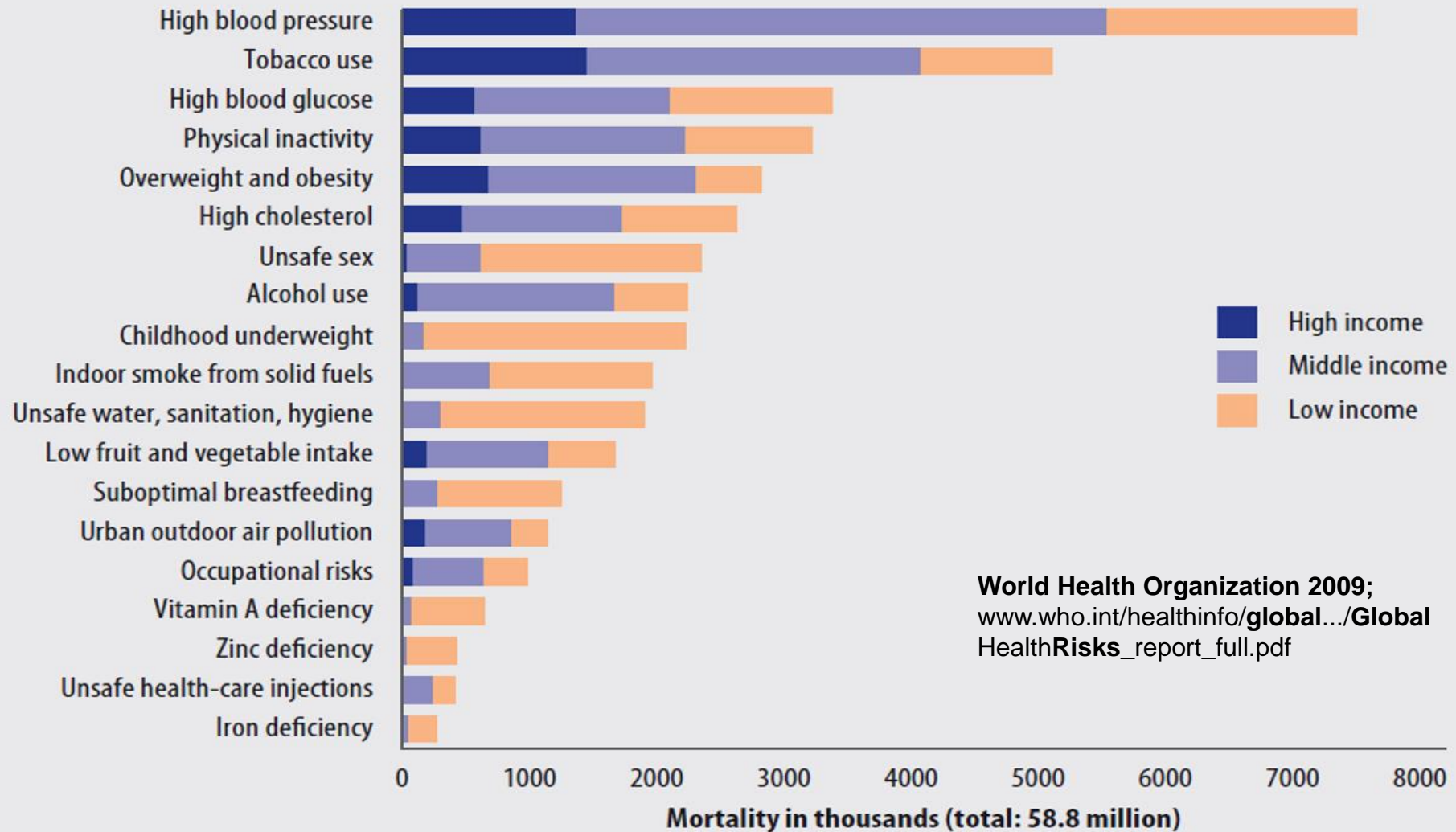


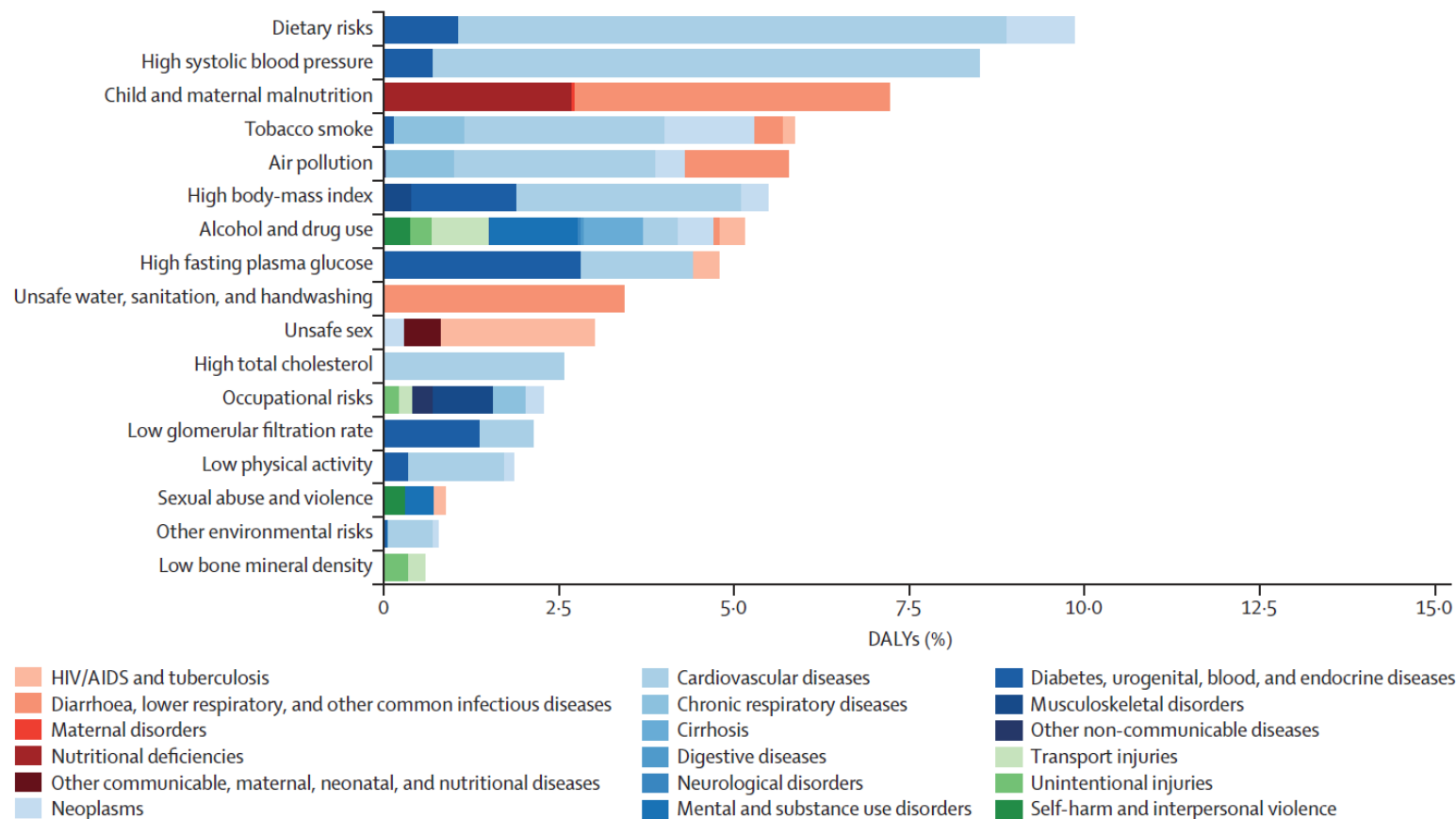
Learning objectives

1. Identify a high risk hypertensive, and the blood pressure target
2. Describe how to measure blood pressure to inform treatment decisions
3. Describe an approach to managing resistant hypertension including when to refer to a hypertension specialist

Global Health Risks: Mortality and Burden of Disease Attributable to Selected Major Risks

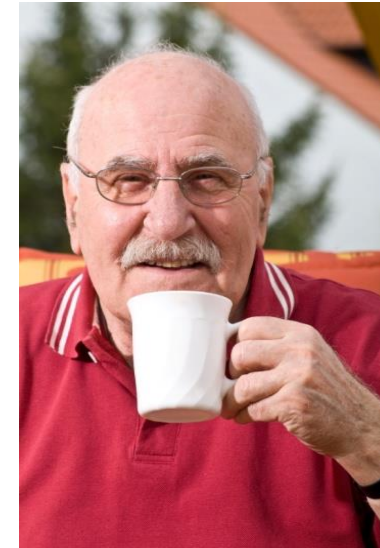
Figure 6: Deaths attributed to 19 leading risk factors, by country income level, 2004.





GBD 2013 Risk Factors Collaborators Lancet 2016; 386: 2287–323 Global, regional, and national comparative risk assessment of 79 behavioural, environmental and occupational, and metabolic risks or clusters of risks in 188 countries, 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013

Management of Hypertension in Non-diabetes Patients with Chronic Kidney Disease



Gerald

An 78-year-old man with a 20 year history of hypertension is found to have a creatinine of 140 $\mu\text{mol/L}$ on his most recent blood tests

- Height: 183 cm
- Weight: 85 kg
- BMI: 25.4 kg/m²
- BP (left arm, seated):
136/72 mmHg using an
automated device,
unattended
No postural drop
- Pulse: 78 regular
- No murmurs, no gallops
- No bruits
- No edema
- Lungs clear on chest exam
- Peripheral pulses reduced

- Candesartan 16/HCTZ 12.5 mg OD
- Amlodipine 2.5 mg OD
- Atorvastatin 40 mg OD

- What is Gerald's BP target?

