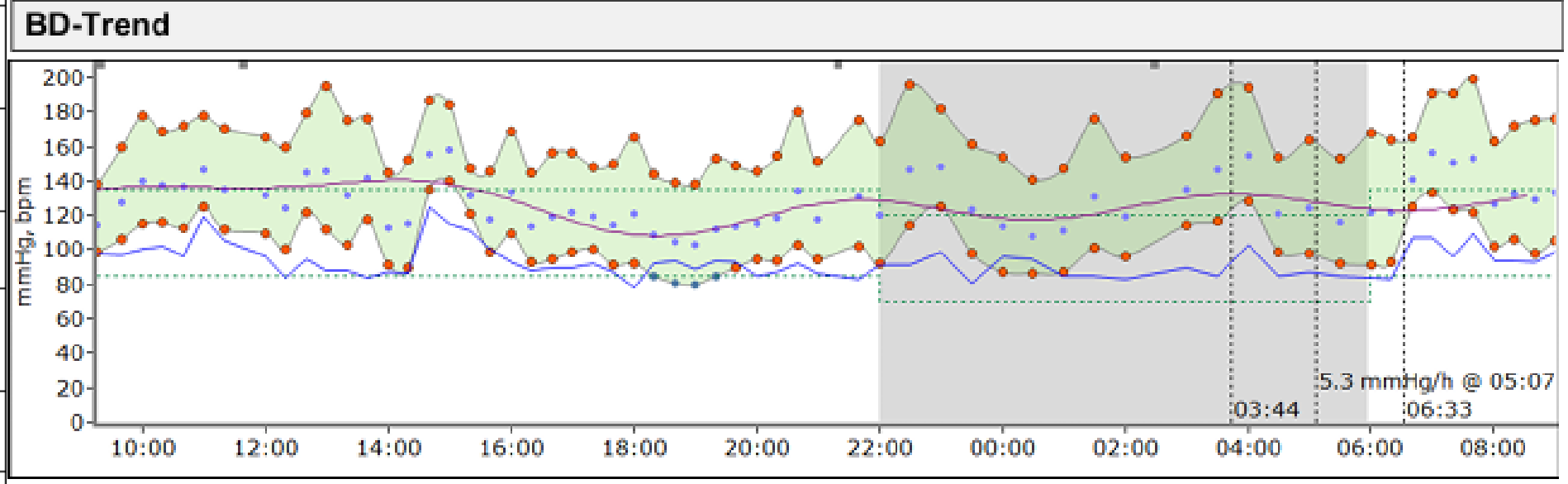

Adapt
ACE
V
5
10
15
Exam (01/26/2025, 18:42:03 PM, 45 y)

Jardiance (Filmtabl 10 mg) Blist *Empagliflozin Filmtabl (10 mg/Stk)*		1			
Aspirin Cardio (Filmtabl 100 mg) Blist *Acetylsalicylsäure Filmtabl (100 mg/Stk)*		1			
Esidrex (Tabl 25 mg) Ds *Hydrochlorothiazid Tabl (25 mg/Stk)*		½			
Aldactone (Filmtabl 50 mg) Blist *Spironolacton Filmtabl (50 mg/Stk)*		1			
Carvedilol Mepha (Tabl 25 mg) Blist *Carvedilol Tabl (25 mg/Stk)*		1		1	
Entresto (Filmtabl 200 mg) Blist *Valsartan, Sacubitril Filmtabl (102.8 mg/Stk, 97.2 mg/Stk)*		1		1	
Atorvastatin Viatris (Filmtabl 40 mg) Blist *Atorvastatin Filmtabl (40 mg/Stk)*		1			
Amlodipin Viatris (Tabl 10 mg) Blist *Amlodipin Tabl (10 mg/Stk)*		1			
Novalgin (Filmtabl 500 mg) Blist					

BD-Trend



Jardiance (Filmtabl 10 mg) Blist *Empagliflozin Filmtabl (10 mg/Stk)*		1			
Aspirin Cardio (Filmtabl 100 mg) Blist *Acetylsalicylsäure Filmtabl (100 mg/Stk)*		1			
Esidrex (Tabl 25 mg) Ds *Hydrochlorothiazid Tabl (25 mg/Stk)*		½			
Aldactone (Filmtabl 50 mg) Blist *Spironolacton Filmtabl (50 mg/Stk)*		1			
Carvedilol Mepha (Tabl 25 mg) Blist *Carvedilol Tabl (25 mg/Stk)*		1		1	
Entresto (Filmtabl 200 mg) Blist *Valsartan, Sacubitril Filmtabl (102.8 mg/Stk, 97.2 mg/Stk)*		1		1	
Atorvastatin Viatris (Filmtabl 40 mg) Blist *Atorvastatin Filmtabl (40 mg/Stk)*		1			
Amlodipin Viatris (Tabl 10 mg) Blist *Amlodipin Tabl (10 mg/Stk)*		1			
Novalgin (Filmtabl 500 mg) Blist					



Circulation
Volume 142, Issue 19, 10 November 2020; Pages 1810-1820
https://doi.org/10.1161/CIRCULATIONAHA.120.049730

