Hypertension update – a practical guide

Brian Rayner,
Division of Hypertension, University of Cape Town
Overview

• Introduction and importance
• Definitions and targets
• BP measurement
• Basic tests
• Non pharmacological treatment
• Pharmacological treatment
• A few words on treatment resistant HT
Historical Perspective

• The greatest danger to a man with high blood pressure lies in its discovery, because then some fool is certain to try and reduce it. J.H. Hay, 1931

• Hypertension may be an important compensatory mechanism which not be tampered with, even were it certain that we could control it – Paul Dudley White, 1937
VA Cooperative Study Group – Estimated Cumulative Incidence of All Morbid Events Over 5 Years

Hypertension Treatment Significantly Reduced Mortality and Morbidity

DBP – 90 -114 mmHg

Why talk about the Same Old Thing\textsuperscript{1,2}

67% INCREASE IN HYPERTENSION Between 1990 and 2010

- 18% of deaths overall are caused by high BP
- 40% of deaths in people with diabetes is caused by high BP
- 50% of heart disease, stroke and HF is caused by high BP

1. Adapted from The Journal of clinical hypertension. 2014.DOI:10.1111/jch.12372. 2. www.hypertension.org

#1 Risk for Death in 2010

Estimated to causes

- 500,000 DEATHS
- AND 10 MILLION YEARS OF LIFE LOST

4 in 10 PEOPLE GLOBALLY HAVE HYPERTENSION

1. Adapted from The Journal of clinical hypertension. 2014.DOI:10.1111/jch.12372. 2. www.hypertension.org
Scope of Problem in South Africa

Rise in Prevalence of Hypertension in SA men
Similar in females

Economically productive age

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
HT in South Africa


91.1% unmet need
Why do we have guidelines?

- 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
The Treatment of Hypertension: A Remarkable Success Story

Marvin Moser, MD; Edward J. Roccella, PhD, MPH

One of the most successful public health programs in the past century provides an example of what can be accomplished when the government, the private sector, academia, and community organizations work together. The results of 4 decades of activities of the National High Blood Pressure Education Program (NHBPEP) can be measured in several ways. The public’s awareness, treatment, and control have increased remarkably. Hypertension is the primary reason adults visit physicians. Age-adjusted mortality for heart disease and stroke has declined by 70% and 80%, respectively, since the beginning of the program. The decline in heart and stroke deaths is seen in both sexes and blacks and whites, and 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. This dramatic decrease in strokes and heart disease has occurred despite the substantial increase in obesity and diabetes in the United States. J Clin Hypertens (Greenwich). 2013; 15:86-91 © 2012 Wiley Periodicals, Inc.

Effect of proper implementation of guidelines
“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.”
Kaiser Permanente Model

• Between 2001-2009 number of patients with HT increased from 349,937 to 652,763
• Introduction of simplified guidelines
• Target BP from 44% to 80%
• In 2011 > 87% reached target

Go et al, Effective approach to HT management, Hypertension 2014
Review Article

South African hypertension practice guideline 2014

Hypertension guideline working group: YK Seedat, BL Rayner, Yosuf Veriava

Abstract

Outcomes: Extensive data from many randomised, controlled trials have shown the benefit of treating hypertension (HTN). The target blood pressure (BP) for antihypertensive management is systolic < 140 mmHg and diastolic < 90 mmHg, with minimal or no drug side effects. Lower targets are no longer recommended. The reduction of BP in the elderly should be achieved gradually over one month. Co-existent cardiovascular (CV) risk factors should also be controlled.

Benefits: Reduction in risk of stroke, cardiac failure, chronic kidney disease and coronary artery disease.

