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Hypertension

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Internal Medicine/Cardiovascular Disease

No financial disclosures

What is your role in patient care?

A - Post graduate year 1

0%

B - Post graduate year 2

0%

C - Post graduate year 3

0%

D - Post graduate year 4

0%

E - Faculty

0%

F - Nurse

0%

G - Community Health Worker

0%

H - Other

0%

Outline

- Definition and Diagnosis of Hypertension
- Zambia Data
- Cardiovascular Risk Factors
- Treatment of Hypertension
- Special Circumstances
- Ethnicity, Race and Hypertension

Pre: According to the 2020 International Hypertension Guidelines which of the following is classified as Grade 1 hypertension?

A) 132/92

0%

B) 147/96

0%

C) 122/84

0%

D) 173/100

0%

E) None of the above

0%

Pre: What is the recommended daily sodium intake for adults according to the WHO?

A) 2,000 mg/day

0%

B) 5,000 mg/day

0%

C) 300 mg/day

0%

D) 100 mg/day

0%

E) None of the above

0%

A Case

- 42 year old man who participated in the May Measurement Month presents to clinic to discuss management strategies for recorded blood pressure of 142/94 mmHg.

What guides our practice?

Clinical Practice Guidelines

2020 International Society of Hypertension Global Hypertension Practice Guidelines

Thomas Unger, Claudio Borghi, Fadi Charchar, Nadia A. Khan, Neil R. Poulter, Dorairaj Prabhakaran, Agustin Ramirez, Markus Schlaich, George S. Stergiou, Maciej Tomaszewski, Richard D. Wainford, Bryan Williams, Aletta E. Schutte

- Global application
- Applicable in low-, and high-resource settings
- Feasible and reproducible

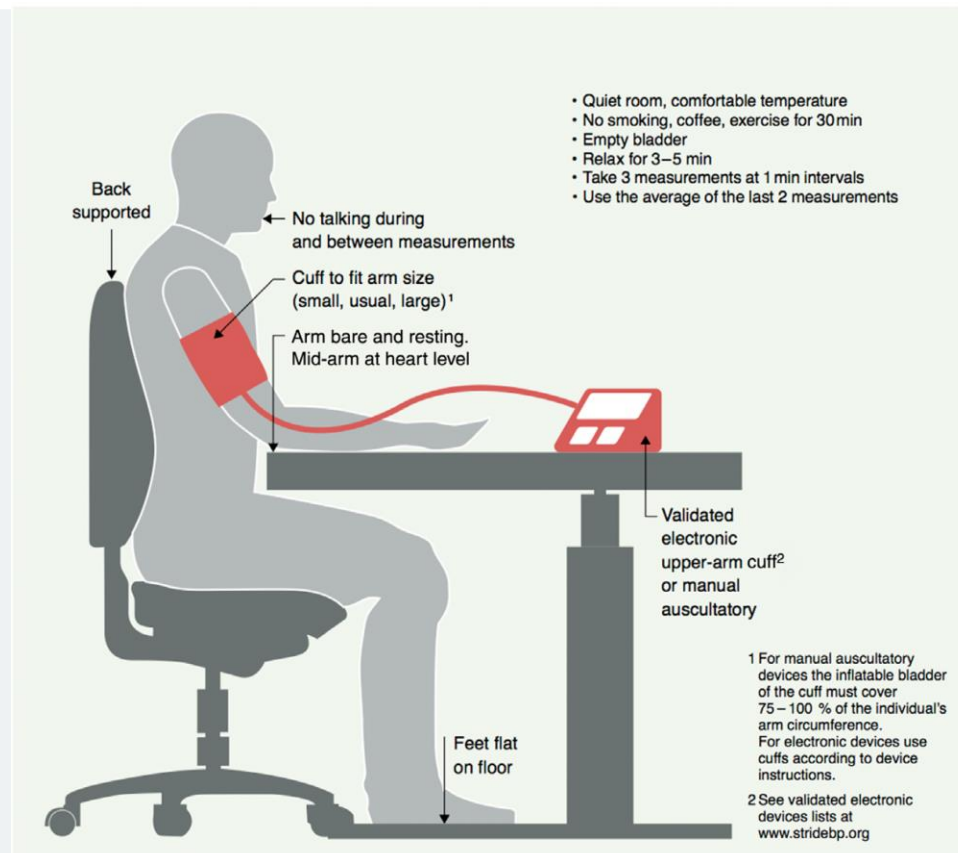
Classification of Hypertension (Office)

Table 1. Classification of Hypertension Based on Office Blood Pressure (BP) Measurement