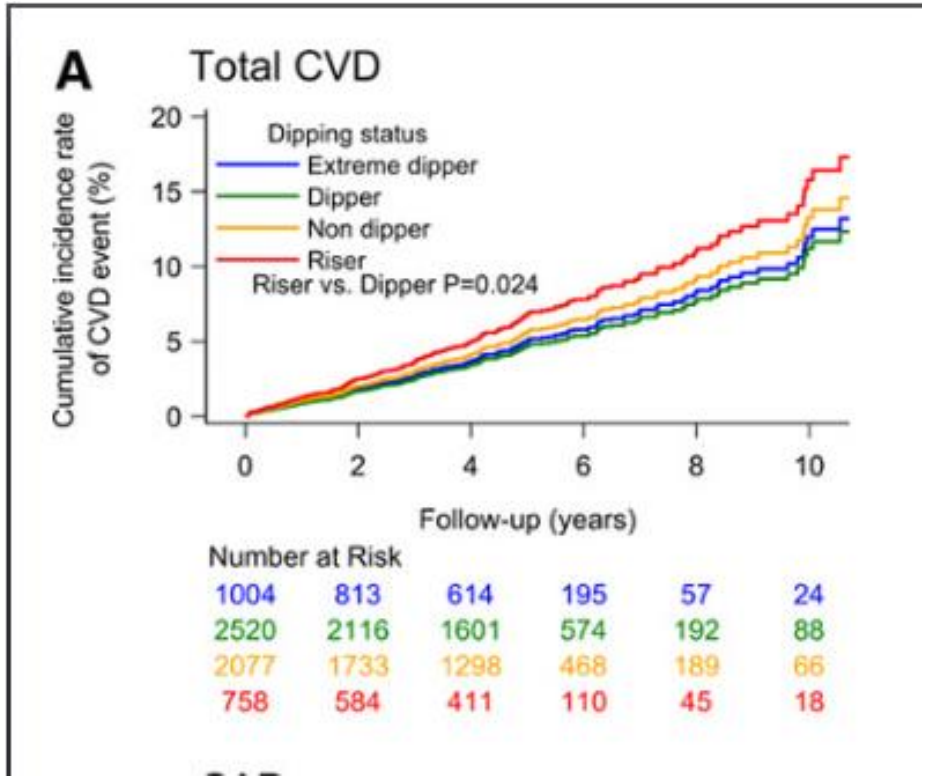
ORIGINAL RESEARCH ARTICLE

Nighttime Blood Pressure Phenotype and Cardiovascular Prognosis

Practitioner-Based Nationwide JAMP Study

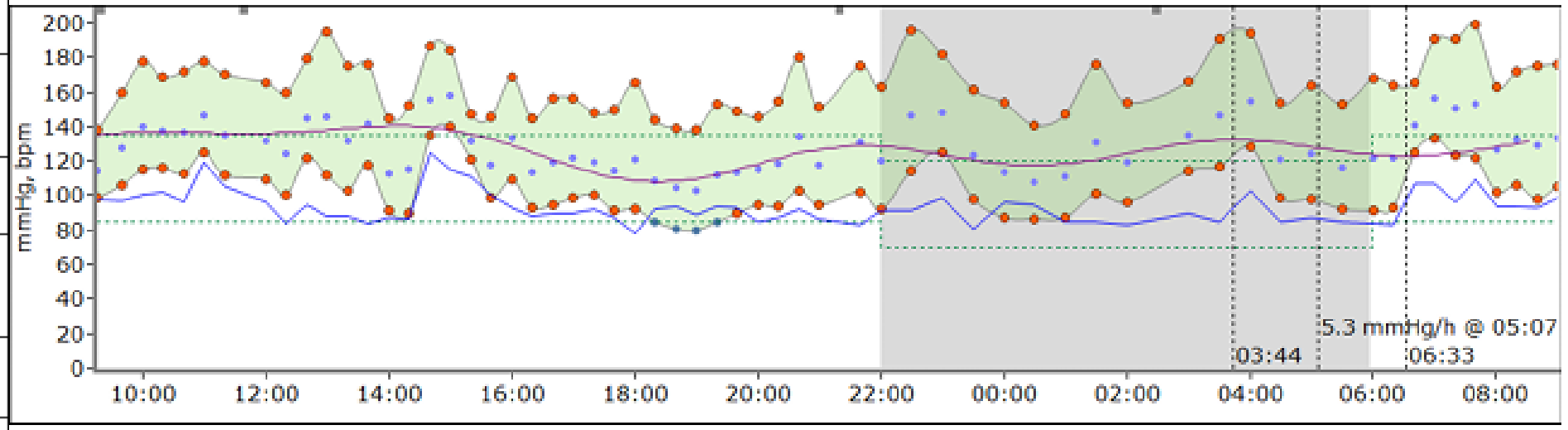
Extreme dipper:	>20%
Dipper:	10-20%
Non-dipper:	0-10%
RISER:	any increase

Schlafapnoe??



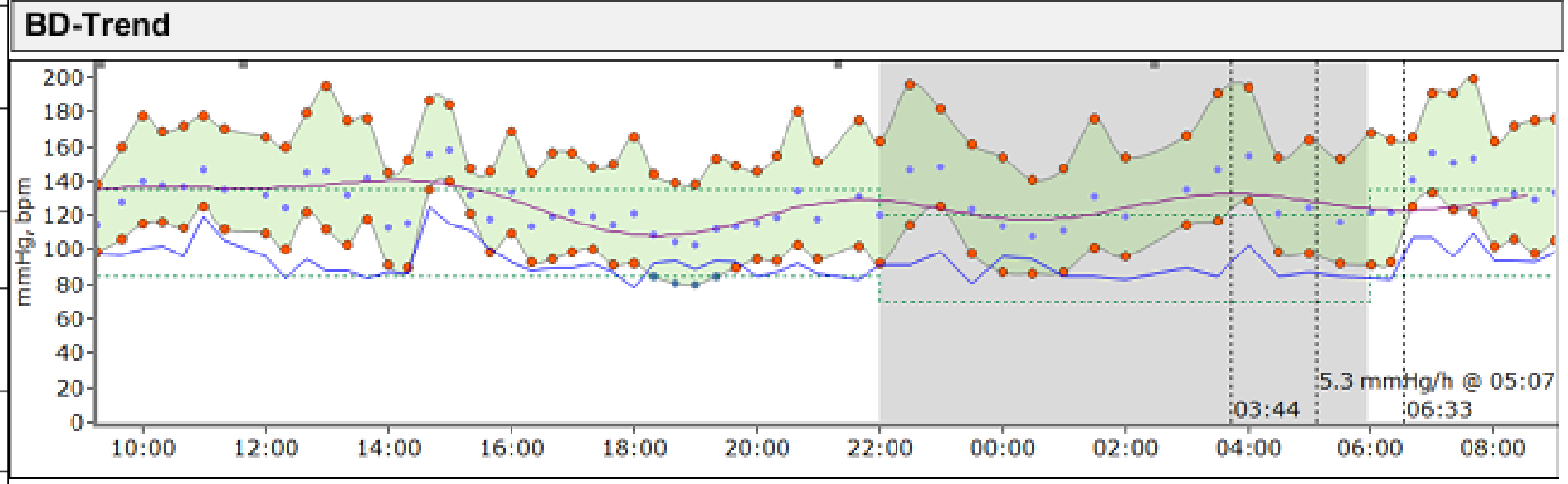
Jardiance (Filmtabl 10 mg) Blist *Empagliflozin Filmtabl (10 mg/Stk)*	1			
Aspirin Cardio (Filmtabl 100 mg) Blist *Acetylsalicylsäure Filmtabl (100 mg/Stk)*	1			
Esidrex (Tabl 25 mg) Ds *Hydrochlorothiazid Tabl (25 mg/Stk)*	½			
Aldactone (Filmtabl 50 mg) Blist *Spironolacton Filmtabl (50 mg/Stk)*	1			
Carvedilol Mepha (Tabl 25 mg) Blist *Carvedilol Tabl (25 mg/Stk)*	1		1	
Entresto (Filmtabl 200 mg) Blist *Valsartan, Sacubitril Filmtabl (102.8 mg/Stk, 97.2 mg/Stk)*	1		1	
Atorvastatin Viatris (Filmtabl 40 mg) Blist *Atorvastatin Filmtabl (40 mg/Stk)*	1			
Amlodipin Viatris (Tabl 10 mg) Blist *Amlodipin Tabl (10 mg/Stk)*	1			
Novalgin (Filmtabl 500 mg) Blist				

BD-Trend



Während Hospitalisation:

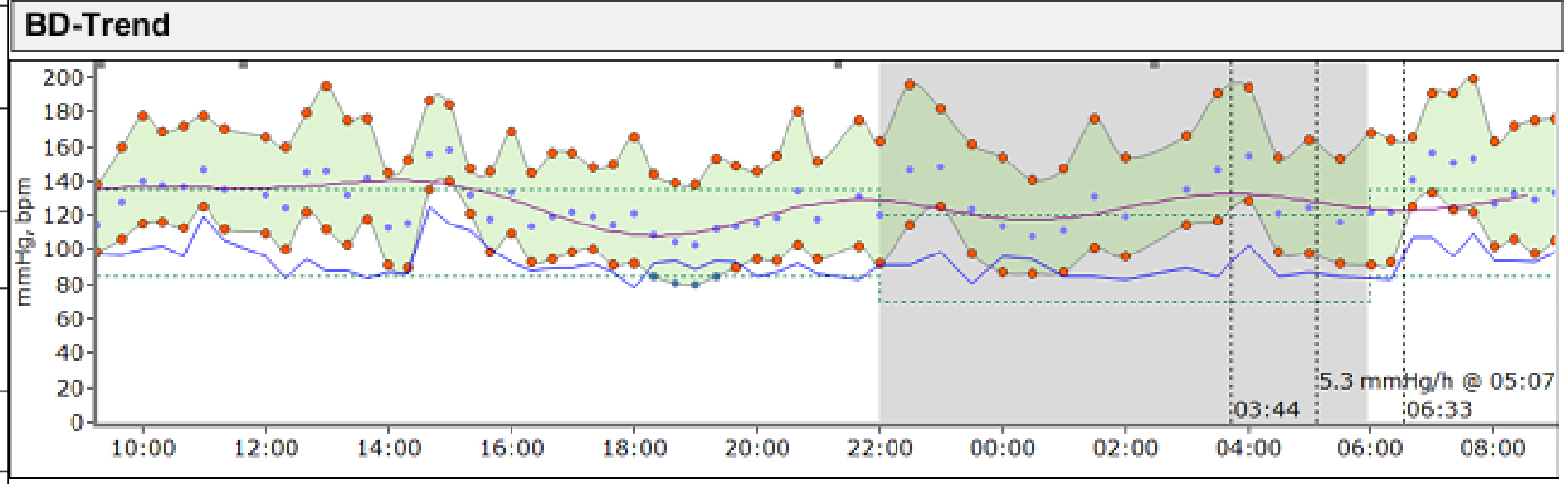
Jardiance (Filmtabl 10 mg) Blist *Empagliflozin Filmtabl (10 mg/Stk)*	1			
Aspirin Cardio (Filmtabl 100 mg) Blist *Acetylsalicylsäure Filmtabl (100 mg/Stk)*	1			
Esidrex (Tabl 25 mg) Ds *Hydrochlorothiazid Tabl (25 mg/Stk)*	½			
Aldactone (Filmtabl 50 mg) Blist *Spironolacton Filmtabl (50 mg/Stk)*	1			
Carvedilol Mepha (Tabl 25 mg) Blist *Carvedilol Tabl (25 mg/Stk)*	1		1	
Entresto (Filmtabl 200 mg) Blist *Valsartan, Sacubitril Filmtabl (102.8 mg/Stk, 97.2 mg/Stk)*	1		1	
Atorvastatin Viatris (Filmtabl 40 mg) Blist *Atorvastatin Filmtabl (40 mg/Stk)*	1			
Amlodipin Viatris (Tabl 10 mg) Blist *Amlodipin Tabl (10 mg/Stk)*	1			
Novalgin (Filmtabl 500 mg) Blist				