Recommendations: Correct BP measurement procedure is described. Evaluation of cardiovascular risk factors and recommendations for antihypertensive therapy are stipulated. Lifestyle modification and patient education are cornerstones of management. The major indications, precautions and contra-indications are listed for each antihypertensive drug recommended. Drug therapy for the patient with uncomplicated HTN is either mono- or combination therapy with a low-dose diuretic, calcium channel blocker (CCB) and an ACE inhibitor (ACEI) or angiotensin receptor blocker (ARB). Combination therapy should be considered ab initio if the BP is ≥ 160/100 mmHg. In black patients, either a diuretic and/or a CCB is recommended initially because the response rate is better compared to an ACEI. In resistant hypertension, add an alpha-blocker, spironolactone, vasodilator or β-blocker.

Validity: The guideline was developed by the Southern African Hypertension Society 2014.

Keywords: South Africa, hypertension, guideline
Goals of treatment

<table>
<thead>
<tr>
<th></th>
<th>Systolic</th>
<th>Diastolic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uncomplicated</td>
<td>&lt;140</td>
<td>&lt;90</td>
</tr>
<tr>
<td>Diabetic (or any high risk patient)</td>
<td>&lt;130</td>
<td>&lt;80</td>
</tr>
<tr>
<td>CKD with proteinuria</td>
<td>&lt;120</td>
<td>&lt;70</td>
</tr>
</tbody>
</table>

Guidelines Subcommittee 2003
Blood pressure and cardiovascular death

Cardiovascular death (%) vs. Systolic blood pressure

- Diabetics
  n=3,305
  Death rate - 5.3%

- Non-diabetics
  n=88,257
  Death rate - 2.2%

Reappraisal of European guidelines on hypertension management: a European Society of Hypertension Task Force document

Giuseppe Mancia\textsuperscript{a}, Stéphane Laurent\textsuperscript{b}, Enrico Agabiti-Rosei\textsuperscript{c}, Ettore Ambrosioni\textsuperscript{d}, Michel Burnier\textsuperscript{e}, Mark J. Caulfield\textsuperscript{f}, Renata Cifkova\textsuperscript{g}, Denis Clément\textsuperscript{h}, Antonio Coca\textsuperscript{i}, Anna Dominiczak\textsuperscript{j}, Serap Erdine\textsuperscript{k}, Robert Fagard\textsuperscript{l}, Csaba Farsang\textsuperscript{m}, Guido Grassi\textsuperscript{n}, Hermann Haller\textsuperscript{o}, Anthony Heagerty\textsuperscript{p}, Sverre E. Kjeldsen\textsuperscript{q}, Wolfgang Kiowski\textsuperscript{r}, Jean Michel Mallion\textsuperscript{s}, Athanasios Manolis\textsuperscript{t}, Krzysztof Narkiewicz\textsuperscript{u}, Peter Nilsson\textsuperscript{v}, Michael H. Olsen\textsuperscript{w}, Karl Heinz Rahn\textsuperscript{x}, Josep Redon\textsuperscript{y}, José Rodicio\textsuperscript{z}, Luis Ruilope\textsuperscript{a1}, Roland E. Schmieder\textsuperscript{a2}, Harry A.J. Struijker-Boudier\textsuperscript{a3}, Pieter A. van Zwieten\textsuperscript{a4}, Margus Viigimaa\textsuperscript{a5} and Alberto Zanchetti\textsuperscript{a6}
Diabetes mellitus – Systolic BP

SBP (mmHg)

170
160
150
140
130
120
110
100

HOT SHEP UK MHope SEur AB CDC IDNT REN PROG ADV ACCORD

BPΔ Benefit Partial benefit No Benefit

133.5 119.3

130

119.3
Cardiovascular Mortality Risk Doubles with Each 20/10 mmHg Increment in Systolic/Diastolic Blood Pressure*

*Individuals aged 40–69 years

Incidence of primary outcome (bar graphs) and HR (line graphs; adjusted for baseline conditions, without propensity score analysis) as a function of SBP and DBP in patients with and without previous revascularization.

INVEST Study
Balancing harm vs good (BP)

Too high
1. Stroke
2. CCF
3. CKD
4. IHD
5. PVD

Low target
1. Dizziness, falls
2. \( \uparrow \) CV events
3. Other adverse effects

Does it meet the pragmatic definition proposed by Geoffrey Rose decades ago should perhaps be considered—viz: “that level of BP above which investigation and management does more good than harm.”