Category	Systolic (mm Hg)		Diastolic (mm Hg)
Normal BP	<130	and	<85
High-normal BP	130–139	and/or	85–89
Grade 1 hypertension	140–159	and/or	90–99
Grade 2 hypertension	≥160	and/or	≥100

Office Blood Pressure Measurement

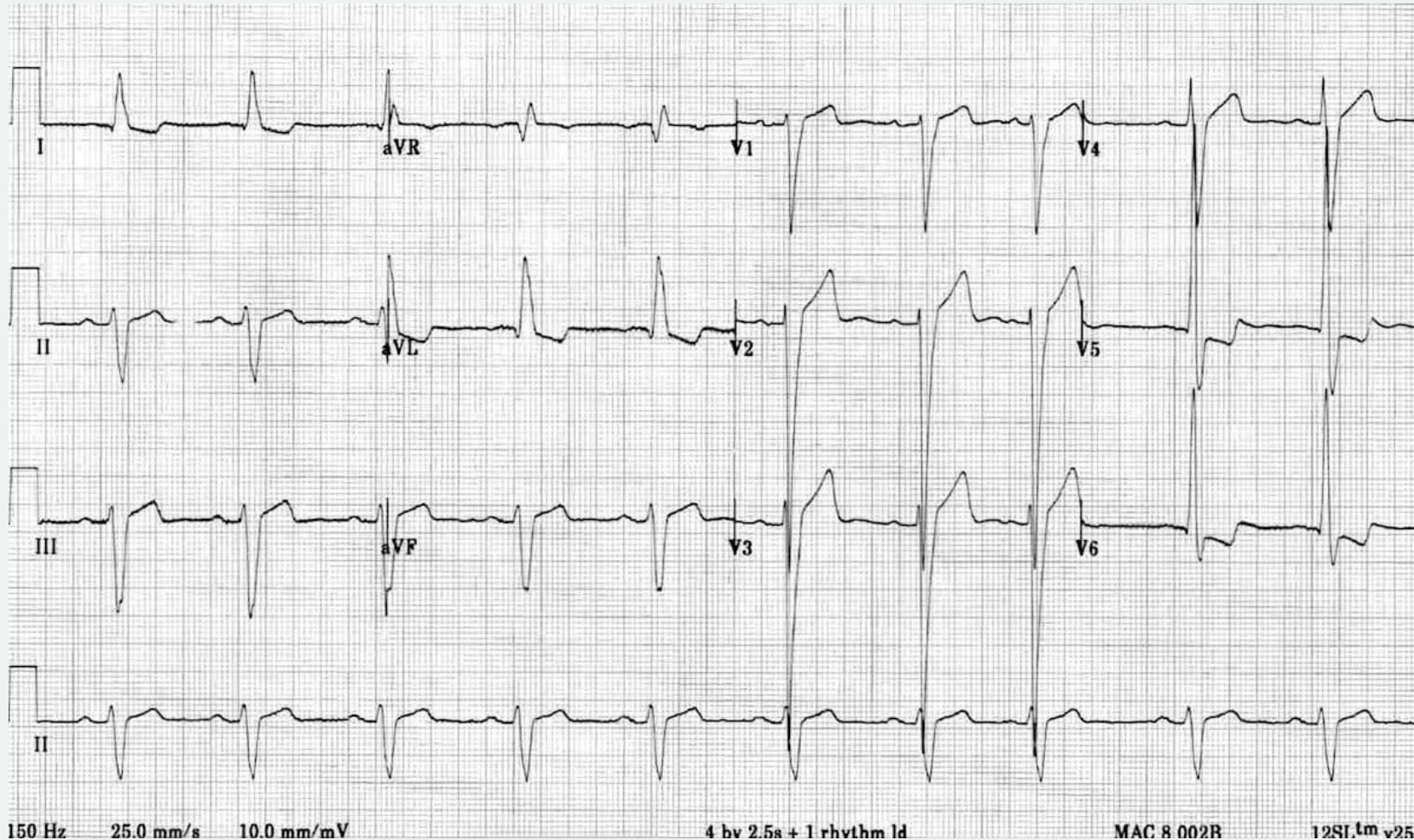
- Measure in both arms
- If difference of >20 mmHg – further investigation



Diagnostic and Clinical Tests

- Personal and family medical history
- Cardiovascular risk
- Symptoms
- Secondary hypertension symptoms
- Physical exam
- Investigation
 - Blood tests
 - ECG