What is the blood pressure target (mmHg) for Gerald?

- a) < 120/80
- b) < 130/80
- c) < 140/90

a) < 120/80

- <120/80 mmHg
- Correct

Treatment Targets: Hypertension and CKD

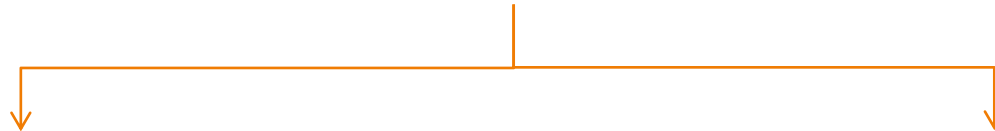
- The SPRINT study included a renal subgroup demonstrating that the lower BP target resulted in improved CV outcomes
- Renal outcomes were not improved and there were more people with rises in creatinine and in acute kidney injury

SPRINT Design

Examine effect of more intensive high blood pressure treatment
than is currently recommended



Randomized controlled trial
Target systolic blood pressure
N = 9,361

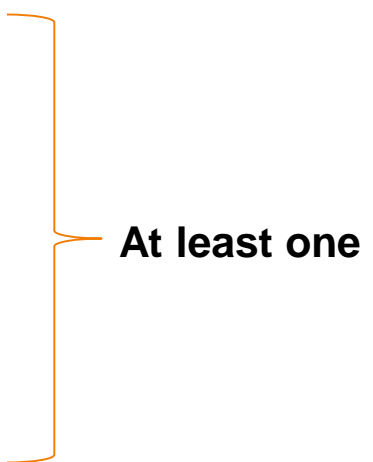


Intensive treatment
Target SBP <120 mm Hg
N = 4,678

Standard treatment
Target SBP <140 mm Hg
N = 4,683

ITT analysis

Major inclusion criteria

- ▶ ≥50 years old
 - ▶ Systolic blood pressure: 130-180 mm Hg (treated or untreated)
 - ▶ Additional cardiovascular disease risk:
 - Clinical or subclinical CVD (excluding stroke)
 - Framingham Risk Score for 10-year CVD risk ≥ 15%
 - **Chronic kidney disease, defined as eGFR 20-<60 ml/min/1.73m²**
 - **Age ≥ 75 years**
- 
- At least one

Major exclusion criteria

- ▶ **Stroke**
- ▶ **Diabetes mellitus**
- ▶ Polycystic kidney disease
- ▶ Congestive heart failure (symptoms or EF <35%)
- ▶ Proteinuria >1g/d
- ▶ CKD with eGFR <20 ml/min/1.73m² (MDRD)
- ▶ Adherence concerns

Primary outcome & primary hypothesis

▶ Primary outcome:

- CVD composite: 1st occurrence of:
 - Myocardial infarction (MI)
 - Acute coronary syndrome (non-MI ACS)
 - Stroke
 - Acute decompensated heart failure (HF)
 - Cardiovascular disease death

▶ Primary hypothesis*:

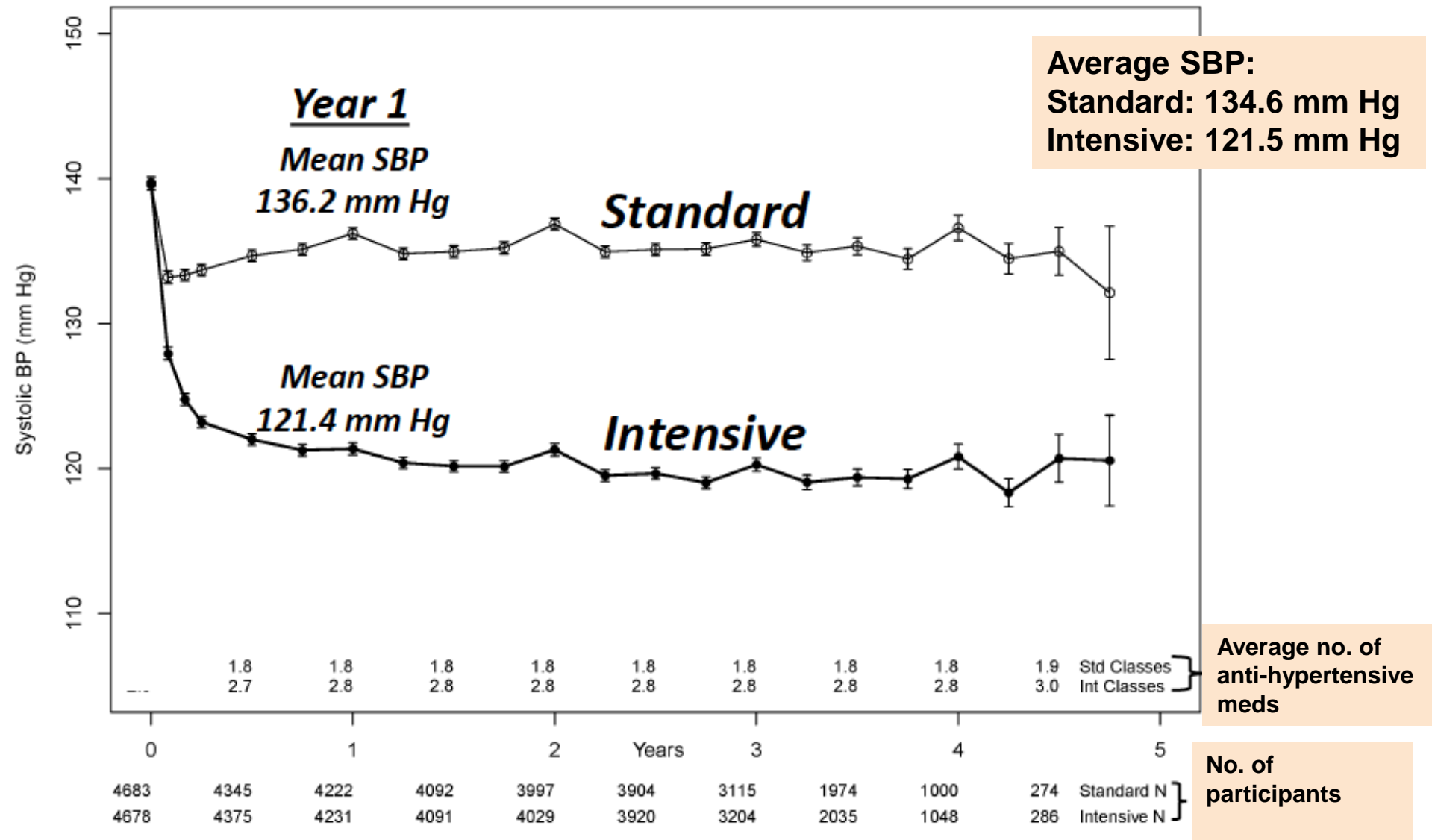
- CVD composite event rate lower in the intensive compared to standard treatment