Table 1 | Blood-pressure goals according to current hypertension guidelines

<table>
<thead>
<tr>
<th>Guideline (publication year)</th>
<th>Target population</th>
<th>Systolic/diastolic blood pressure goal (mmHg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NICE (2011)</td>
<td>Aged &lt;80 years</td>
<td>&lt;140/90</td>
</tr>
<tr>
<td></td>
<td>Aged ≥80 years</td>
<td>&lt;150/90</td>
</tr>
<tr>
<td>European Society of Hypertension/ESC (2013)</td>
<td>Aged &lt;80 years</td>
<td>&lt;140/90</td>
</tr>
<tr>
<td></td>
<td>Aged &gt;80 years</td>
<td>&lt;150/90</td>
</tr>
<tr>
<td></td>
<td>Diabetes mellitus</td>
<td>&lt;140/85</td>
</tr>
<tr>
<td></td>
<td>CKD without overt proteinuria</td>
<td>&lt;140/90</td>
</tr>
<tr>
<td></td>
<td><strong>CKD with overt proteinuria</strong></td>
<td><strong>&lt;130/90</strong></td>
</tr>
<tr>
<td>Eighth US Joint National Committee (2014)</td>
<td>Aged &lt;60 years</td>
<td>&lt;140/90</td>
</tr>
<tr>
<td></td>
<td><strong>Aged ≥60 years</strong></td>
<td><strong>&lt;150/90</strong></td>
</tr>
<tr>
<td></td>
<td>Diabetes or CKD</td>
<td>&lt;140/90</td>
</tr>
<tr>
<td>American Society of Hypertension/International Society of Hypertension (2014)</td>
<td>Aged &lt;80 years</td>
<td>&lt;140/90</td>
</tr>
<tr>
<td></td>
<td>Aged ≥80 years</td>
<td>&lt;150/90</td>
</tr>
</tbody>
</table>

CKD, chronic kidney disease.
Eligibility, Randomization, and Follow-up.

Clinical or sub-clinical cardiovascular disease excluding stroke and diabetes
OR
CKD - proteinuria <1 g/d, eGFR 20-59 mL/min
OR
†Estimated 10-year global cardiovascular risk ≥15% (Framingham)
OR
Age ≥ 75 years

SBP between 130 -180 mmHg

Age ≥ 50 years

Mean of 3 BPs unobserved
Systolic Pressures (mean ± 95% CI)

Mean # Meds
- Intensive: 3.2, 3.4, 3.5, 3.4
- Standard: 1.9, 2.1, 2.2, 2.3

Average after 1st year: 133.5 Standard vs. 119.3 Intensive, Delta = 14.2

Method of measurement not defined
## SPRINT Primary Outcome and its Components

### Event Rates and Hazard Ratios

<table>
<thead>
<tr>
<th>Event</th>
<th>Intensive</th>
<th>Standard</th>
<th>HR (95% CI)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primary Outcome</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of Events</td>
<td>243</td>
<td>319</td>
<td>0.75 (0.64, 0.89)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Rate, %/year</td>
<td>1.65</td>
<td>2.19</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>All MI</strong></td>
<td>97</td>
<td>116</td>
<td>0.83 (0.64, 1.09)</td>
<td>0.19</td>
</tr>
<tr>
<td>No. of Events</td>
<td>0.65</td>
<td>0.78</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Non-MI ACS</strong></td>
<td>40</td>
<td>40</td>
<td>1.00 (0.64, 1.55)</td>
<td>0.99</td>
</tr>
<tr>
<td>Rate, %/year</td>
<td>0.27</td>
<td>0.27</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>All Stroke</strong></td>
<td>62</td>
<td>70</td>
<td>0.89 (0.63, 1.25)</td>
<td>0.50</td>
</tr>
<tr>
<td>No. of Events</td>
<td>0.41</td>
<td>0.47</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>All HF</strong></td>
<td>62</td>
<td>100</td>
<td>0.62 (0.45, 0.84)</td>
<td>0.002</td>
</tr>
<tr>
<td>Rate, %/year</td>
<td>0.41</td>
<td>0.67</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>CVD Death</strong></td>
<td>37</td>
<td>65</td>
<td>0.57 (0.38, 0.85)</td>
<td>0.005</td>
</tr>
<tr>
<td>No. of Events</td>
<td>0.25</td>
<td>0.43</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Serious Adverse Events* (SAE) During Follow-up

