Scope of Problem

Prevalence of Hypertension in SA men

Deaths attributable to high blood pressure in males, South Africa 2000

Bradshaw et al. MRC and CDiA 2011

Norman et al. 2007  BOD at the MRC
Results of randomised trials of antihypertensive drug therapy

STROKE

Randomised trials
Epidemiological data

CHD

Randomised trials
Epidemiological data

% reduction / 6 mm Hg fall in diastolic blood pressure

Collins and Peto, 1994
Awareness, treatment, and control of hypertension

USA
Canada
UK
Germany
Greece
Spain
China
Japan
Taiwan
Mexico

Proportion of patients (%)

Aware*
Treated†
Controlled#

*Prior diagnosis by health professional
†Use of BP medication
#On BP medication, with SBP/DBP<140/90 mm Hg

Figure 6. Adapted from Whelton. J Clin Hypertens. 2004;6:636-642.
Prevalence, awareness, treatment and control in SSA

Pooled data from 33 surveys involving over 110,414 participants of mean age 40 years

Adapted, Feven Ataklte et al, Hypertension, 2014
Annualized Case Fatality Rates after Specific Cardiovascular Events.

- Myocardial Infarction: Hazard Ratio (HR) 1.00, 4.13, 2.59
- Stroke: HR 1.00, 2.83, 3.37
- Heart Failure: HR 1.00, 2.61, 3.72
- Major Cardiovascular Disease: HR 1.00, 2.67, 2.30
- All Cardiovascular Disease: HR 1.00, 5.39, 7.25

P-values for trend:
- Myocardial Infarction: P=0.20
- Stroke: P<0.001
- Heart Failure: P<0.001
- Major Cardiovascular Disease: P=0.01
- All Cardiovascular Disease: P<0.001
“is particularly evident in people who reside in the Southeastern portion of the United States, which once had the highest mortality rates of stroke in the United States.”

“The public awareness has increased dramatically”

“This dramatic decrease in strokes and heart disease has occurred despite the substantial increase in obesity and diabetes in the United States.”
According to repeated nationwide surveys,

More Doctors
Smoke CAMELS
than any other cigarette!

Doctors in every branch of medicine were asked, "What cigarette do you smoke?" The brand named most was Camel!

You'll enjoy Camels for the same reasons so many doctors have chosen Camels have cool, mild tobacco, pack after pack, and a flavor unmatched by any other cigarette. Make this available new-Camels only. Camels for 30 days and see how well Camels please your taste, how well they suit your smoking habits. You'll see how enjoyable a cigarette can be!

THE DOCTORS' CHOICE IS AMERICA'S CHOICE!

For 30 days, test Camels in your "T-Zone" (T for Throat, T for Taste).
Principles

- Identifying all patients eligible for management
- Monitoring at the practice/population level
- Increasing patient and provider awareness
- Providing an effective diagnosis and treatment guideline
- Systematic follow-up of patients for the initiation and intensification of therapy
- Clarifying roles of healthcare providers to implement a team approach
- Reducing barriers for patients to receive and adhere to medications and to implement lifestyle modifications
- Leveraging the electronic medical record systems being established throughout the United States to support each of these steps

Go et al, Effective approach to HT management, Hypertension 2014
Key Issues

• Measurement of BP
• Investigations
• Thresholds for diagnosis and intervention
• First line therapy
• How to initiate
• Treatment resistance
Table II. Recommendations for blood pressure measurement.

<table>
<thead>
<tr>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allow patient to sit for 3-5 min before commencing measurement</td>
</tr>
<tr>
<td>The SBP should be first estimated by palpation to avoid missing the auscultatory gap</td>
</tr>
<tr>
<td>Take 2 readings 1-2 minutes apart. If consecutive readings differ by &gt; 5 mm, take additional readings</td>
</tr>
<tr>
<td>At initial consultation measure BP in both arms, and if discrepant use the higher arm for future estimations</td>
</tr>
<tr>
<td>The patient should be seated, back supported, arm bared and arm supported at heart level</td>
</tr>
<tr>
<td>Patients should not have smoked, ingested caffeine containing beverages or food in previous 30 min</td>
</tr>
<tr>
<td>An appropriate size cuff should be used: a standard cuff (12 cm) for a normal arm and a larger cuff (15 cm) for an arm with a mid-upper circumference &gt;33cm (the bladder within the cuff should encircle 80% of the arm).</td>
</tr>
<tr>
<td>Measure BP after 1 and 3 minutes of standing at first consultation in the elderly, diabetics and in patients where orthostatic hypotension is common</td>
</tr>
<tr>
<td>When adopting the auscultatory measurement use Korotkoff 1 and V (disappearance) to identify SBP and DBP respectively</td>
</tr>
</tbody>
</table>
CONVENTIONAL BP MEASUREMENT