* Estimated power of 88.7% to detect a 20% difference

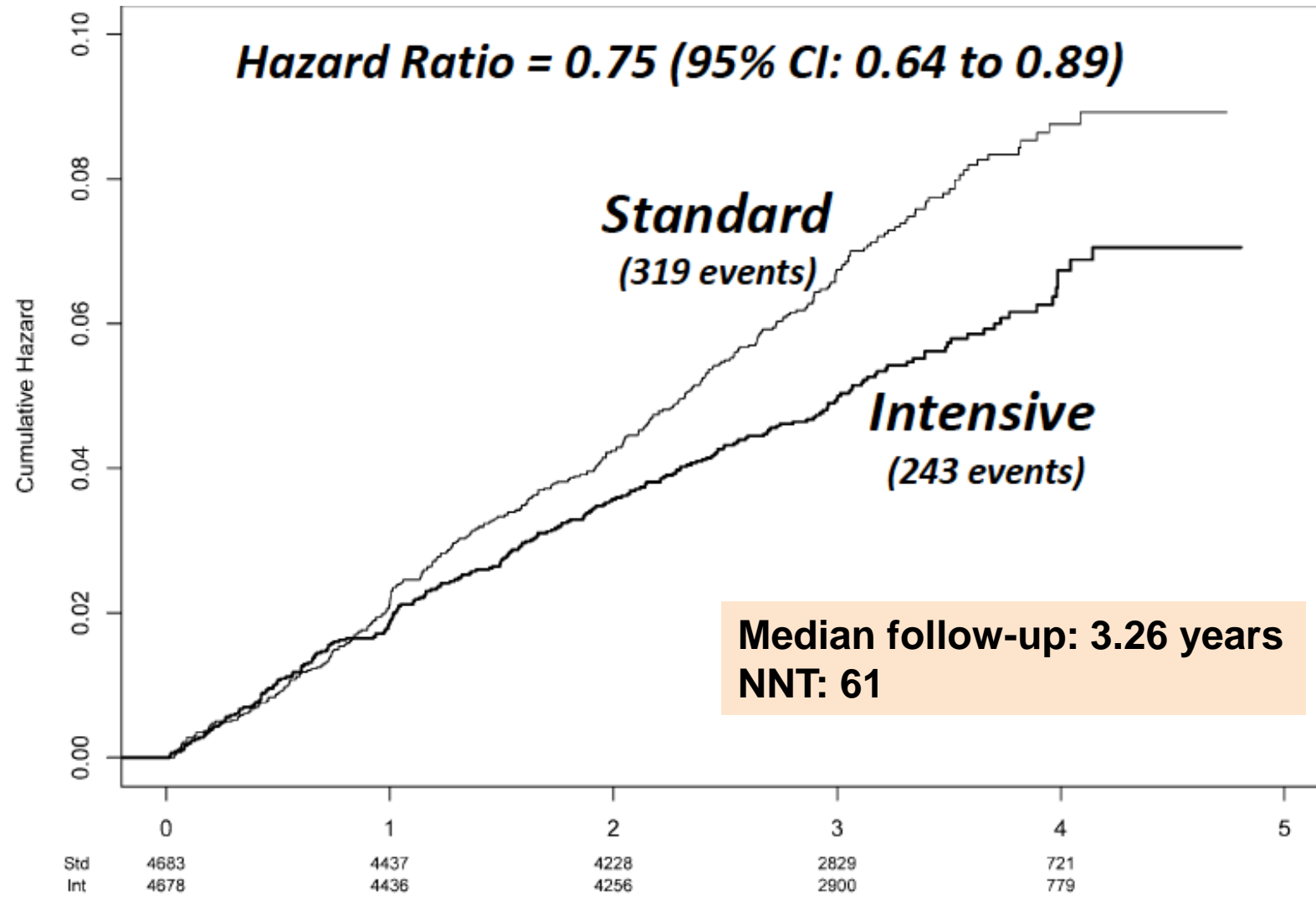
- Based on recruitment of 9,250 participants, 4-6 years of follow-up and loss to follow-up of 2%/year