Left Ventricular Hypertrophy



- **Cornell Criteria:**

- R in aVL + S in V3
- ♂ > 28 mm and ♀ > 20 mm

- **Modified Cornell:**

- R in aVL > 12 mm

- **Sokolow-Lyon:**

- S in V1 + R in V5 or V6 > 35 mm

- Romhilt-Estes LVH Point Score

Zambia

Hypertension profile

Total population (2019): 18 380 000

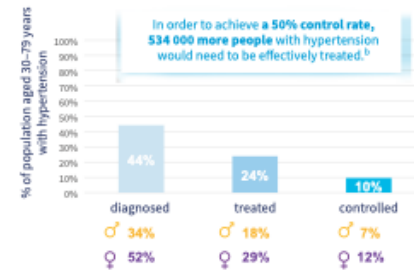
Total deaths (2019): 121 000

Age-standardized prevalence of hypertension among adults aged 30–79 years (2019)^a ♀ 32% ♂ 30% ♀ 34%

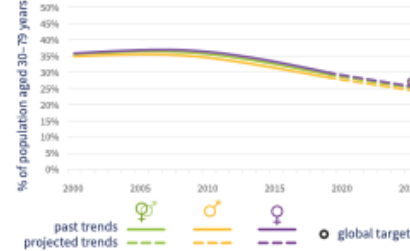
Prevalence of hypertension – global comparison (both sexes)^a



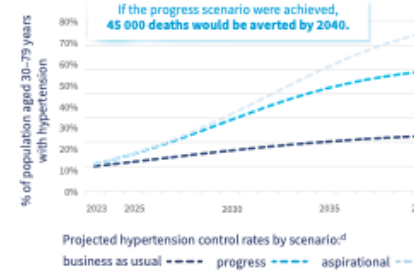
Of the 1.3 million adults aged 30–79 years with hypertension:



Trends in uncontrolled hypertension in adults aged 30–79 years^c



Hypertension control rate scenarios



Mortality

	both sexes	males	females	year
Probability of premature mortality from NCDs (%)	25	29	21	2019
Cardiovascular disease deaths	16 700	8800	7900	2019
Cardiovascular disease deaths attributable to high systolic blood pressure (%)	52	52	52	2019

Risk factors^a

	both sexes	males	females	year
Mean population salt intake, adults aged 25+ years (g/day)	7	6	8	2019
Current tobacco use, adults aged 15+ years (%)	15	25	4	2019
Obesity, adults aged 18+ years (%)	8	4	12	2016
Total alcohol per capita consumption, adults aged 15+ years (litres)	4	6	1	2019
Physical inactivity, adults aged 18+ years (%)	22	19	25	2016

National response

Targets	Treatment
National target for blood pressure	✘
National target for salt consumption	✘
Conducted recent, national survey measuring raised blood pressure/hypertension	✓
Conducted recent, national survey on salt/sodium intake	✓
Functioning system for generating reliable cause-specific mortality data on a routine basis	✘
	Guidelines for management of hypertension ✓



Footnotes: a. SBP ≥ 140 mmHg or DBP ≥ 90 mmHg or taking medication for hypertension. b. Control rate: adults aged 30–79 years receiving treatment, with blood pressure SBP < 140 mmHg and DBP < 90 mmHg. c. SBP ≥ 140 mmHg or DBP ≥ 90 mmHg. d. Progress and aspirational scenarios reflect a theoretical scaling up of treatment and control. e. Age-standardized estimates are presented for all indicators except salt intake.