<table>
<thead>
<tr>
<th>All SAE reports</th>
<th>Number (%) of Participants</th>
<th>Intensive</th>
<th>Standard</th>
<th>HR (P Value)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1793 (38.3)</td>
<td>1736 (37.1)</td>
<td>1.04 (0.25)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SAEs associated with Specific Conditions of Interest</th>
<th>Number (%) of Participants</th>
<th>Intensive</th>
<th>Standard</th>
<th>HR (P Value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypotension</td>
<td>110 (2.4)</td>
<td>66 (1.4)</td>
<td>1.67 (0.001)</td>
<td></td>
</tr>
<tr>
<td>Syncope</td>
<td>107 (2.3)</td>
<td>80 (1.7)</td>
<td>1.33 (0.05)</td>
<td></td>
</tr>
<tr>
<td>Injurious fall</td>
<td>105 (2.2)</td>
<td>110 (2.3)</td>
<td>0.95 (0.71)</td>
<td></td>
</tr>
<tr>
<td>Bradycardia</td>
<td>87 (1.9)</td>
<td>73 (1.6)</td>
<td>1.19 (0.28)</td>
<td></td>
</tr>
<tr>
<td>Electrolyte abnormality</td>
<td>144 (3.1)</td>
<td>107 (2.3)</td>
<td>1.35 (0.020)</td>
<td></td>
</tr>
<tr>
<td>Acute kidney injury or acute renal failure</td>
<td>193 (4.1)</td>
<td>117 (2.5)</td>
<td>1.66 (&lt;0.001)</td>
<td></td>
</tr>
</tbody>
</table>

*Fatal or life threatening event, resulting in significant or persistent disability, requiring or prolonging hospitalization, or judged important medical event.
## Categories of BP in Adults

<table>
<thead>
<tr>
<th>BP Category*</th>
<th>SBP</th>
<th>DBP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>&lt;120</td>
<td>and &lt;80</td>
</tr>
<tr>
<td>Elevated</td>
<td>120-129</td>
<td>and &lt;80</td>
</tr>
<tr>
<td>Hypertension</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stage 1</td>
<td>130-139</td>
<td>80-89</td>
</tr>
<tr>
<td>Stage 2</td>
<td>≥140</td>
<td>≥90</td>
</tr>
</tbody>
</table>

*Individuals with SBP and DBP in 2 categories should be designated to higher.
BP in indicates BP based on ≥2 careful readings obtained on ≥2 occasions

Adapted AHA/ACC Hypertension Guidelines, 2017
BP Goals

<table>
<thead>
<tr>
<th>COR</th>
<th>BP Goal for Patients with Hypertension</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>For adults with confirmed hypertension and known CVD or ASCVD event risk &gt; 10%# a BP target &lt; 130/80 is recommended*</td>
</tr>
<tr>
<td>IIb</td>
<td>For adults with confirmed hypertension without additional markers of increased CVD risk a BP target &lt; 130/80 maybe reasonable</td>
</tr>
</tbody>
</table>

*Including patients with diabetes, CKD
Framingham risk 15% = +/- 6-7% ASCVD

Adapted AHA/ACC Hypertension Guidelines, 2017
CENTRAL ILLUSTRATION: Prevalence of Hypertension, Recommendation for Pharmacological Antihypertensive Treatment, and Blood Pressure Above Goal Among U.S. Adults According to the 2017 ACC/AHA and the JNC7 Guidelines

Treatment Thresholds and Targets in Hypertension
Different Readings of the Same Evidence?