- Sprint MIND – To prevent Dementia

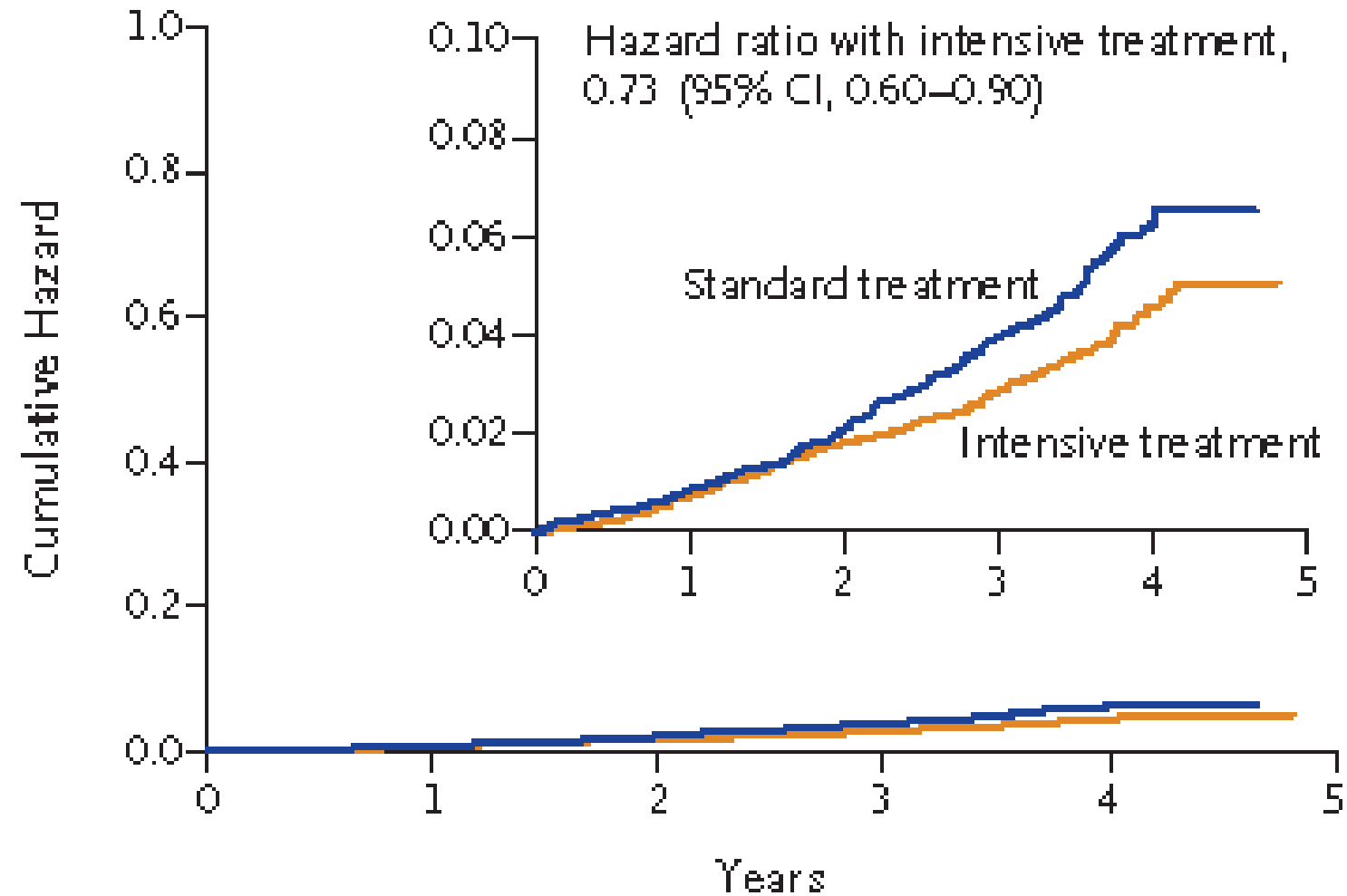
Systolic BP during follow up



Primary outcome – cumulative hazard



B Death from Any Cause



No. at Risk

Standard treatment	4683	4528	4383	2998	789
Intensive treatment	4678	4516	4390	3016	807