See Explanatory notes for description of indicators

Cardiac Risk Stratification

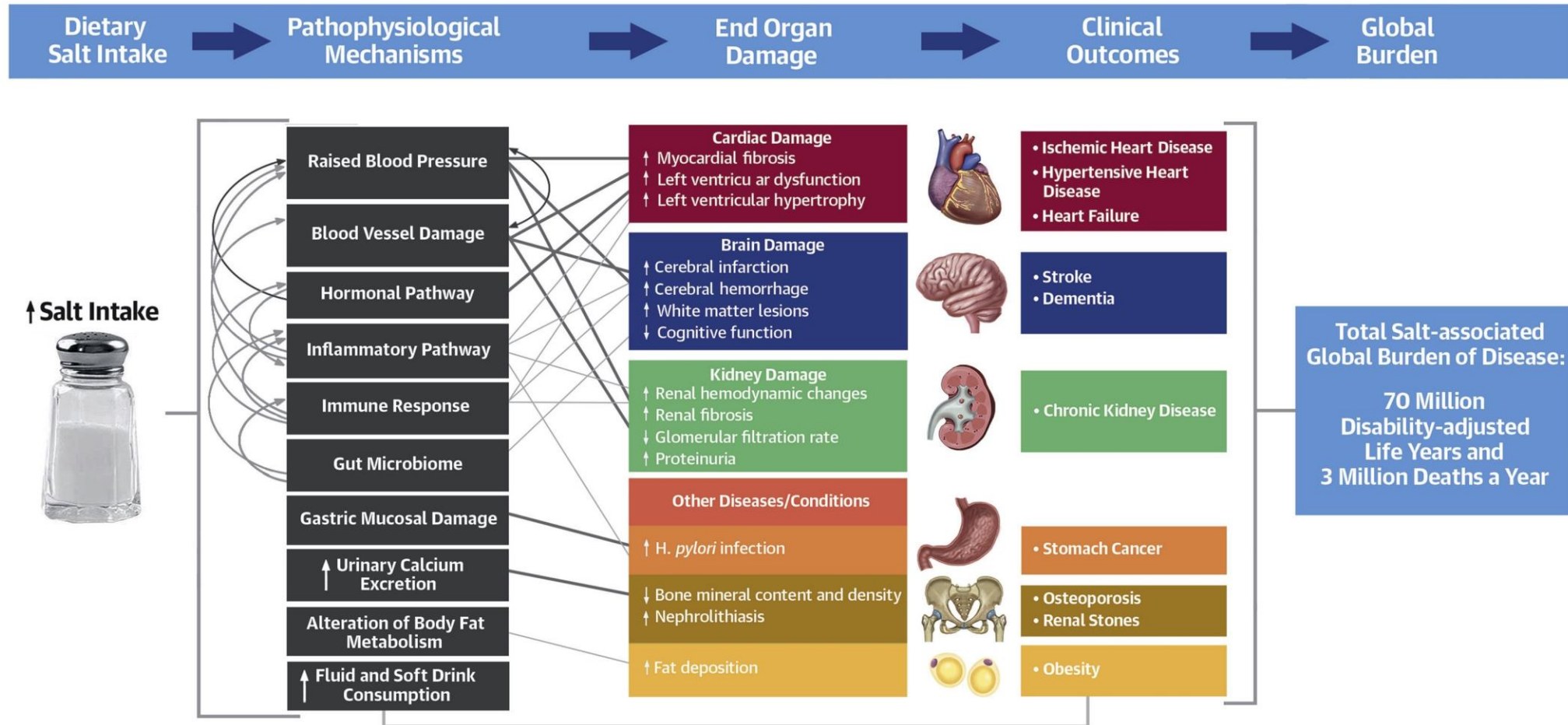
Other Risk Factors, HMOD, or Disease	High-Normal SBP 130–139 DBP 85–89	Grade 1 SBP 140–159 DBP 90–99	Grade 2 SBP ≥160 DBP ≥100	
No other risk factors	Low	Low	Moderate	High
1 or 2 risk factors	Low	Moderate	High	
≥3 risk factors	Low	Moderate	High	High
HMOD, CKD grade 3, diabetes mellitus, CVD	High	High	High	

Treatment – Lifestyle Modification

Salt reduction 	There is strong evidence for a relationship between high salt intake and increased blood pressure. ⁴⁷ Reduce salt added when preparing foods, and at the table. Avoid or limit consumption of high salt foods such as soy sauce, fast foods and processed food including breads and cereals high in salt.
Healthy diet	Eating a diet that is rich in whole grains, fruits, vegetables, polyunsaturated fats and dairy products and reducing food high in sugar, saturated fat and trans fats, such as the DASH diet (http://www.dashforhealth.com). ⁴⁸ Increase intake of vegetables high in nitrates known to reduce BP, such as leafy vegetables and beetroot. Other beneficial foods and nutrients include those high in magnesium, calcium and potassium such as avocados, nuts, seeds, legumes and tofu. ⁴⁹
Healthy drinks	Moderate consumption of coffee, green and black tea. ⁵⁰ Other beverages that can be beneficial include karkadé (hibiscus) tea, pomegranate juice, beetroot juice and cocoa. ⁴⁹
Moderation of alcohol consumption 	Positive linear association exists between alcohol consumption, blood pressure, the prevalence of hypertension, and CVD risk. ⁵¹ The recommended daily limit for alcohol consumptions is 2 standard drinks for men and 1.5 for women (10 g alcohol/standard drink). Avoid binge drinking.
Weight reduction	Body weight control is indicated to avoid obesity. Particularly abdominal obesity should be managed. Ethnic-specific cut-offs for BMI and waist circumference should be used. ⁵² Alternatively, a waist-to-height ratio <0.5 is recommended for all populations. ^{53,54}
Smoking cessation	Smoking is a major risk factor for CVD, COPD and cancer. Smoking cessation and referral to smoking cessation programs are advised. ⁵⁵
Regular physical activity	Studies suggest that regular aerobic and resistance exercise may be beneficial for both the prevention and treatment of hypertension. ^{56–58} Moderate intensity aerobic exercise (walking, jogging, cycling, yoga, or swimming) for 30 minutes on 5–7 days per week or HIIT (high intensity interval training) which involves alternating short bursts of intense activity with subsequent recovery periods of lighter activity. Strength training also can help reduce blood pressure. Performance of resistance/strength exercises on 2–3 days per week.
Reduce stress and induce mindfulness	Chronic stress has been associated to high blood pressure later in life. ⁵⁹ Although more research is needed to determine the effects of chronic stress on blood pressure, randomized clinical trials examining the effects of transcendental meditation/mindfulness on blood pressure suggest that this practice lowers blood pressure. ⁶⁰ Stress should be reduced and mindfulness or meditation introduced into the daily routine.
Complementary, alternative or traditional medicines	Large proportions of hypertensive patients use complementary, alternative or traditional medicines (in regions such as Africa and China) ^{61,62} yet large-scale and appropriate clinical trials are required to evaluate the efficacy and safety of these medicines. Thus, use of such treatment is not yet supported.
Reduce exposure to air pollution and cold temperature	Evidence from studies support a negative effect of air pollution on blood pressure in the long-term. ^{63,64}