Während Hospitalisation:

Resistant hypertension
Malcompliance
White-coat effect?

Jardiance (Filmtabl 10 mg) Blist *Empagliflozin Filmtabl (10 mg/Stk)*	1			
Aspirin Cardio (Filmtabl 100 mg) Blist *Acetylsalicylsäure Filmtabl (100 mg/Stk)*	1			
Esidrex (Tabl 25 mg) Ds *Hydrochlorothiazid Tabl (25 mg/Stk)*	½			
Aldactone (Filmtabl 50 mg) Blist *Spironolacton Filmtabl (50 mg/Stk)*	1			
Carvedilol Mepha (Tabl 25 mg) Blist *Carvedilol Tabl (25 mg/Stk)*	1		1	
Entresto (Filmtabl 200 mg) Blist *Valsartan, Sacubitril Filmtabl (102.8 mg/Stk, 97.2 mg/Stk)*	1		1	
Atorvastatin Viatris (Filmtabl 40 mg) Blist *Atorvastatin Filmtabl (40 mg/Stk)*	1			
Amlodipin Viatris (Tabl 10 mg) Blist *Amlodipin Tabl (10 mg/Stk)*	1			
Novalgin (Filmtabl 500 mg) Blist				



Während Hospitalisation:

Resistant hypertension
Malcompliance
White-coat effect?

Gute BD-Kontrolle unter Medi-Abgabe Apotheke
Nach 6 Monaten wiederum Malcompliance
Ad renale Denervation

Anzahl Medikamente ist der wichtigste RF für Noncompliance

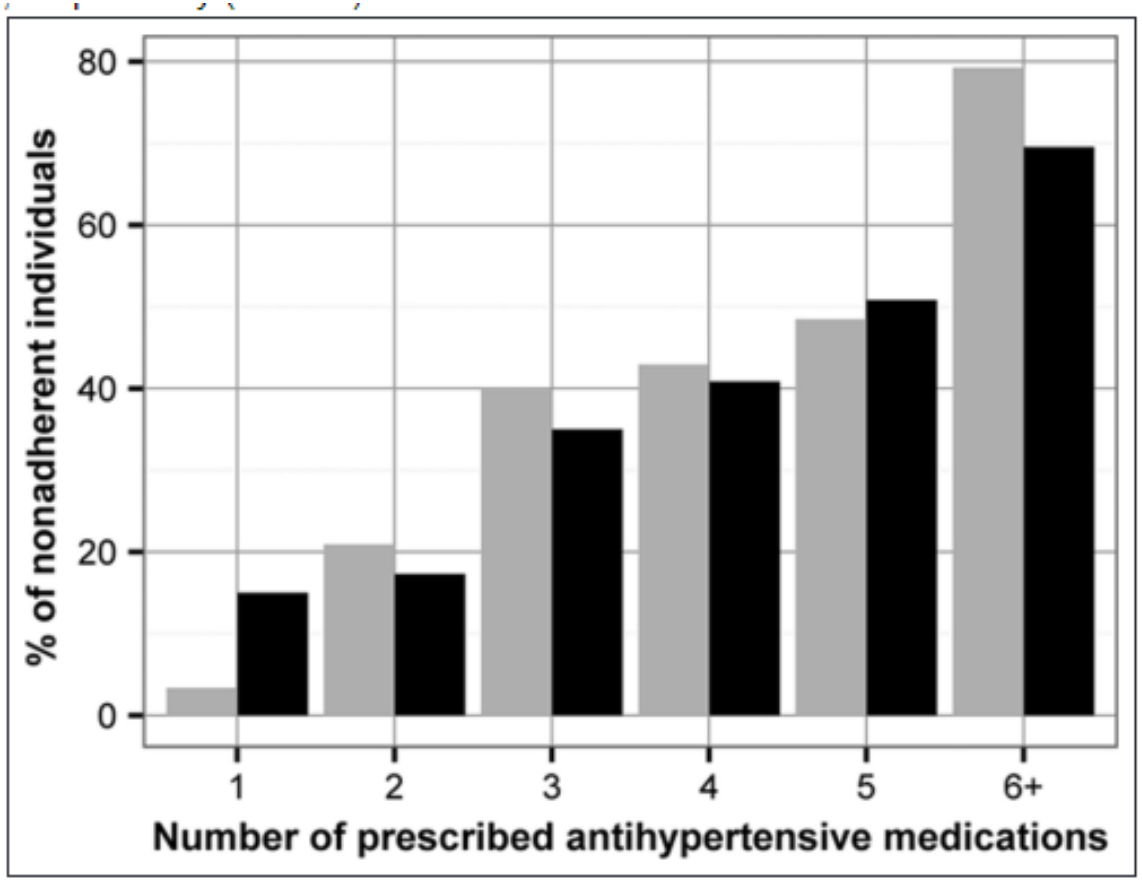


Figure 1. Association between the number of prescribed antihypertensive medications and the risk of nonadherence by population (gray, United Kingdom; black, Czech Republic).

Gupta et al Hypertension 2017

Malcompliance?

60% der BD-Senkung mit ¼ der Maximaldosis!

Ramipril 2.5mg
Amlodipin 2.5mg
Concor 2.5mg
Indapamid 0.625mg
….