Costas Tsioufis, Costas Thomopoulos, Reinhold Kreutz
## CLASSIFICATION OF HYPERTENSION (>18 years)

<table>
<thead>
<tr>
<th>Category</th>
<th>Systolic</th>
<th>Diastolic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optimal</td>
<td>&lt;120</td>
<td>and &lt;80</td>
</tr>
<tr>
<td>Normal</td>
<td>&lt;130</td>
<td>and &lt;85</td>
</tr>
<tr>
<td>High-normal</td>
<td>130 - 139</td>
<td>or 85 - 89</td>
</tr>
<tr>
<td>Hypertension</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stage 1</td>
<td>140 - 159</td>
<td>or 90 - 99</td>
</tr>
<tr>
<td>Stage 2</td>
<td>160 - 179</td>
<td>or 100 - 109</td>
</tr>
<tr>
<td>Stage 3</td>
<td>≥ 180</td>
<td>or ≥ 110</td>
</tr>
</tbody>
</table>
Are the American Heart Association/American College of Cardiology High Blood Pressure Guidelines Fit for Global Purpose?

Thoughts From the International Society of Hypertension

Neil R. Poulter, Rafael Castillo, Fadi J. Charchar, Markus P. Schlaich, Aletta E. Schutte, Maciej Tomaszewski, Rhian M. Touyz, Ji-Guang Wang
Balancing harm vs good (BP)

Too high
1. Stroke
2. CCF
3. CKD
4. IHD
5. PVD

Low target
1. Hypotension
2. Electrolyte abN
3. AKI, no ↑ ESRD
4. No increase in MI
5. Benefit in certain high risk patients e.g. Sprint entry criteria
WHY SO MUCH ATTENTION TO ACCURATE BP MEASUREMENT?

BP ~ ‘KING’ OF PROGNOSTIC MARKERS

ESSENTIAL FOR DIAGNOSIS

ESSENTIAL FOR BP CONTROL
CONVENTIONAL BP MEASUREMENT

INACCURATE IN OVER ONE-THIRD OF PATIENTS IF NOT DONE CORRECTLY

Subject to White Coating
Out-of-Office BP Measurements are More Highly Correlated With BP-Related Risk

Indexes of hypertensive target organ damage

Diagnosing hypertension

- If the clinic blood pressure is 140/90 mmHg or higher, offer ambulatory blood pressure monitoring (ABPM) to confirm the diagnosis of hypertension. [new 2011]
<table>
<thead>
<tr>
<th>Blood Pressure</th>
<th>Mean (SD)</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Systolic</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CBP sitting</td>
<td>172 (8)</td>
<td>159–197</td>
</tr>
<tr>
<td>CBP standing</td>
<td>168 (10)</td>
<td>149–197</td>
</tr>
<tr>
<td>Baseline morning ABP (8:00 AM–12:00 noon)</td>
<td>140 (20)</td>
<td>101–201</td>
</tr>
<tr>
<td>Baseline daytime ABP (8:00 AM–8:00 PM)</td>
<td>136 (16)</td>
<td>105–174</td>
</tr>
<tr>
<td>Baseline night-time ABP (10:00 PM–6:00 AM)</td>
<td>124 (20)</td>
<td>90–217</td>
</tr>
<tr>
<td>Baseline 24-h ABP</td>
<td>133 (15)</td>
<td>104–187</td>
</tr>
<tr>
<td>Difference between CBP sitting and ABP morning</td>
<td>32 (21)</td>
<td>−33 to 80</td>
</tr>
<tr>
<td>Difference between CBP sitting and ABP daytime</td>
<td>36 (16)</td>
<td>−13 to 73</td>
</tr>
</tbody>
</table>
Automated Office BP Measurement Preferred

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

- More closely approximates ABPM than routine office BPs (mitigates white coat effect)\(^1-3\)
- Is more predictive of end organ damage (LVMI, proteinuria and cIMT), similar to ABPM\(^4-6\)