Serious adverse events* (SAE)

Number (%) of participants			
All SAE reports	Intensive	Standard	HR (P value)
	1,793 (38.3)	1,736 (37.1)	1.04 (0.25)
SAEs associated with specific conditions of interest			
Hypotension	110 (2.4)	66 (1.4)	1.67 (0.001)
Syncope	107 (2.3)	80 (1.7)	1.33 (0.05)
Injurious fall	105 (2.2)	110 (2.3)	0.95 (0.71)
Bradycardia	87 (1.9)	73 (1.6)	1.19 (0.28)
Electrolyte abnormality	144 (3.1)	107 (2.3)	1.35 (0.020)
Acute kidney injury or acute renal failure	193 (4.1)	117 (2.5)	1.66 (<0.001)

* Fatal or life threatening event, resulting in significant or persistent disability, requiring or prolonging hospitalization, or judged important medical event.



Usual Office BP Threshold Values for Initiation of Pharmacological Treatment

Population	SBP	DBP
High Risk (SPRINT population)	≥ 130	<u>NA</u>
Diabetes	≥ 130	≥ 80
Moderate-to-high risk (TOD or CV risk factors)*	≥ 140	≥ 90

TOD = target organ damage

***AOBP threshold > 135/85**



Recommended Office BP Treatment Targets

Treatment consists of health behaviour ± pharmacological management

Population	SBP	DBP
High Risk (SPRINT)	<120	NA
Diabetes	< 130	< 80
All others (including CKD)*	< 140	< 90

* Target BP with AOBP < 135/85



New thresholds/targets for the high risk patient post- **SPRINT: *who does this apply to??***

- Clinical or sub-clinical cardiovascular disease
OR
- Chronic kidney disease (non-diabetic nephropathy, proteinuria <1 g/d,
*estimated glomerular filtration rate 20-59 mL/min/1.73m²)
OR
- †Estimated 10-year global cardiovascular risk ≥15%
OR
- Age ≥ 75 years

Patients with one or more clinical indications should consent to intensive management.

* Four variable MDRD equation

† Framingham Risk Score, D'Agastino, Circulation 2008



New Guideline post-SPRINT

For high-risk patients, aged ≥ 50 years, with systolic BP levels ≥ 130 mm Hg, intensive management to target a systolic BP ≤ 120 mm Hg should be considered.

Intensive management should be guided by automated office BP measurements.

Patient selection for intensive management is recommended and caution should be taken in certain high-risk groups.

How should the diagnosis of hypertension be made?

Demonstration of Inaccuracy of Usual Compared to Standardized Office BP Measurement

- Data from SPRINT study from 49 of 102 sites (3074 participants)
- Compared the SPRINT AOBP to three recent recorded EMR BP readings
- EMR BP was **7.7 mmHg higher** than the SPRINT AOBP in the intensive arm targeting < 120 mmHg systolic
- This comparison highlights the importance of proper BP measurement to reduce variability
- It is **potentially hazardous** to apply the SBP target of < 120 mm Hg to BP measurements obtained in a **non-standardized manner**.

Acronyms

Office Blood Pressure Measurement	OBPM
Home Blood Pressure Measurement	HBPM
Ambulatory Blood Pressure Measurement	ABPM
Automated Office Blood Pressure Measurement	AOBP

New in 2015

Recommendation Diagnosing HTN

The diagnosis of hypertension should be based on out-of-office measurements:

- Ambulatory Blood Pressure Measurement (ABPM) is the recommended out-of-office measurement method.
- Home Blood Pressure Measurement (HBPM) is recommended if ABPM is not tolerated, not readily available or due to patient preference.

Ambulatory Blood Pressure Measurement (ABPM)

Ambulatory Blood Pressure Measurement Report

Physician : [REDACTED]

Patient ID [REDACTED]
 Name : [REDACTED]
 Sex : Male
 Age : 78
 DOB : [REDACTED]