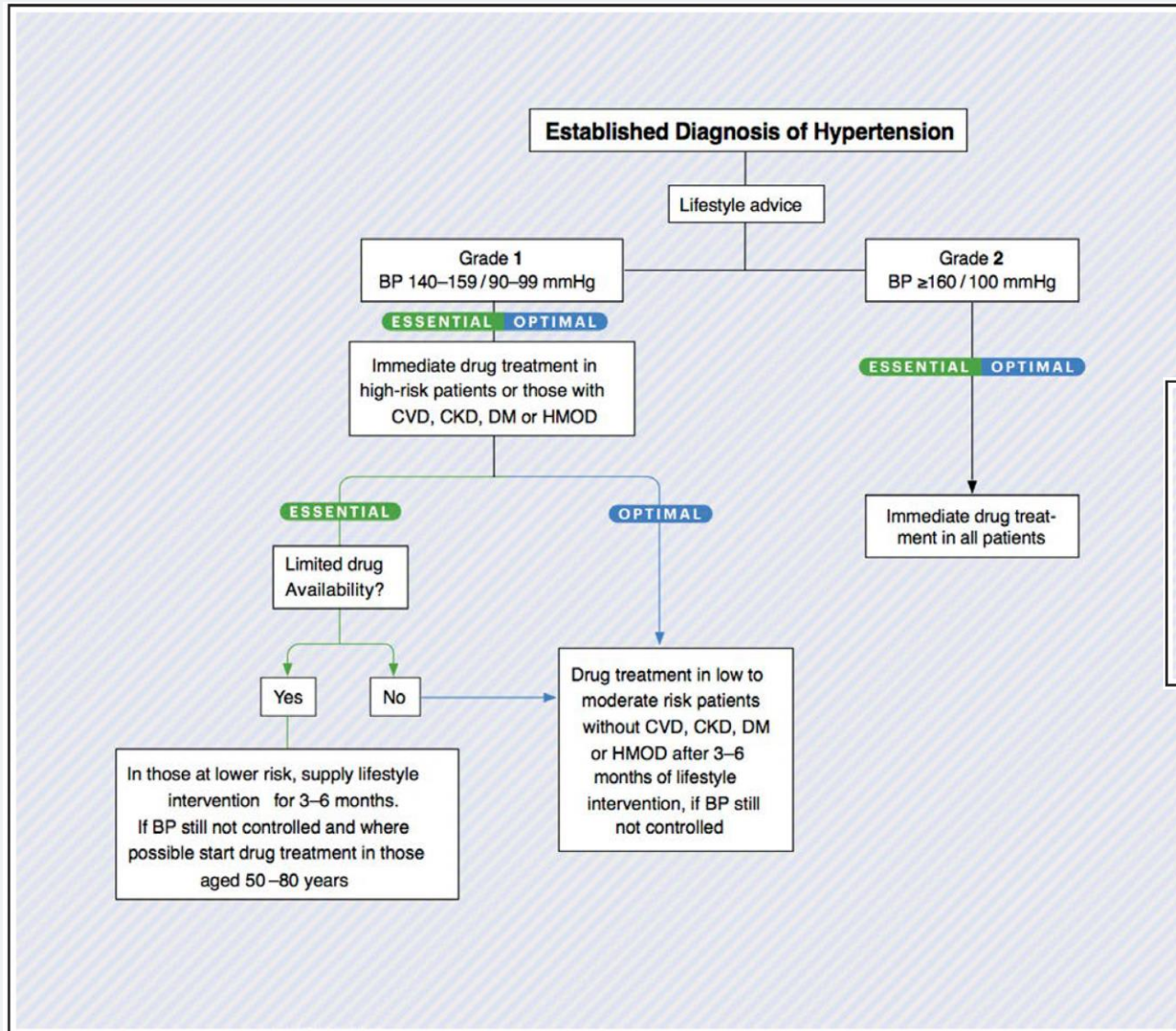
WHO: 2g sodium/day (~5g salt/day)
Zambia: ~4g sodium/day (>9g salt/day)