\(ABPM = \text{ambulatory blood pressure measurement}\)

\(LVMI = \text{left ventricular mass index}\)

\(cIMT = \text{carotid intima media thickness}\)

Automated Office BP (AOBP)

- Automated and calibrated device
- BP taken in the normal way away from the physician
- Avoids white coating
- At least 3 readings at 1-2 min intervals, average 3 stable readings
- Cut off 135/85 mmHg
- Used for diagnosis and follow up
### TABLE III. Definitions of hypertension by different methods of BP measurement

<table>
<thead>
<tr>
<th></th>
<th>Office</th>
<th>Automated office</th>
<th>Self</th>
<th>Ambulatory</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Predicts outcome</strong></td>
<td>+</td>
<td>++</td>
<td>++</td>
<td>+++</td>
</tr>
<tr>
<td><strong>Initial diagnosis</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Cut-off BP (mmHg)</strong></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><strong>Evaluation of treatment</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Limited, but valuable</td>
</tr>
<tr>
<td><strong>Assess diurnal variation</strong></td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Increasing risk of an event

Asymptomatic

Oligosymptomatic
- Proteinuria
- Nephrosclerosis
- Left-ventricular hypertrophy
- Retinopathy
- Binswanger lesions

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

Target organ disease

Prehypertension

Established hypertension
Approach

• History
• Con meds – NSAIDs, Ritalin, Tik, OC, etc
• Risk factors and prior events
• Level of BP
• Examination – TOD (fundi, apex), secondary causes (pulses, bruits, striae, etc), waist and BMI
• Basic investigations
# 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/eGFR</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/excess diuretic</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
ECG Criteria for LVH

- Repolarisation changes - harbinger of death

Electrocardiogram from patient with malignant hypertension. Voltage changes of left ventricular hypertrophy (deep
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>
</table>
| Levels of systolic and diastolic BP. | LVH: based on ECG  
- Sokolow-Lyons >35mm  
- R in aVL > 11 mm  
- Cornel > 2440 (mm.ms)  
- Microalbuminuria: albumin creatine ratio 3-30 mg/mmol preferably spot morning urine and eGFR > 60ml/min |  
- Coronary heart disease  
- Heart failure  
- Chronic kidney disease:  
  - macroalbuminuria > 30mg/mmol  
  - OR eGFR < 60ml/min |  
| Smoking. |  |  
| Dyslipidaemia:  
- total cholesterol > 5.1 mmol/L, OR  
- LDL > 3 mmol/L, OR  
- HDL men <1 and women <1.2 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 ≥ 88 cm. The exceptions are South Asians and Chinese: Men: >90 cm and Women: >80 cm. |  |  

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

• Lifestyle
• Antihypertensive therapy
• Treatment of all risk factors – LDL and diabetes as per LASSA and SEMDSA guidelines
• Statins should be considered in every patient
• Aspirin for secondary prevention and only for very high risk for primary prevention
• BP must be controlled (at least < 160 mmHg) to avoid cerebral Hx
PATIENT REPORTED HE WALKED THE DOG REGULARLY
To keep a slender figure
No one can deny...

Reach for a LUCKY instead of a sweet

“It’s CHO free
No Throat Irritation - No Cough.”
Sugar – 50% glucose/50% fructose, high fructose corn syrup 45% glucose/55% fructose
Honey = sugar from bees

It is important to recognise sugar causes HT through mechanisms other than obesity

We gathered a few popular drinks from our canteen's refrigerator to check how much sugar each one contains. The results were surprising. Even 'healthier' drinks, such as flavoured mineral water and drinking yogurt, contain a large amount of sugar.
The sugar scale

Although they punt themselves as a healthy, easy breakfast option, cereals are loaded with sugar. A 100g bowl of Milo cereal, for example, has about the same amount of sugar as a chocolate bar.