Day and Night Period

Time Interval

Day : 07 ~ 22 20 min

Night : 22 ~ 07 30 min

Actual Awake / Asleep

Awake : 07 ~ 22 h

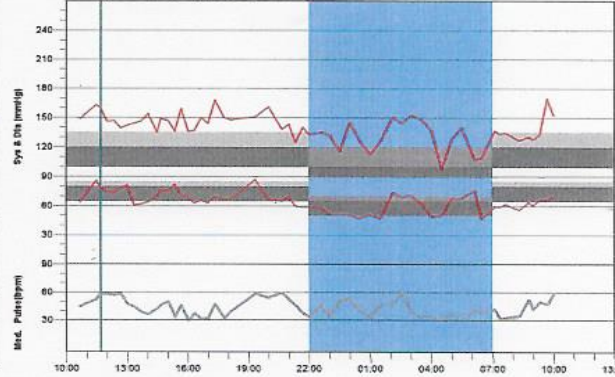
Asleep : 22 ~ 07 h

BP Threshold

Day : 135/85 mmHg

Night : 120/70 mmHg

Study Date : 23/09/2015



Readings	Average Blood Pressure (SD)						White Coat Window		
Total Readings : 59	Sys	Dia	HR	MAP	PP		Sys	Dia	HR
Successful : 55 (93.2%)	24-hr 140 (15)	65 (10)	46 (11)	90	75		Readings 3	3	3
BP Load	Awake 145 (11)	69 (8)	48 (11)	94	76		1st hr Max 163	86	62
Day readings ≥ 135/85 93.3%	Asleep 130 (16)	58 (10)	42 (10)	82	72		Night-time Dip%	Sys	Dia
Night readings ≥ 120/70 66.7%							Dip%	10.3	15.9

Date/Time	Sys	Dia	HR	Date/Time	Sys	Dia	HR	Date/Time	Sys	Dia	HR
23/09/2015				24/09/2015							
10:41 149	64	47		00:01 145	51	56		07:41 135	62	33	
11:28 163	88	56		00:30 127	47	42		08:21 127	56	35	
11:40 160	80	62		01:03 113	51	34		08:48 131	64	56	
12:00 146	75	62		01:31 126	47	50		09:00 128	61	44	
12:20 147	74	61		02:08 151	74	50		09:20 133	66	53	
12:40 139	79	63		02:34 144	69	64		09:42 170	67	50	
13:00 142	81	50		03:00 153	71	40		10:00 153	69	62	
13:20 144	61	46		03:33 148	63	34					
13:40 146	62	40		04:01 137	49	35					
14:03 154	64	37		04:31 98	50	29					
14:28 135	70	44		05:01 126	68	39					
14:40 149	76	49		05:30 140	68	28					
15:03 147	76	53		06:08 108	76	43					
15:23 136	82	34		06:30 110	47	41					
15:40 159	72	48		07:08 137	59	43					
16:03 136	69	29		07:23 134	59	32					
16:20 137	63	38									
16:41 150	66	31									
17:01 144	63	32									
17:21 168	70	50									
17:48 150	67	32									
18:08 148	67	41									
19:20 151	87	63									
20:00 161	67	58									

Comments: _____

Signature: _____



<http://www.dablededucational.org/sphygmomanometers.html>

<http://www.bhsoc.org/bp-monitors/bp-monitors/>

Recommended automated blood pressure monitors for home blood pressure measurement



Complete list of devices endorsed by Hypertension Canada
<https://hypertension.ca/hypertension-and-you/managing-hypertension/measuring-blood-pressure/devices/>

Resources for Home Monitoring

www.hypertension.ca

- Information to assist you in training patients to measure blood pressure at home
- Information for patients on how to purchase a device for home measurement and how to measure blood pressure at home

How should blood pressure be measured in the office?



Automated office blood pressure (AOBP) measurement is the preferred method of performing in-office BP measurement

Automated Office Blood Pressure Measurement (AOBP)

Office Automated (unattended, AOBP)
Oscillometric (electronic)



BpTRU®



Microlife Watch BP Office®



**Omron HEM
907®**

Manual Office BP Measurement Methods

Auscultation Method:

- Standardized Method Takes \approx 10 minutes



Mercury Sphygmomanometers
(mercury is toxic)



Aneroid Sphygmomanometers
(Calibration checks every 6 months)

Positioning the Patient

Common to all methods of office BP measurement, the patients should be:

- ❑ Seated
- ❑ Back supported
- ❑ Legs uncrossed
- ❑ Feet flat on floor
- ❑ Arm supported
- ❑ Midpoint of cuff at heart level



Adapted from Cloutier, Perspective infirmière, p.48, 2011

Does Gerald have Resistant HT?

- Blood pressure above target despite 3 or more BP-lowering drugs at optimal doses, preferably including a diuretic

Prevalence of RHT

- 10-30% of all hypertensives
 - Apparent treatment-resistant 14.7%
 - Not taking meds
 - White coat hypertension
 - True 10.3%
- Risk factors include
 - Diabetes
 - Obesity
 - Adverse lifestyle factors (ie sodium, alcohol)
 - Elevated aldosterone levels

Clinical Impact of RHT

- RHT
 - Higher CVD risk vs HT without RHT
 - HR 1.5 (95% CI 1.33-1.62)
- RHT
 - Higher all cause mortality
 - Uncontrolled RHT vs controlled HT
 - HR 1.27 (95% CI 1.01 – 1.60)

Secondary Hypertension

- Renal
 - CKD
 - Renal artery stenosis
- Adrenal
 - Conn's Syndrome
 - Bilateral adrenal hyperplasia
 - Cushing's disease
 - Pheochromocytoma
- Other
 - Hypo and hyperthyroidism
 - Coarctation of the aorta
 - Sleep Apnoea