- CLINIC
- TEMPERATURE
- HUMIDITY
- NOISE
- OBSERVER
- TRAINING
- BIAS

- SPHYGMO
  - HEIGHT
  - POSITION & TILT
  - LEVEL OF HG
  - CLOGGED VENT
  - MAINTENANCE
  - STETHOSCOPE

INACCURATE IN OVER ONE-THIRD OF PATIENTS

- RAPPORT
- HEARING & VISION
- DISTANCE

- CUFF/BLADDER
  - CUFF CONDITION
  - APPLICATION
  - BLADDER SIZE
  - BLADDER POSITION
  - RIGHT OR LEFT?

- ANXIETY
- RECENT EXERCISE
- MEAL OR TOBACCO
- OBESITY
- ELDERLY
- ARRHYTHMIA
- POSTURE
- ARM LEVEL
- ARM SUPPORT
<table>
<thead>
<tr>
<th></th>
<th>Office</th>
<th>Automated office</th>
<th>Self</th>
<th>Ambulatory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Predicts outcome</td>
<td>+</td>
<td>++</td>
<td>++</td>
<td>+++</td>
</tr>
<tr>
<td>Initial diagnosis</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Cut-off BP (mmHg)</td>
<td>140/90</td>
<td>Mean 135/85</td>
<td>135/85</td>
<td>Mean day 135/85 Mean night 120/70</td>
</tr>
<tr>
<td>Evaluation of treatment</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Limited, but valuable</td>
</tr>
<tr>
<td>Assess diurnal variation</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Table I. Definitions and classification of office BP (mmHg) (adapted from ref 9)

<table>
<thead>
<tr>
<th>Stage</th>
<th>Systolic BP</th>
<th>Diastolic BP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>&lt;120</td>
<td>&lt;80</td>
</tr>
<tr>
<td>Optimal</td>
<td>120-129</td>
<td>80-84</td>
</tr>
<tr>
<td>High normal</td>
<td>130-139</td>
<td>85-89</td>
</tr>
<tr>
<td>Grade 1</td>
<td>140-159</td>
<td>90-99</td>
</tr>
<tr>
<td>Grade 2</td>
<td>160-179</td>
<td>100-109</td>
</tr>
<tr>
<td>Grade 3</td>
<td>≥180</td>
<td>≥110</td>
</tr>
<tr>
<td>Isolated systolic</td>
<td>≥140</td>
<td>&lt;90</td>
</tr>
</tbody>
</table>

BP should be categorised into the highest level of BP whether systolic or diastolic. Units - mmHg
TARGETS

• All patients < 140/90 mmHg
• In patients > 80 years of age there is solid evidence to initiate treatment at SBP ≥ 160, and lower it between 140-150 provided they are in good mental and physical condition 1 A
• In frail elderly treatment is discretionary 1 C
BP TARGETS DIABETES

Reappraisal of ESH Guidelines, J Hypertens 2009
Figure. 2014 Hypertension Guideline Management Algorithm

Adult aged ≥18 years with hypertension

Implement lifestyle interventions (continue throughout management).

Set blood pressure goal and initiate blood pressure lowering-medication based on age, diabetes, and chronic kidney disease (CKD).