5g = 1 teaspoon
All the values are per 100g

1g
1.8g
7.9g
8g
12.9g
16.4g
17.5g
21g
22g
25g
31.7g
33g
33.1g

Plain Jungle Oats
Weet-Bix
Kellogg’s Corn Flakes
Kellogg’s Rice Krispies
Kellogg’s All-Bran Flakes
Futurelife High Energy Smart Food
Kellogg’s Special K
ProNutro (chocolate flavour)
Kellogg’s Frosties
Jungle Energy Crunch (with raisins)
Kellogg’s Coco Pops
Kellogg’s Strawberry Pops
Nestlé Milo cereal

GRAPHIC SUPPLIED BY graphics24

RESEARCH: GRETHE KOEN

Dyna Gliclazide SR 30 mg
SUSTAINED CONTROL
How do we realistically institute life style changes?

Table VI. Recommended lifestyle changes

<table>
<thead>
<tr>
<th>Modification</th>
<th>Recommendation</th>
<th>Approx ↓ 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>↓ saturated fat and total fat, ↑ 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 or sugar
NICE/SA/JNC/ISHIB GUIDELINES

- Thiazides/indapamide*/chlorthalidone*
- ACEi
- CCB
- ARB

*Recommended by NICE

Diuretic/CCB preferred in black patients
<table>
<thead>
<tr>
<th>Major cardiovascular events</th>
<th>Intervention Events</th>
<th>Intervention Participants</th>
<th>Control Events</th>
<th>Control Participants</th>
<th>RR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACE inhibitor</td>
<td>10</td>
<td>5379</td>
<td>31562</td>
<td>9766</td>
<td>1.63 (1.00-1.06)</td>
</tr>
<tr>
<td>ARB</td>
<td>8</td>
<td>3647</td>
<td>27140</td>
<td>3779</td>
<td>0.98 (0.93-1.02)</td>
</tr>
<tr>
<td>β-blocker</td>
<td>9</td>
<td>2854</td>
<td>25939</td>
<td>2520</td>
<td>1.17 (1.14-1.24)</td>
</tr>
<tr>
<td>CCB</td>
<td>21</td>
<td>7857</td>
<td>53693</td>
<td>12808</td>
<td>0.97 (0.94-0.99)</td>
</tr>
<tr>
<td>Diuretic</td>
<td>11</td>
<td>5830</td>
<td>38353</td>
<td>6732</td>
<td>0.97 (0.94-1.00)</td>
</tr>
<tr>
<td>Coronary heart disease</td>
<td>ACE inhibitor</td>
<td>13</td>
<td>12718</td>
<td>33054</td>
<td>0.95 (0.90-1.01)</td>
</tr>
<tr>
<td>ARB</td>
<td>9</td>
<td>3295</td>
<td>27553</td>
<td>1080</td>
<td>1.66 (1.58-1.75)</td>
</tr>
<tr>
<td>β-blocker</td>
<td>11</td>
<td>3579</td>
<td>39864</td>
<td>344</td>
<td>1.01 (0.96-1.06)</td>
</tr>
<tr>
<td>CCB</td>
<td>25</td>
<td>2995</td>
<td>74465</td>
<td>4576</td>
<td>0.98 (0.94-1.03)</td>
</tr>
<tr>
<td>Diuretic</td>
<td>11</td>
<td>2041</td>
<td>40531</td>
<td>2246</td>
<td>1.02 (0.97-1.09)</td>
</tr>
<tr>
<td>Stroke</td>
<td>ACE inhibitor</td>
<td>14</td>
<td>1502</td>
<td>33355</td>
<td>1.05 (1.01-1.10)</td>
</tr>
<tr>
<td>ARB</td>
<td>10</td>
<td>1459</td>
<td>28703</td>
<td>1215</td>
<td>0.92 (0.85-0.99)</td>
</tr>
<tr>
<td>β-blocker</td>
<td>12</td>
<td>1399</td>