CENTRAL ILLUSTRATION: Salt and Health



He, F.J. et al. J Am Coll Cardiol. 2020;75(6):632-47.

Pharmacologic Treatment



ESSENTIAL Target BP reduction by at least 20/10mmHg, ideally to <140/90 mmHg

OPTIMAL <65 years : BP target <130 / 80 mmHg if tolerated (but >120 / 70 mmHg).
 ≥65 years : BP target <140 / 90 mmHg if tolerated but consider an individualised BP target in the context of frailty, independence and likely tolerability of treatment.

Aim for BP control within 3 months

Comorbidity Guided Drug Treatment Strategy

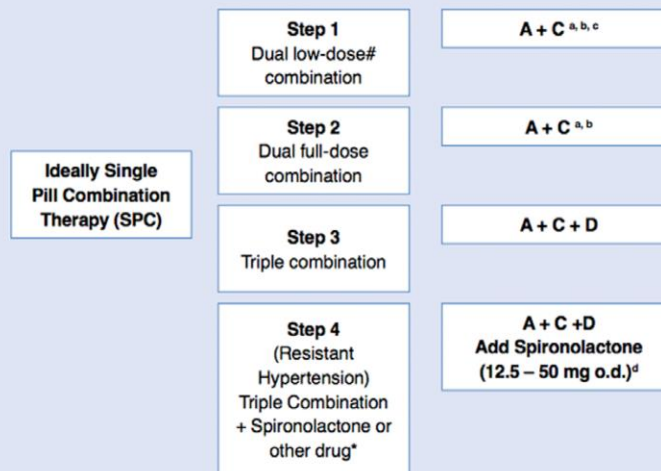
ESSENTIAL

- Use whatever drugs are available with as many of the ideal characteristics (see **Table 9**) as possible.
- Use free combinations if SPCs are not available or unaffordable
- Use thiazide diuretics if thiazide-like diuretics are not available
- Use alternative to DHP-CCBs if these are not available or not tolerated (i.e. Non-DHP-CCBs: diltiazem or verapamil).

ESSENTIAL OPTIMAL

Consider beta-blockers at any treatment step when there is a specific indication for their use, e.g. heart failure, angina, post-MI, atrial fibrillation, or younger women with, or planning pregnancy.

OPTIMAL



- a) Consider monotherapy in low risk grade 1 hypertension or in very old (≥ 80 yrs) or frailer patients.
- b) Consider A + D in post-stroke, very elderly, incipient HF or CCB intolerance.
- c) Consider A + C or C + D in black patients.
- d) Caution with spironolactone or other potassium sparing diuretics when estimated GFR < 45 ml/min/1.73m² or K⁺ > 4.5 mmol/L.

A = ACE-Inhibitor or ARB (Angiotensin Receptor Blocker)
 C = DHP-CCB (Dihydropyridine -Calcium Channel Blocker)
 D = Thiazide-like diuretic

Supportive references: A + C,^{69,70} Spironolactone,⁷¹ Alpha-blocker,⁷² C + D⁷³.

* Alternatives include: Amiloride, doxazosin, eplerenone, clonidine or beta-blocker.

low-dose generally refers to half of the maximum recommended dose

RCT-based benefits between ACE-I's and ARB's were not always identical in different patient populations. Choice between the two classes of RAS-Blockers will depend on patient characteristics, availability, costs and tolerability.