General population (no diabetes or CKD) →
- Age ≥60 years
  - Blood pressure goal
    - SBP ≤150 mm Hg
    - DBP <90 mm Hg

- Age <60 years
  - Blood pressure goal
    - SBP ≤140 mm Hg
    - DBP <90 mm Hg

Diabetes or CKD present →
- All ages Diabetes present
  - Blood pressure goal
    - SBP ≤140 mm Hg
    - DBP <90 mm Hg

- All ages CKD present with or without diabetes
  - Blood pressure goal
    - SBP ≤140 mm Hg
    - DBP <90 mm Hg

# Level E evidence
JNC-8 Minority View

• increasing the target will probably reduce the intensity of antihypertensive treatment in a large population at high risk for cardiovascular disease
• the evidence supporting increasing the SBP target from 140 to 150 mm Hg in persons aged 60 years or older was insufficient
• the higher SBP goal in individuals aged 60 years or older may reverse the decades-long decline in CVD, especially stroke mortality

OUTCOME OF TREATMENT WITH STAGE 1 HYPERTENSION (3.6/2.4 mmHg)

<table>
<thead>
<tr>
<th></th>
<th>RR</th>
<th>CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stroke</td>
<td>0.72</td>
<td>0.55 - 0.94</td>
</tr>
<tr>
<td>Coronary heart disease</td>
<td>0.91</td>
<td>0.74 - 1.12</td>
</tr>
<tr>
<td>CCF</td>
<td>0.8</td>
<td>0.57 - 1.12</td>
</tr>
<tr>
<td>Total CVS events</td>
<td>0.86</td>
<td>0.74 - 1.01</td>
</tr>
<tr>
<td>CVS death</td>
<td>0.75</td>
<td>0.57 - 0.98</td>
</tr>
<tr>
<td>Total mortality</td>
<td>0.92</td>
<td>0.67 - 0.92</td>
</tr>
</tbody>
</table>

Favours Treatment Favours control

Adapted Johan Sundstrom, Ann Intern Med 2014
# Mandatory Investigations

<table>
<thead>
<tr>
<th>Investigation</th>
<th>TOD</th>
<th>Secondary cause</th>
<th>Risk stratification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dipsticks urine</td>
<td>Yes, usually 1+ protein only in hypertensive nephrosclerosis</td>
<td>2+ or more proteinuria and/or haematuria suggests kidney disease</td>
<td>Yes</td>
</tr>
<tr>
<td>ECG</td>
<td>LVH (see ECG criteria)</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>creatinine</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Echocardiogram*</td>
<td>LVH</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>K+</td>
<td>No</td>
<td>Low K+ may suggest primary aldosteronism</td>
<td>No</td>
</tr>
<tr>
<td>Fasting glucose</td>
<td>No</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>Fasting lipogram</td>
<td>No</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>Urine albumin/creatinine ratio*</td>
<td>Yes</td>
<td>Yes, if markedly elevated</td>
<td>Yes</td>
</tr>
</tbody>
</table>

*mandatory in diabetics, first voided urine specimen, < 3mg – normal, 3-30 microalbuminuria, > 30 macroalbuminuria (spot urines tend to overestimate ratio), # - only if readily available
### TABLE: IV: MAJOR RISK FACTORS, TARGET ORGAN DAMAGE (TOD) AND COMPLICATIONS