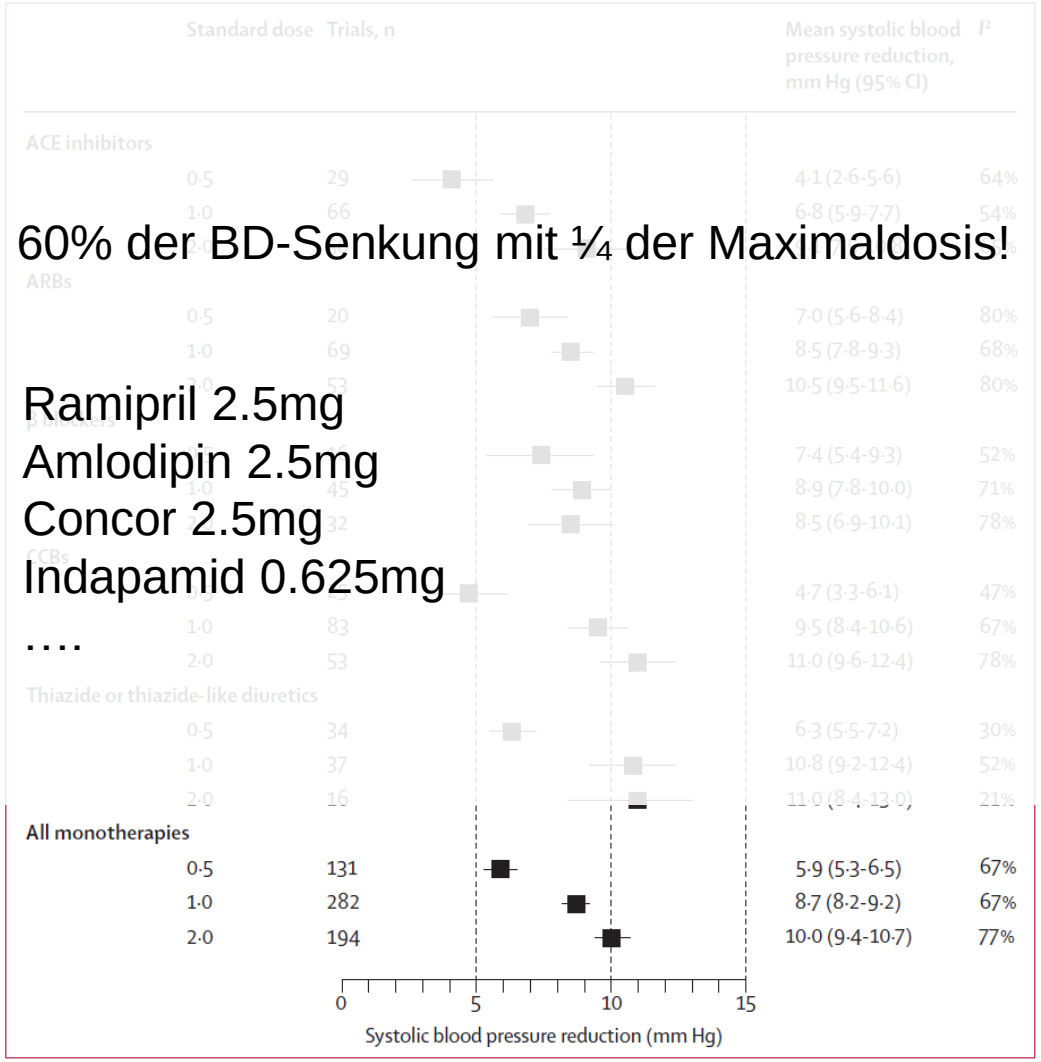


Figure 1: **Mean placebo-corrected systolic blood pressure reductions by drug class and dose**
Boxes represent mean values, and whiskers represent 95% CIs. Estimates are standardised to a baseline systolic blood pressure of 154 mm Hg. ACE=angiotensin-converting enzyme. ARB=angiotensin II receptor blocker. CCB=calcium channel blocker.

Bpmodel.org

		None	Losartan		Lisinopril		Metoprolol	
Hydrochlorothiazide	Amlodipine	0 mg	50 mg	100 mg	10 mg	20 mg	50 mg	100 mg
0 mg	0 mg		7 (6–8)	8 (7–9)	7 (6–8)	10 (7–11)	7 (5–8)	7 (6–8)
0 mg	5 mg	9 (8–10)	15 (13–16)	16 (14–17)	15 (13–16)	18 (15–19)	15 (13–16)	15 (14–17)
0 mg	10 mg	12 (10–15)	18 (15–19)	19 (16–21)	18 (16–20)	21 (17–22)	18 (16–20)	18 (16–21)
12·5 mg	0 mg	6 (5–7)	12 (11–13)	13 (12–14)	12 (11–13)	15 (13–16)	12 (11–13)	12 (11–14)
12·5 mg	5 mg	14 (13–15)	19 (17–20)	20 (18–21)	20 (18–21)	22 (19–24)	19 (17–21)	20 (17–21)
12·5 mg	10 mg	17 (15–19)	22 (19–24)	23 (20–25)	22 (20–24)	25 (21–27)	22 (19–24)	22 (19–24)
25 mg	0 mg	8 (7–9)	14 (12–15)	15 (13–16)	14 (12–15)	17 (15–18)	14 (12–15)	14 (12–15)
25 mg	5 mg	16 (14–17)	21 (19–22)	22 (19–23)	21 (19–22)	24 (21–25)	21 (19–22)	21 (18–23)
25 mg	10 mg	19 (17–21)	23 (20–25)	24 (21–26)	24 (21–25)	26 (22–28)	23 (20–25)	23 (20–25)

Efficacy
Low intensity Moderate intensity High intensity

90% der Patienten mit 1 Tablette/Tag eingestellt

Start Kombination gemäss Bpmodel.org

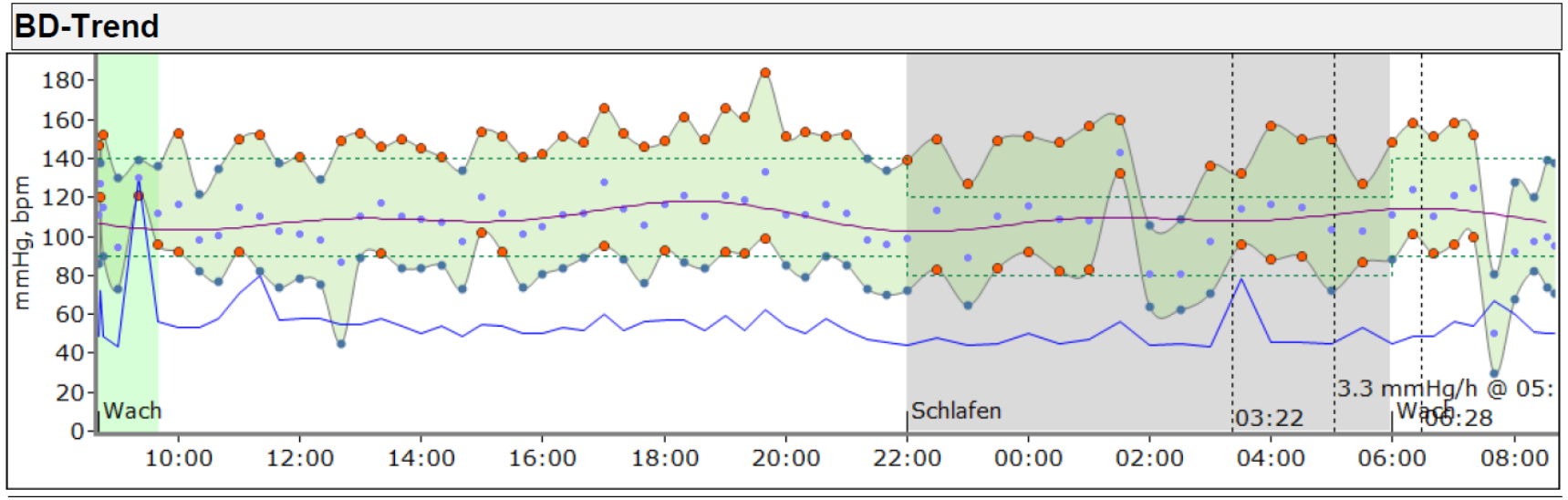
Bessere Compliance, weniger Frust beim Patient!

Wang et al Lancet 2025

Malcompliance?