Black Populations

- Younger age
- Higher frequency of resistant hypertension
- Higher risk of HMOD
- Management
 - Annual screening >18 years
 - Lifestyle modifications
 - First-line – thiazide + CCB *or* CCB + ARB
 - ARB preferred for RAS-inhibition due to higher risk of angioedema in this population

A Case

- 42 year old man who participated in the May Measurement Month presents to clinic to discuss management strategies for recorded blood pressure of 142/94 mmHg.
 - Personal and family medical history
 - Evaluate for HMOD
 - Appropriate diagnostic tests
 - Lifestyle and/or pharmacologic therapy
 - Close follow up

Specific Circumstances

- Resistant Hypertension
- Secondary Hypertension
- Hypertension in Pregnancy
- Hypertensive Emergencies
 - Severely elevated BP + HMOD
 - Malignant HTN (retinopathy)
 - Hypertensive encephalopathy (edema, seizure)
 - Hypertensive thrombotic microangiopathy (hemolysis and low plts)
 - Acute coronary syndromes, dissection, pulmonary edema

Hypertensive Emergencies

Clinical Presentation	Timeline and Target BP	First Line Treatment	Alternative
Malignant hypertension with or without TMA or acute renal failure	Several hours, MAP –20% to –25%	Labetalol Nicardipine	Nitroprusside Urapidil
Hypertensive encephalopathy	Immediate, MAP –20% to –25%	Labetalol Nicardipine	Nitroprusside
Acute ischaemic stroke and SBP >220 mm Hg or DBP >120 mm Hg	1 h, MAP –15%	Labetalol Nicardipine	Nitroprusside
Acute ischaemic stroke with indication for thrombolytic therapy and SBP >185 mm Hg or DBP >110 mm Hg	1 h, MAP –15%	Labetalol Nicardipine	Nitroprusside
Acute hemorrhagic stroke and SBP >180 mm Hg	Immediate, 130<SBP<180 mm Hg	Labetalol Nicardipine	Urapidil
Acute coronary event	Immediate, SBP <140 mm Hg	Nitroglycerine Labetalol	Urapidil
Acute cardiogenic pulmonary edema	Immediate, SBP <140 mm Hg	Nitroprusside or nitroglycerine (with loop diuretic)	Urapidil (with loop diuretic)
Acute aortic disease	Immediate, SBP <120 mm Hg and heart rate <60 bpm	Esmolol and nitroprusside or nitroglycerine or nicardipine	Labetalol or metoprolol
Eclampsia and severe preeclampsia/HELLP	Immediate, SBP <160 mm Hg and DBP <105 mm Hg	Labetalol or nicardipine and magnesium sulphate	

Post: According to the 2020 International Hypertension Guidelines which of the following is classified as Grade 1 hypertension?

A) 132/92

0%

B) 147/96

0%

C) 122/84

0%

D) 173/100

0%

E) None of the above

0%

Post: What is the recommended daily sodium intake for adults according to the WHO?

A) 2,000 mg/day

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B) 5,000 mg/day

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C) 300 mg/day

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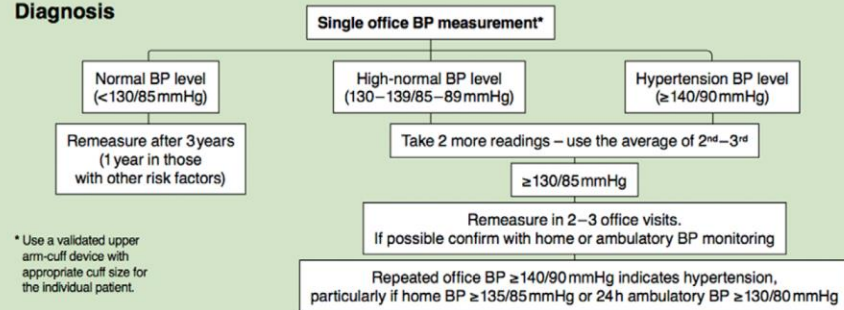
D) 100 mg/day

0%

E) None of the above

0%

Diagnosis



Evaluation

History & Physical Exam

- Exclude drug-induced hypertension
- Evaluate for organ damage
- Assess total CV risk
- Search for symptoms/signs of secondary hypertension

Lab Tests

- Serum sodium, potassium & creatinine
- Lipid profile & glucose
- Urine dipstick
- 12 lead ECG

Additional Tests

- If necessary for suspected organ damage or secondary hypertension

Treatment

Grade 1 Hypertension:

- 140–159/90–99 mmHg
1. Start lifestyle interventions
 2. Start drug treatment in:
 - High-risk patients (CVD,CKD, diabetes, organ damage, or aged 50-80 years)
 - All others with persistent BP elevation after 3–6 months of lifestyle intervention

Grade 2 Hypertension:

- ≥160/100 mmHg
1. Start drug treatment immediately
 2. Start lifestyle intervention

Lifestyle Interventions

- Stop smoking
- Regular exercise
- Lose weight
- Salt reduction
- Healthy diet and drinks
- Lower alcohol intake

Drug Therapy Steps

Use any drugs available and include as many of those below as possible. Consider monotherapy in low-risk grade 1 hypertension and in patients aged >80 years or frail. Simplify regimen with once daily dosing and single pill combinations.