<table>
<thead>
<tr>
<th>MAJOR RISK FACTORS</th>
<th>TOD</th>
<th>Complications</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Levels of systolic and diastolic BP.</td>
<td>• LVH: based on ECG</td>
<td>• Coronary heart disease</td>
</tr>
<tr>
<td>• Smoking.</td>
<td>o Sokolow-Lyons &gt;35mm</td>
<td>• Heart failure</td>
</tr>
<tr>
<td>• Dyslipidaemia:</td>
<td>o R in aVL &gt; 11 mm</td>
<td>• Chronic kidney disease:</td>
</tr>
<tr>
<td>o total cholesterol &gt; 5.1 mmol/L, OR</td>
<td>o Cornel &gt; 2440 (mm.ms)</td>
<td>o macroalbuminuria &gt; 30mg/mmol</td>
</tr>
<tr>
<td>o LDL &gt; 3 mmol/L, OR</td>
<td>• Microalbuminuria:</td>
<td>OR eGFR &lt; 60ml/min</td>
</tr>
<tr>
<td>o HDL men &lt;1 and women &lt;1.2 mmol/L.</td>
<td>albumin creatinine ratio</td>
<td>• Stroke or TIA</td>
</tr>
<tr>
<td>• Diabetes mellitus.</td>
<td>3-30 mg/mmol preferably spot morning urine</td>
<td>• Peripheral arterial disease</td>
</tr>
<tr>
<td>• Men &gt; 55 years.</td>
<td>and eGFR &gt; 60ml/min</td>
<td>• Advanced retinopathy:</td>
</tr>
<tr>
<td>• Women &gt; 65 years.</td>
<td></td>
<td>o haemorrhages OR;</td>
</tr>
<tr>
<td>• Family history of early onset of CVD:</td>
<td></td>
<td>o exudates;</td>
</tr>
<tr>
<td>o Men aged &lt;55 years;</td>
<td></td>
<td>o papilloedema.</td>
</tr>
<tr>
<td>o Women aged &lt;65 years.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Waist circumference- abdominal obesity:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>o Men ≥ 102 cm;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>o Women ≥ 88 cm.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The exceptions are South Asians and Chinese: Men: &gt;90 cm and Women: &gt;80 cm.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(Adapted from the ESH/ESC guidelines) [9]
Asymptomatic

Prehypertension

Established hypertension

Target organ disease

Proteinuria
Nephrosclerosis

Left-ventricular hypertrophy

Retinopathy
Binswanger lesions

Oligosymptomatic

Symptomatic

Chronic renal failure

Coronary artery disease
Angina

Systolic/diastolic dysfunction

Atrial fibrillation
Ventricular arrhythmias

Dementia
Transient ischaemic attack

Polysymptomatic or end-stage disease

End-stage renal disease

Myocardial infarction

Congestive heart failure

Ventricular tachycardia
Ventricular fibrillation

Stroke

Death
Table VI. Recommended lifestyle changes

<table>
<thead>
<tr>
<th>Modification</th>
<th>Recommendation</th>
<th>Approx ( \downarrow ) SBP (mmHg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight reduction</td>
<td>BMI 18.5 – 24.9</td>
<td>5-20 per 10 kg</td>
</tr>
<tr>
<td>Dash diet</td>
<td>( \downarrow ) saturated fat and total fat, ( \uparrow ) fruit and vegetables</td>
<td>8-14</td>
</tr>
<tr>
<td>Dietary Na(^+)</td>
<td>(&lt;100) mmols or 6 gm NaCl/day</td>
<td>2-8</td>
</tr>
<tr>
<td>Physical activity</td>
<td>Brisk walking for 30 minutes per day most days</td>
<td>4-9</td>
</tr>
<tr>
<td>Moderation of alcohol</td>
<td>No more than 2 drinks per day</td>
<td>2-4</td>
</tr>
<tr>
<td>Tobacco</td>
<td>Complete cessation</td>
<td>-</td>
</tr>
</tbody>
</table>

Avoid refined CHO
PATIENT REPORTED HE WALKED THE DOG REGULARLY
How do we realistically institute life style changes?

Salt Intake in SA

- Blacks – 7.8 gm/day
- Coloureds – 8.5 gm/day
- Whites – 9.5 gm/day

- All had inadequate K+ intake
Change in 24 hour uNa, and SBP and DBP in hypertensive and normotensive individuals in Na by ethnic group