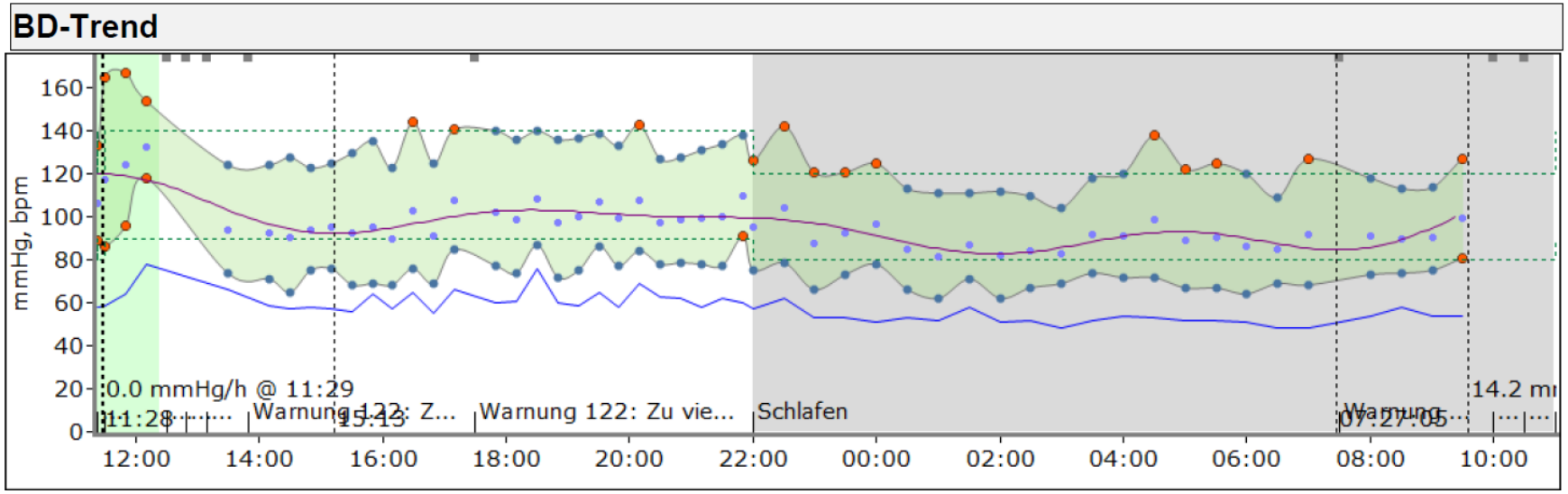
59-jähriger Patient
KHK x2
Coveram Plus und Aldactone
Indikation: <u>Resistant hypertension</u>

SBP über 24h: 144mmHg
(<130mmHg)



24h-BD
<u>Medi-Einnahme unter Aufsicht!</u>

SBP über 24h: 126mmHg
(<130mmHg)



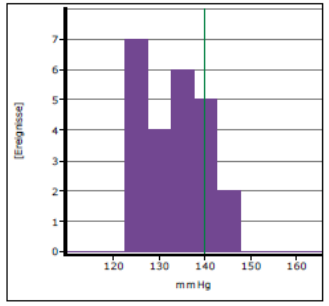
Die letzte Seite?

Stadtspital Zürich

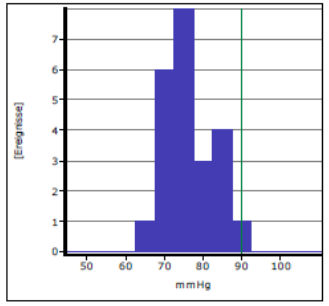
11460248
Blechschmidt,Dirk

BD-Histogramme

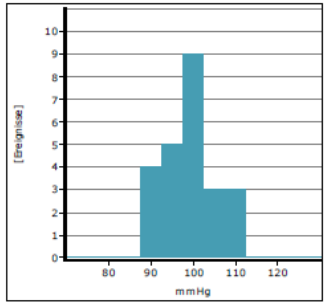
Systolisch Wach



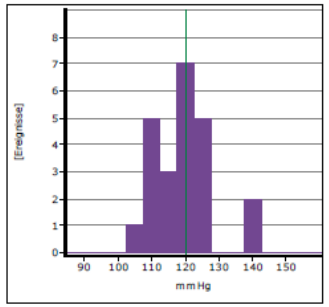
Diastolisch Wach



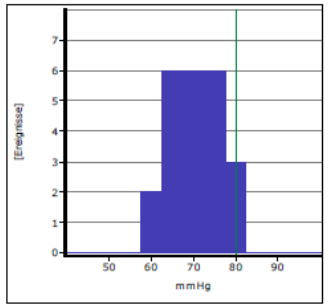
MAD Wach



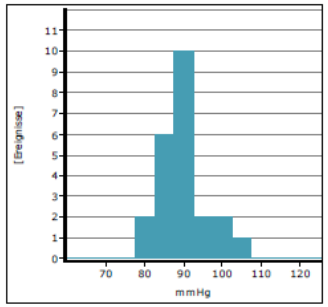
Systolisch Schlaf



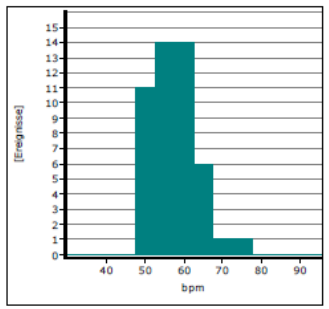
Diastolisch Schlaf



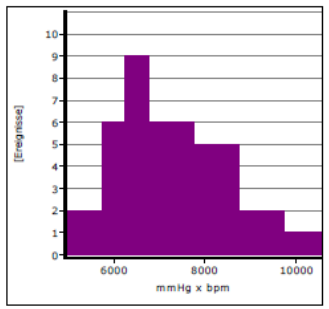
MAD Schlaf



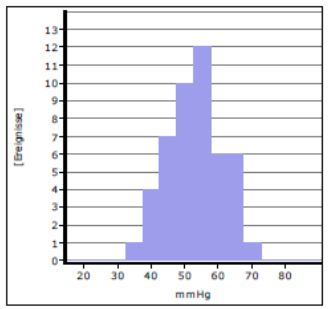
HF Gesamt



RPP Gesamt



PD Gesamt



Die letzte Seite?

Stadtspital Zürich

11460248
Blechschmidt,Dirk

BD-Histogramme

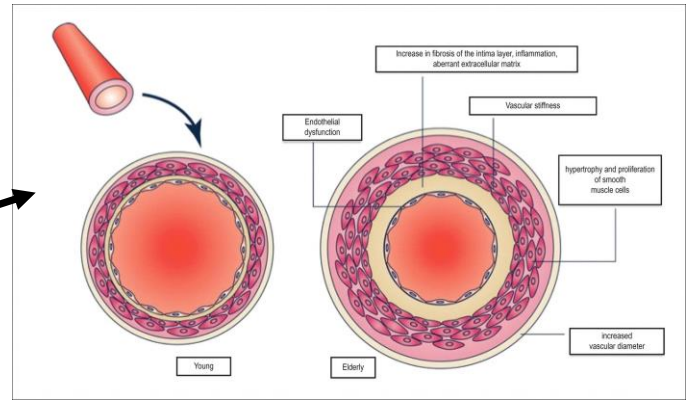
Systolisch Wach | Diastolisch Wach | MAD Wach