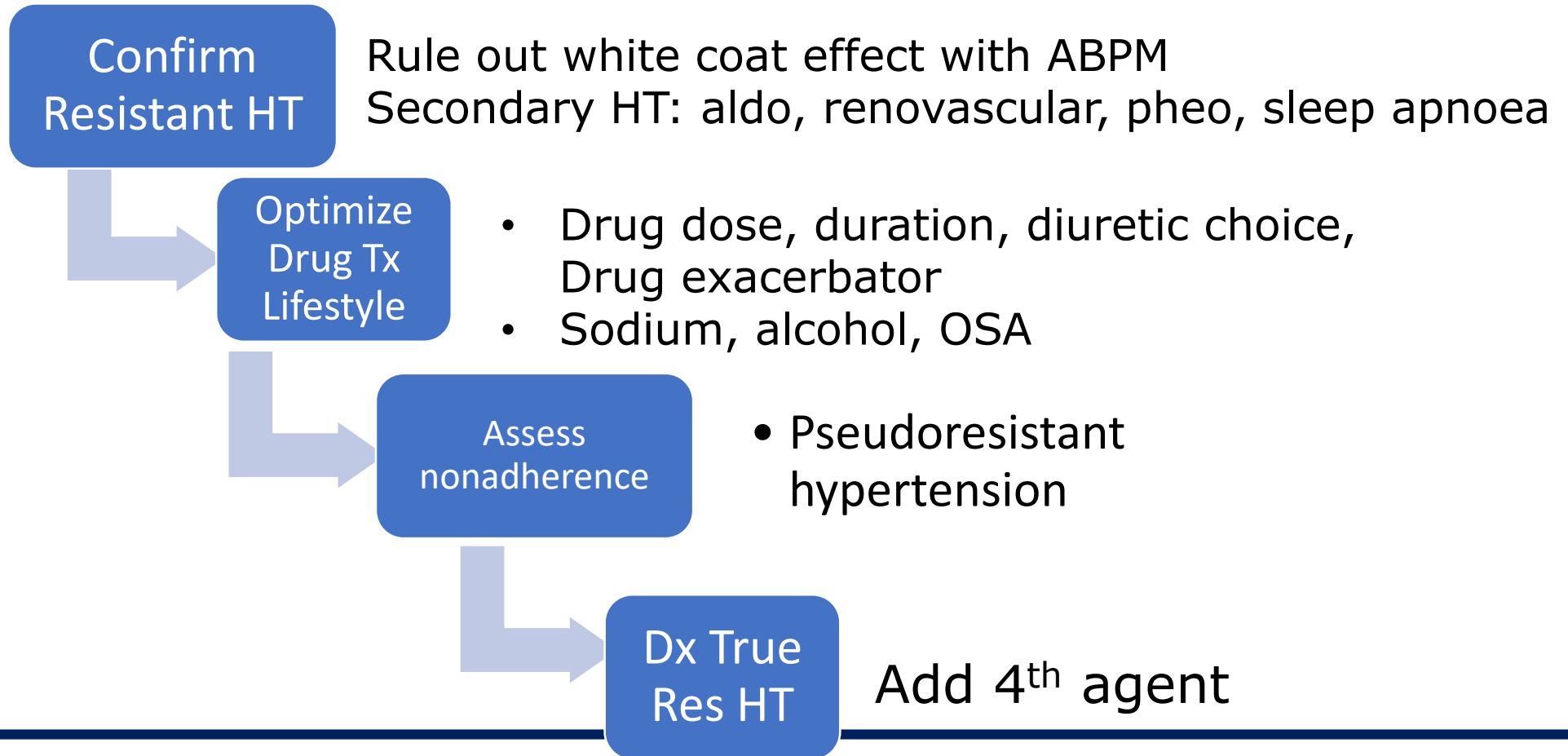
Nonpharmacological Management

- Reduce sodium intake
- Increase dietary K⁺
- Reduce
 - stress
 - weight
 - alcohol intake



Management Algorithm

BP not at target with 3 or more drugs



Canadian Recommended Office BP Treatment Targets

Treatment consists of health behaviour \pm pharmacological management

Population	SBP	DBP
High Risk	≤ 120	NA
Diabetes	< 130	< 80
All others (including CKD)*	< 140	< 90

* Target BP with AOBP $< 135/85$

- Candesartan 16/HCTZ 12.5 mg OD
- Amlodipine 2.5 mg OD
- Atorvastatin 40 mg OD

- Candesartan 32/HCTZ 25 mg OD
- Amlodipine 5 mg OD
- Atorvastatin 40 mg OD

Gerald

An 78-year-old man with a 20 year history of hypertension is found to have a creatinine of 140 umol/L

BP is now 118/64 mmHg



NNT to prevent an event over 4 years

- 66 primary composite outcome
- 28 All cause mortality
- 61 CV Death

NNH (number needed to harm) over 4 years

- 35 AKI*
- 131 hypokalemia
- 41 hyperkalemia