<table>
<thead>
<tr>
<th>Ethnic group</th>
<th>Trials</th>
<th>Participants</th>
<th>Mean effect</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertensive-white</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SBP (mm Hg)</td>
<td>16</td>
<td>599</td>
<td>-5.12</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>DBP (mm Hg)</td>
<td>17</td>
<td>623</td>
<td>-2.66</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>24h UNa</td>
<td>17</td>
<td>623</td>
<td>-77.44</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Hypertensive-black</td>
<td>5</td>
<td>171</td>
<td>-7.83</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>SBP (mm Hg)</td>
<td>5</td>
<td>171</td>
<td>-4.08</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>DBP (mm Hg)</td>
<td>5</td>
<td>171</td>
<td>-66.87</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Hypertensive-Asian</td>
<td>1</td>
<td>29</td>
<td>-5.41</td>
<td>0.008</td>
</tr>
<tr>
<td>SBP (mm Hg)</td>
<td>1</td>
<td>29</td>
<td>-2.17</td>
<td>0.047</td>
</tr>
<tr>
<td>DBP (mm Hg)</td>
<td>1</td>
<td>29</td>
<td>-68.42</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>24h UNa</td>
<td>1</td>
<td>29</td>
<td>-76.45</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Normotensive-white</td>
<td>12</td>
<td>1901</td>
<td>-2.11</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>SBP (mm Hg)</td>
<td>12</td>
<td>1901</td>
<td>-0.88</td>
<td>0.03</td>
</tr>
<tr>
<td>DBP (mm Hg)</td>
<td>12</td>
<td>1901</td>
<td>-76.45</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>24h UNa</td>
<td>12</td>
<td>1901</td>
<td>-76.45</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Normotensive-black:</td>
<td>3</td>
<td>412</td>
<td>-4.02</td>
<td>0.02</td>
</tr>
<tr>
<td>SBP (mm Hg)</td>
<td>3</td>
<td>412</td>
<td>-1.98</td>
<td>0.12</td>
</tr>
<tr>
<td>DBP (mm Hg)</td>
<td>3</td>
<td>412</td>
<td>-40.31</td>
<td>0.16</td>
</tr>
<tr>
<td>24h UNa</td>
<td>3</td>
<td>412</td>
<td>-40.31</td>
<td>0.16</td>
</tr>
</tbody>
</table>
Voluntary/Legislative Programme

- Under leadership of the Minister of Health experts consulted e.g. Graham Mc Gregor from WASH
- Australian study showed cost effectiveness of legislated Na reduction – 20 x gains compared to voluntary
- In 2012 the Minister gazetted information to changes to the Foodstuffs, Cosmetics and Disinfectant Act
- Draft regulations to reduce Na content over several years with goals being achieved in 2020, and gazetted into law
NICE/SA/JNC/ISHIB GUIDELINES

Thiazides/indapamide*/chlorthalidone*

*Recommended by NICE

Diuretic/CCB preferred in black patients
# Meta-Analysis of Hypertension Trials: Comparison of Drug Classes

**Trials & Events**

<table>
<thead>
<tr>
<th>Drug Class</th>
<th>SBP (mmHg)</th>
<th>DBP (mmHg)</th>
<th>Number of Trials</th>
<th>Number of Events</th>
<th>Relative Risk (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diuretic vs other</td>
<td>-1.4</td>
<td>0.2</td>
<td>15</td>
<td>2255</td>
<td>0.94 (0.82, 1.09)</td>
</tr>
<tr>
<td>β Blocker vs other</td>
<td>1.4</td>
<td>0.6</td>
<td>13</td>
<td>2004</td>
<td>1.18 (1.03, 1.36)</td>
</tr>
<tr>
<td>ACEI vs other</td>
<td>0.9</td>
<td>0.4</td>
<td>17</td>
<td>2951</td>
<td>1.06 (0.94, 1.20)</td>
</tr>
<tr>
<td>ARB vs other</td>
<td>-0.4</td>
<td>0.1</td>
<td>7</td>
<td>1643</td>
<td>0.90 (0.71, 1.13)</td>
</tr>
<tr>
<td>CCB vs other</td>
<td>-0.4</td>
<td>-0.9</td>
<td>25</td>
<td>4981</td>
<td>0.91 (0.84, 0.98)</td>
</tr>
</tbody>
</table>

**SBP & DBP**

- **SBP**: Systolic Blood Pressure
- **DBP**: Diastolic Blood Pressure
- **Δ BP**: Change in Blood Pressure

**Relative Risk (95% CI)**

- **0.7**: Favouring specified drug
- **1.0**: No difference
- **1.4**: Favouring "other" drug

*Law et al, BMJ, 2009*
Amlodipine/Valsartan inhibitor: Superior Systolic BP-lowering Efficacy Versus Amlodipine Monotherapy in Black Patients with Stage 2 Hypertension

Flack et al. J Hum Hypertens 2009 (E-pub ahead of print)
Triple Combination Therapy with Amlodipine/Valsartan/HCTZ Reduces SBP Significantly More Than Dual Therapy