Systolisch Schlaf | Diastolisch Schlaf | MAD Schlaf

HF Gesamt | RPP Gesamt | PD Gesamt

RPP: rate pressure product
BD x HF
≈ oxygen consumption

Pulsdruck ≈ arterial stiffness

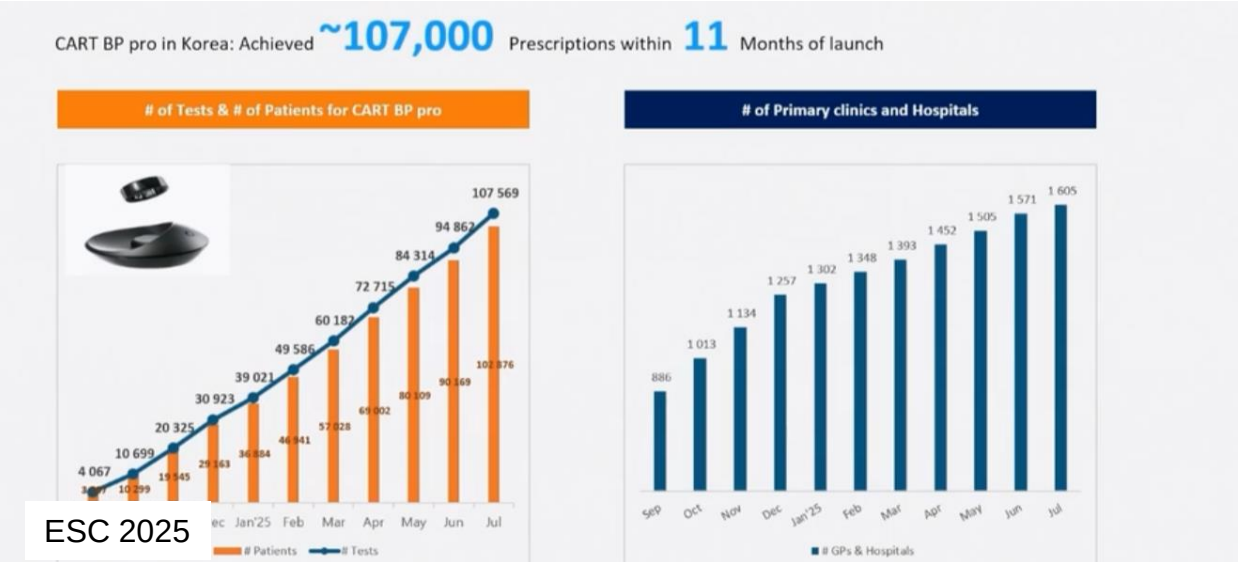


wearables

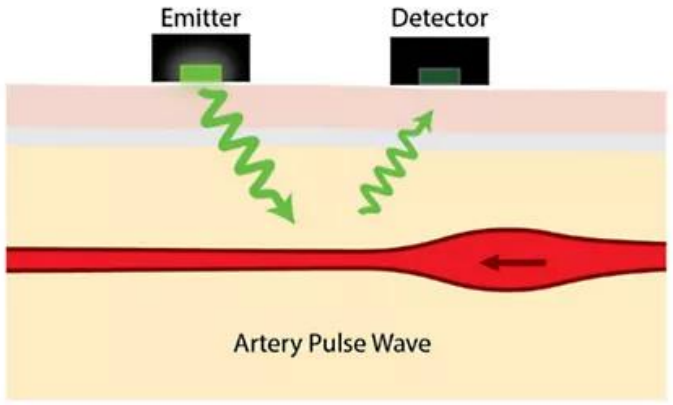
cuffless (manschettenlose) Wearables

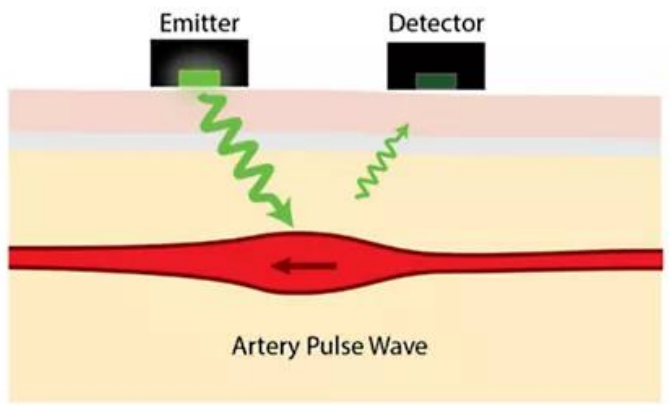
CART (Sky Labs)
Südkorea (entering the market)

HILO Band (Aktiia)
Neuchatel



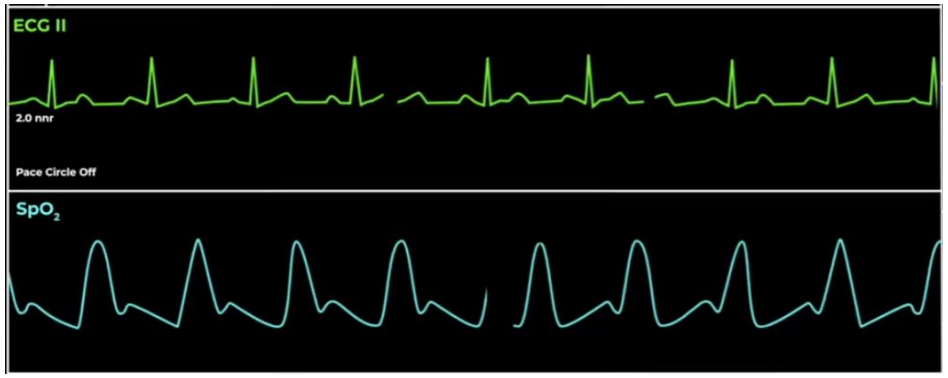
Photoplethysmographie

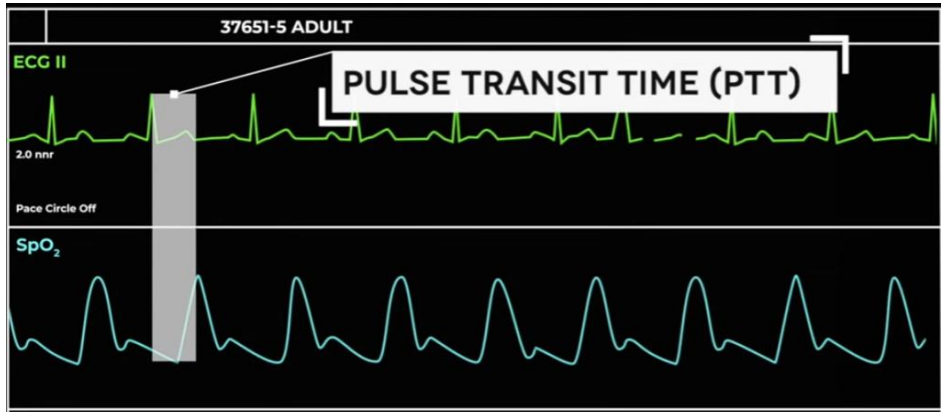


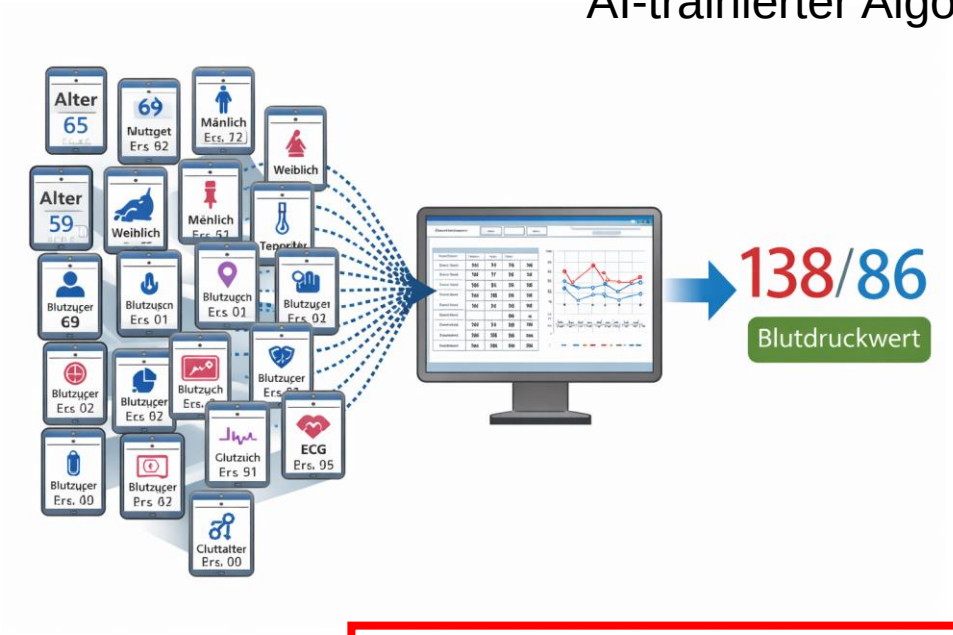


58 Datenpunkte PPS
- Shape of the curve
- Pulse transit time
- etc

Daten über Patienten
Kalibration
AI-trainierter Algorhythmus







Keine BD-Messung
Vorhersage des Blutdruckes!