Non-Black Patients

1. Low dose ACEI/ARB* + DHP-CCB
2. Increase to full dose
3. Add thiazide/thiazide-like diuretic
4. Add spironolactone or, if not tolerated or contraindicated, amloride, doxazosin, eplerenone, clonidine or beta-blocker

Black Patients

1. Low dose ARB* + DHP-CCB or DHP-CCB + thiazide/thiazide-like diuretic
2. Increase to full dose
3. Add diuretic or ARB /ACEI
4. Add spironolactone or, if not tolerated or contraindicated, amloride, doxazosin, eplerenone, clonidine or beta-blocker

* No ACEI/ARB in women with or planning pregnancy

Monitoring

Target

- Reduce BP by at least 20/10 mmHg, ideally to < 140/90 mmHg
- Individualize for elderly based on frailty

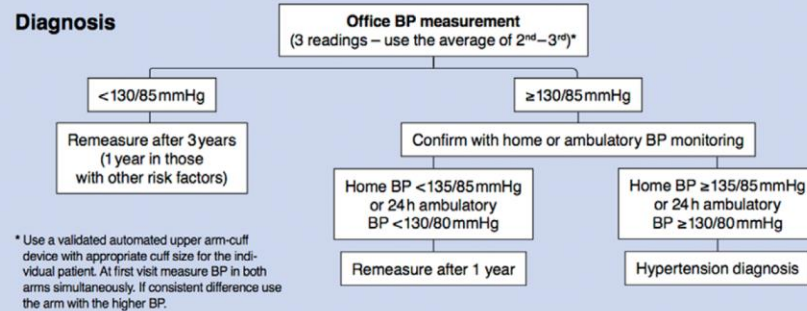
Monitor

- BP control (achieve target within 3 months)
- Adverse effects
- Long-term adherence

Referral

- If BP still uncontrolled, or other issue, refer to care provider with hypertension expertise

Diagnosis



Evaluation

History & Physical Exam

- Exclude drug-induced hypertension
- Evaluate for organ damage
- Consider additional CV risk factors
- Assess total cardiovascular risk
- Search for symptoms/signs of secondary hypertension
- Check adherence

Lab Tests

- Serum sodium, potassium & creatinine, uric acid
- Lipid profile & glucose
- Urine dipstick
- 12 lead ECG

Additional Tests

- If necessary for suspected organ damage or secondary hypertension

Treatment

Grade 1 Hypertension:

140–159/90–99 mmHg

1. Start lifestyle interventions
2. Start drug treatment:
 - **Immediately:** In high-risk patients (CVD, CKD, diabetes or organ damage)
 - **After 3–6 months of lifestyle intervention:** In low-moderate risk patients with persistent BP elevation

Grade 2 Hypertension:

≥160/100 mmHg

1. Start drug treatment immediately
2. Start lifestyle intervention

Lifestyle Interventions

- Stop smoking
- Regular exercise
- Lose weight
- Salt reduction
- Healthy diet and drinks
- Lower alcohol intake
- Lower stress
- Reduce exposure to air pollution

Drug Therapy Steps

Simplify regimen with once daily dosing and single pill combinations.
Consider monotherapy in low-risk grade 1 hypertension and in patients aged >80 years or frail

Non-Black Patients

1. Low dose ACEI/ARB* + DHP-CCB
2. Increase to full dose
3. Add thiazide-like diuretic
4. Add spironolactone or, if not tolerated or contraindicated, amiloride, doxazosin, eplerenone, clonidine or beta-blocker

Black Patients

1. Low dose ARB* + DHP-CCB or DHP-CCB + thiazide-like diuretic
2. Increase to full dose
3. Add diuretic or ACEI/ARB
4. Add spironolactone or, if not tolerated or contraindicated, amiloride, doxazosin, eplerenone, clonidine or beta-blocker

* No ACEI/ARB in women with or planning pregnancy

Monitoring

Target

- BP <130/80 mmHg
- Individualise for elderly based on frailty

Monitor

- BP control (achieve target within 3 months)
- Adverse effects
- Long-term adherence

Referral

- If BP still uncontrolled, or other issue, refer to care provider with hypertension expertise

Thank you for all you do!

QUESTIONS?

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