Intent-to-Treat population (N=2,271)

<table>
<thead>
<tr>
<th>Therapy</th>
<th>LSM change in MSSBP (mmHg)</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amlodipine/Valsartan/HCTZ</td>
<td>-39.7*</td>
<td>583</td>
</tr>
<tr>
<td>10/320/25 mg</td>
<td>7.6</td>
<td></td>
</tr>
<tr>
<td>Valsartan/HCTZ</td>
<td>-32.0</td>
<td>559</td>
</tr>
<tr>
<td>320/25 mg</td>
<td>6.2</td>
<td></td>
</tr>
<tr>
<td>Amlodipine/Valsartan</td>
<td>-33.5</td>
<td>568</td>
</tr>
<tr>
<td>10/320 mg</td>
<td>8.2</td>
<td></td>
</tr>
<tr>
<td>HCTZ/amlodipine</td>
<td>-31.5</td>
<td>561</td>
</tr>
<tr>
<td>25/10 mg</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Δ7.6 mmHg* versus all other combinations

HCTZ = hydrochlorothiazide
LSM = least squares mean
MSSBP = mean sitting systolic BP

Affects 1.6% of African Americans. Common problem in South Africa.
Amlodipine Better             Chlorthalidone Better

Total                          0.93 (0.82, 1.06)                      Total                          1.15 (1.02, 1.30)
Age < 65                       0.93 (0.73, 1.19)                      Age < 65                       1.21 (0.97, 1.52)
Age >= 65                      0.93 (0.81, 1.08)                      Age >= 65                      1.13 (0.98, 1.30)
Men                            1.00 (0.85, 1.18)                      Men                            1.10 (0.94, 1.29)
Women                          0.84 (0.69, 1.03)                      Women                          1.22 (1.01, 1.46)
Black                           0.93 (0.76, 1.14)                      Black                          1.40 (1.17, 1.68)
Non-Black                      0.93 (0.79, 1.10)                      Non-Black                      1.00 (0.85, 1.17)
Diabetic                       0.90 (0.75, 1.08)                      Diabetic                       1.07 (0.90, 1.28)
Non-Diabetic                   0.96 (0.81, 1.14)                      Non-Diabetic                   1.23 (1.05, 1.44)

Lisinopril Better             Chlorthalidone Better

P = .01 for interaction
ACEi in African Americans

- This study evaluated the comparative effectiveness of an ACE inhibitor–based regimen on a composite outcome of all-cause mortality, stroke, and acute myocardial infarction (AMI) in hypertensive blacks compared with whites.
- A retrospective cohort study of 434,646 patients in a municipal health care system.
- Four exposure groups (Black-ACE, Black-NoACE, White-ACE, White-NoACE) were created based on race and treatment exposure (ACE or NoACE).
- Risk of the composite outcome and its components was compared across treatment groups and race using weighted Cox proportional hazard models.

RESULTS

![Graphs showing hazard ratios for different outcomes.](image-url)
2014 Hypertension Guideline JNC-8
Dosing Strategies

1. Start low dose monotherapy and titrate to maximum dose before considering 2nd drug

2. Start low dose monotherapy and add second drug at low dose

3. Start 2 drugs especially if BP > 160/100 mmHg or 20/10 mmHg above goal
Figure 1. Overview of approach to treatment

Measure BP on at least 3 occasions

BP 140-159/90-99 mmHg with < 3 risk factors, no TOD or complications
   - Lifestyle modification for 3-6 months
     - Not at goal

BP 140-159/90-99 mmHg with ≥ 3 risk factors, diabetes, TOD or complications
   - Lifestyle modification and commence monotherapy, review in 4-6 weeks
     - Not at goal

BP ≥ 160/100 mmHg
   - Lifestyle modification and commence 2 drugs preferably in fixed drug combination, review in 4-6 weeks
     - Not at goal
       - Add third drug/optimise doses of drugs

BP > 180/110 – see severe hypertension
Resistant Hypertension

- Beta blocker
- Alpha blocker
- Aldosterone antagonist
- Vasodilator e.g. minoxidil
- Centrally acting
- Furosemide twice daily if eGFR < 45mls/min
PLACEBO ADJUSTED RESULTS (mmHg)