Genauigkeit???

ISO-NORM:
Difference of mean BP <5mmHg
Standard deviation <8mmHg

CART BP demonstrates close agreement with ABPM, meeting accuracy criteria for mean BP difference

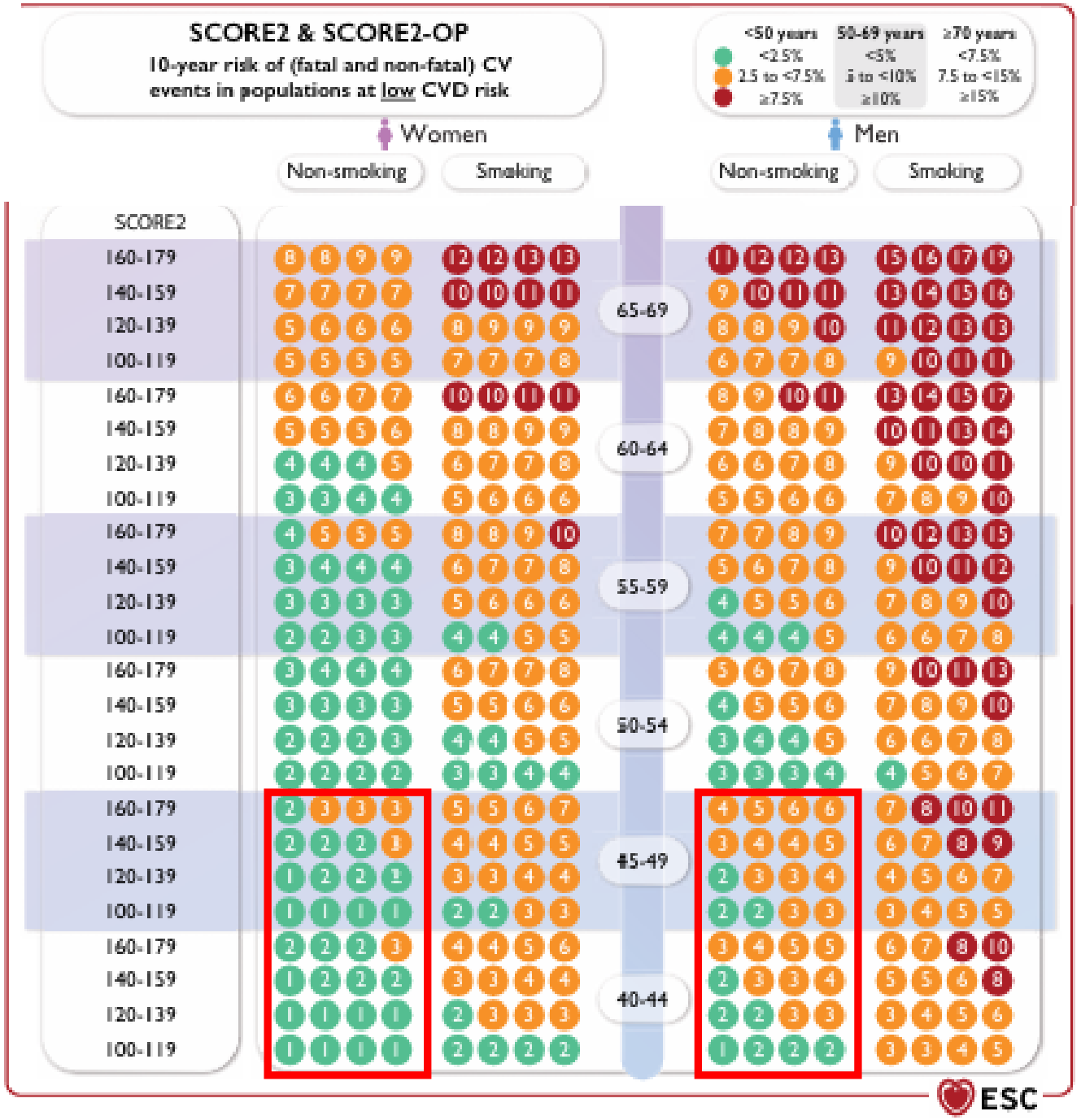
Time period	SBP	DBP
24 hour	-0.13 ± 7.21	-1.23 ± 4.54
Awake	-0.42 ± 7.44	-1.78 ± 4.44
Asleep	-2.16 ± 7.87	-1.69 ± 6.36
Daytime – Nighttime BP Change	**-1.74 ± 6.47**	**0.08 ± 5.84**

Mean ± SD of difference between CART and ABPM (ISO criteria 5 ±8mmHg)

Longevity trend

Typical user of wearables with focus on longevity:

- 40 to 50 years old
- Healthy lifestyle
- Non smoker



21:53 5G

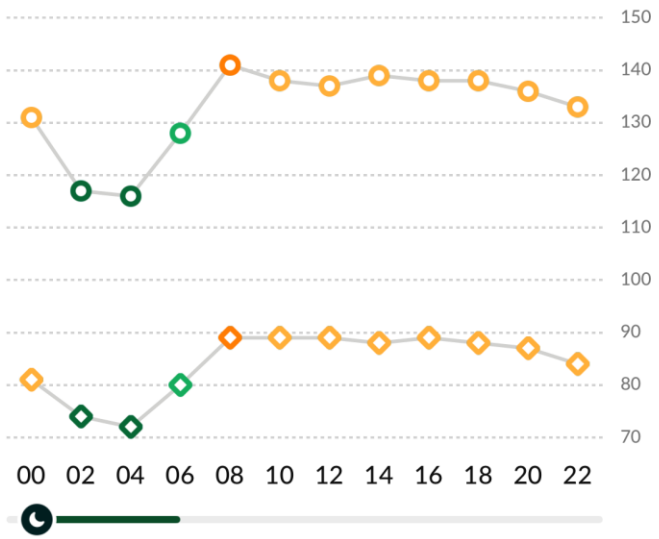
Blutdruck

Tag | Woche | Monat

Di., 24 März

Durchschnitt von 38 Messungen

133 Sys 113-146 / 84 Dia 67-93 mmHg



Tag 138/87

Nacht 120/74

25% im Zielbereich

Der ideale Blutdruckbereich liegt unter 130/85

60 BPM

Deine durchschnittliche Ruheherzfrequenz

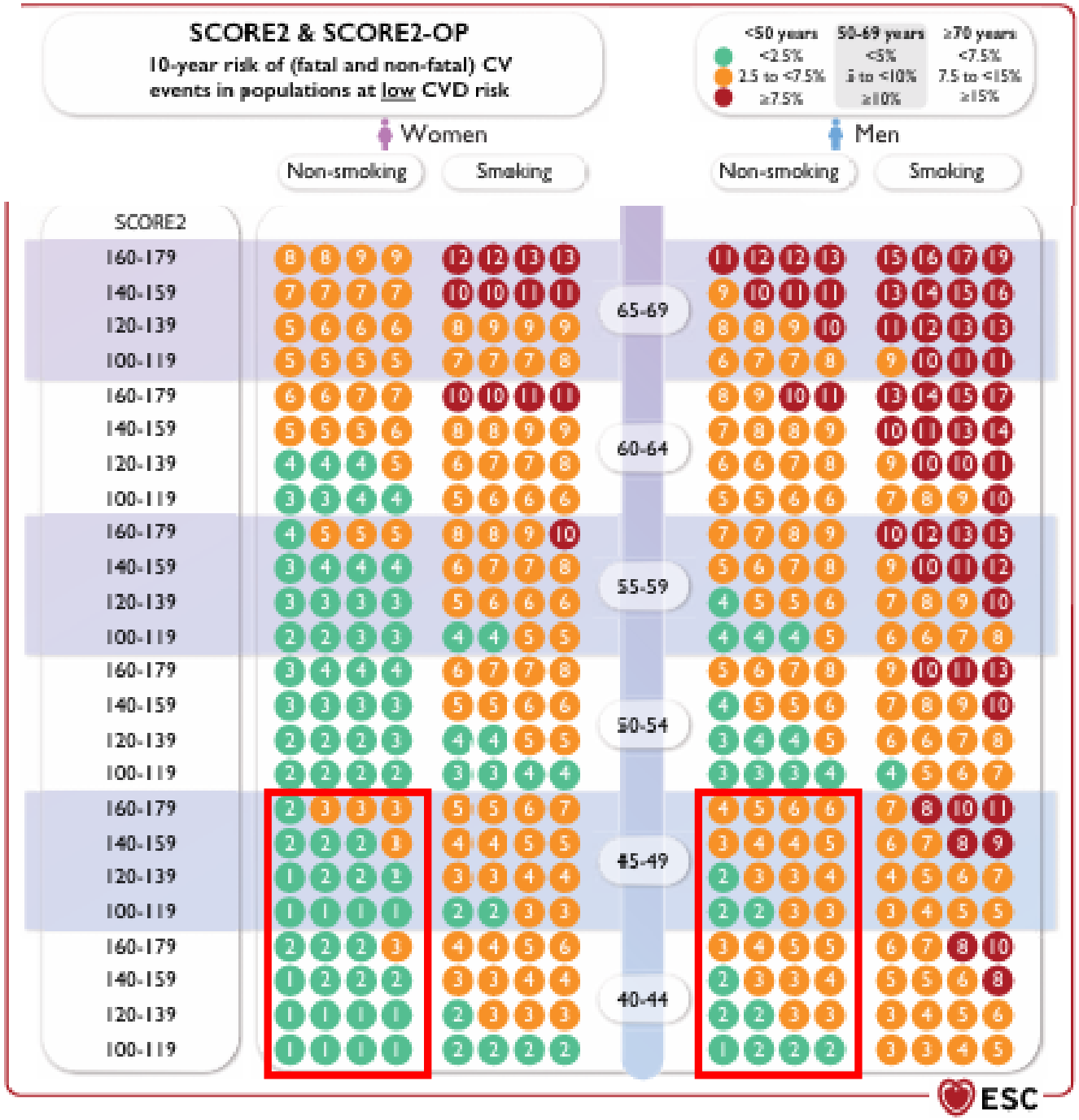
Typical user of wearables with focus on longevity:

- 40 to 50 years old
- Healthy lifestyle
- Non smoker

FEAR >>>> RISK

10y risk 1-6%:
NNT for 5% risk: 40 over 10 years

Pills to prevent 1 MACE: 150.000



Wo könnten solche wearables zum Einsatz kommen?

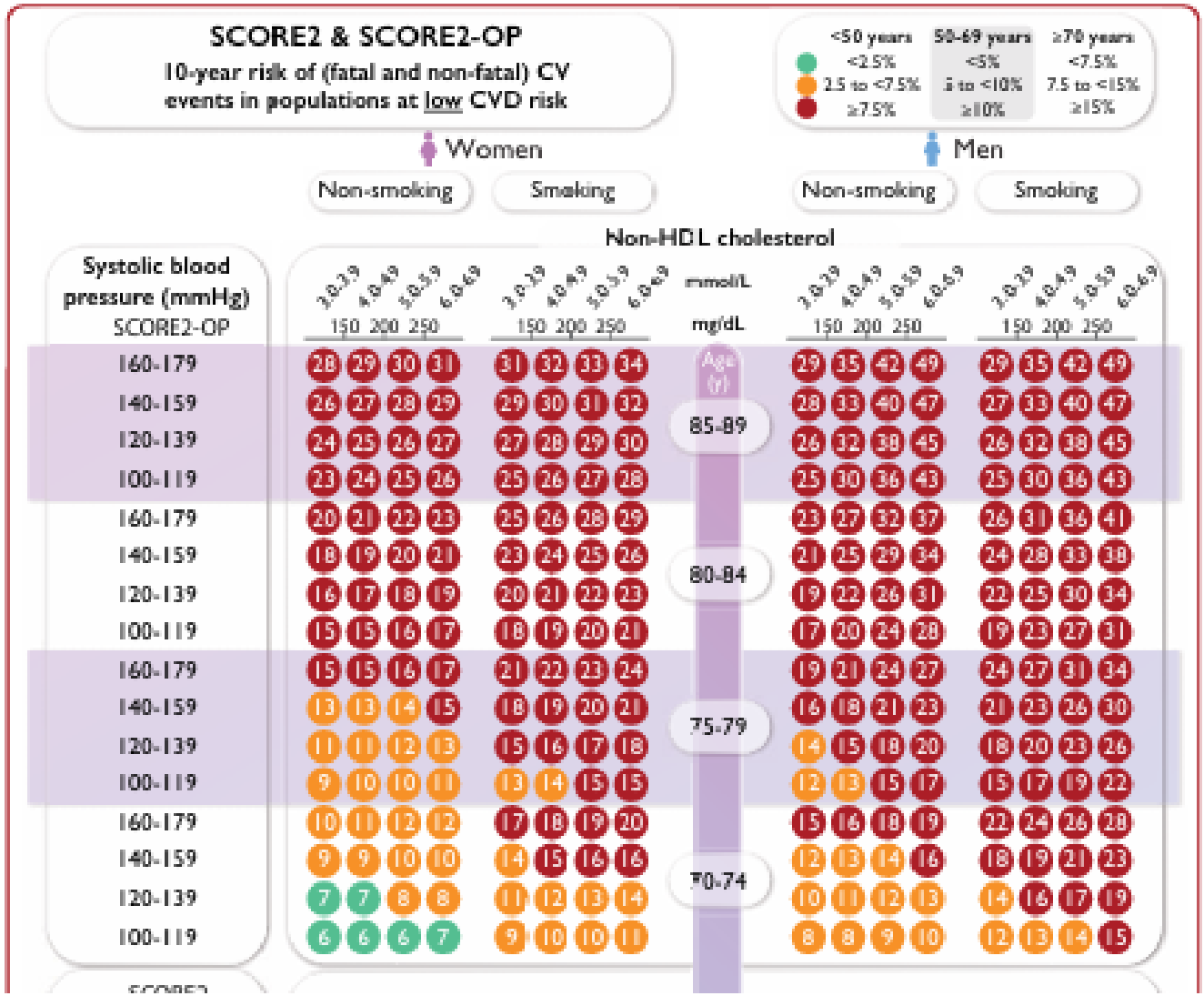
Angenehme 24h-Blutdruckmessung

Wo könnten solche wearables zum Einsatz kommen?

High cardiovascular risk

Secondary prevention

Highly competent patients



The downsides…

Cost:
209 SFR +
119 SFR/Jahr

Regular
calibration needed

Special
populations?