- spiro
- bisopril
- cardura

BP response

Williams B, et al ESC 2015
**Hypertension Management Algorithm**

1. **Assess**
   - **Major Risk Factors**
     - Levels of systolic and diastolic BP
     - Smoking
     - Dyslipidaemia
       - Total cholesterol > 5.1 mmol/L
     - Diabetes mellitus
     - Men > 55 years
     - Women > 65 years
     - Family history of early onset of CVD:
       - Men aged < 55 years
       - Women aged < 65 years
     - Waist circumference - abdominal obesity:
       - Men > 102 cm
       - Women > 84 cm

2. **Measure Blood Pressure**
   - According to the ESC/ESH guidelines

3. **Lifestyle Changes**
   - Weight reduction
   - Restrict salt, dietary sugars, and saturated fat
   - Limit alcohol consumption
   - Increase fruit and vegetables
   - Increase physical activity
   - Stop all tobacco products

4. **Target Organ Damage**
   - LVH: based on ECG
   - Sokolow-Lyon's > 35 mv (S in V1 + R in V5 or V6)
   - Cornell product > 2440 mmvms (S in V3 + R in aVL + 6 in females) x QRS duration
   - S in aVL > 11 mv
   - +ve dipsticks for protein

5. **BP 140-159/90-99 mmHg with < 3 risk factors, no TOD or complications**
   - Lifestyle modification for 12 months
   - Commence monotherapy, review in 4-6 weeks

6. **BP 140-159/90-99 mmHg with ≥ 3 risk factors, diabetes, TOD or complications**
   - Lifestyle modification for 12 months
   - Commence monotherapy, review in 4-6 weeks

7. **BP ≥ 160/100 mmHg**
   - Lifestyle modification for 12 months
   - Commence 2 first line drugs, review in 4-6 weeks
   - Add third drug/optimise doses of drugs

8. **BP Targets**
   - < 140/90 mmHg
   - < 150/90 mmHg if > 80 years

**Routine Management**

1. Choose any of the following:
   - Hydrochlorothiazide 12.5 -25 mg daily or indapamide 1.25 - 2.5 mg daily
   - CCB
   - ACE-I or ARB
   - If 20-30mmHg above goal proceed directly to step 2

2. Step 2
   - 1. Combine any 2 of the above
   - 2. Combine all 3 of above
   - 3. Maximize doses of individual agents

3. **Step 3**
   - Spironolactone 25mg daily (monitor K+ and avoid if eGFR < 45 mls/min)
   - β blocker, α blocker, minoxidil, centrally acting drug, or hydralazine
   - Consider Furosemide 40mg b.d. in place of thiazide if eGFR < 45mls/min
   - Check adherence, secondary causes, home or 24 hour BP monitoring for white coat or pseudoresistance

*CCBs/diuretics preferred in Blacks/Elderly
* 24 hour acting drugs and single pill combinations preferred

**Step 5: Is there a hypertensive urgency or emergency?**
BP > 180/110 mmHg with symptoms and/or accelerated TOD

**Step 6: Are there compelling indications/contraindications? (see below)**

**Step 7: Routine Management**

Abbreviations:
- LVH = left ventricular hypertrophy
- eGFR = estimated glomerular filtration rate
- TOD = target organ damage
- TIA = transient ischaemic attack
- ACE-I = angiotensin converting enzyme inhibitor
- ARB = angiotensin receptor blocker
- CCB = calcium channel blocker
- HF = heart failure
- ISH = isolated systolic hypertension
KEY MESSAGES

• Hypertension is major world wide epidemic
• There are substantial differences in awareness, prevalence and control rates, and CV outcomes especially in Africa
• The SA Hypertension Guideline serves as a model for Africa and implementation thereof can make substantial impact even in low resource settings
• It provides a basis for developing minimum standards for care essential for holding health authorities to account
• The optimal drug combinations in Africa are still to be defined
• These guidelines could be adapted to the economic considerations of each country but the cost of untreated and poorly treated hypertension needs to be considered