<td>40953</td>
<td>989</td>
<td>1.24 (1.14-1.35)</td>
</tr>
<tr>
<td>CCB</td>
<td>26</td>
<td>2245</td>
<td>76768</td>
<td>3470</td>
<td>0.96 (0.93-0.99)</td>
</tr>
<tr>
<td>Diuretic</td>
<td>12</td>
<td>1215</td>
<td>41625</td>
<td>1409</td>
<td>0.97 (0.94-1.00)</td>
</tr>
<tr>
<td>Heart failure</td>
<td>ACE inhibitor</td>
<td>13</td>
<td>1494</td>
<td>32104</td>
<td>0.98 (0.92-1.05)</td>
</tr>
<tr>
<td>ARB</td>
<td>8</td>
<td>1141</td>
<td>76418</td>
<td>1137</td>
<td>0.96 (0.89-1.04)</td>
</tr>
<tr>
<td>β-blocker</td>
<td>8</td>
<td>652</td>
<td>33953</td>
<td>634</td>
<td>1.04 (0.93-1.16)</td>
</tr>
<tr>
<td>CCB</td>
<td>22</td>
<td>2064</td>
<td>73733</td>
<td>2955</td>
<td>1.47 (1.11-1.94)</td>
</tr>
<tr>
<td>Diuretic</td>
<td>8</td>
<td>1108</td>
<td>27530</td>
<td>5770</td>
<td>0.81 (0.75-0.88)</td>
</tr>
<tr>
<td>Renal failure</td>
<td>ACE inhibitor</td>
<td>6</td>
<td>220</td>
<td>19589</td>
<td>0.85 (0.72-0.99)</td>
</tr>
<tr>
<td>ARB</td>
<td>5</td>
<td>160</td>
<td>19534</td>
<td>185</td>
<td>0.85 (0.69-1.05)</td>
</tr>
<tr>
<td>β-blocker</td>
<td>3</td>
<td>262</td>
<td>19447</td>
<td>466</td>
<td>1.19 (1.05-1.34)</td>
</tr>
<tr>
<td>CCB</td>
<td>12</td>
<td>787</td>
<td>90604</td>
<td>1082</td>
<td>1.02 (0.93-1.12)</td>
</tr>
<tr>
<td>Diuretic</td>
<td>3</td>
<td>220</td>
<td>20992</td>
<td>277</td>
<td>0.93 (0.78-1.11)</td>
</tr>
<tr>
<td>All-cause mortality</td>
<td>ACE inhibitor</td>
<td>14</td>
<td>33721</td>
<td>33304</td>
<td>1.01 (0.97-1.05)</td>
</tr>
<tr>
<td>ARB</td>
<td>11</td>
<td>2548</td>
<td>29282</td>
<td>2638</td>
<td>0.99 (0.94-1.04)</td>
</tr>
<tr>
<td>β-blocker</td>
<td>12</td>
<td>2806</td>
<td>40953</td>
<td>2688</td>
<td>1.06 (1.01-1.12)</td>
</tr>
<tr>
<td>CCB</td>
<td>26</td>
<td>5062</td>
<td>78672</td>
<td>8428</td>
<td>0.97 (0.94-1.00)</td>
</tr>
<tr>
<td>Diuretic</td>
<td>12</td>
<td>3473</td>
<td>41625</td>
<td>3006</td>
<td>1.02 (0.97-1.06)</td>
</tr>
</tbody>
</table>

β-blockers no longer recommended unless compelling indications

Copyright © 2016 Elsevier Ltd Terms and Conditions The Lancet 2016 387, 957-967 DOI: (10.1016/S0140-6736(15)01225-8)
<table>
<thead>
<tr>
<th>Class</th>
<th>Conditions favouring use</th>
<th>Compelling</th>
<th>Contraindications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Diuretics</strong> (thiazide/thiazide-like)</td>
<td>HF&lt;br&gt; Elderly hypertensives&lt;br&gt; ISH&lt;br&gt; Hypertensives of African origin</td>
<td>Gout</td>
<td>Pregnancy β-blockers (especially atenolol)</td>
</tr>
<tr>
<td><strong>Diuretics</strong> (loop)</td>
<td>Renal insufficiency&lt;br&gt; HF</td>
<td>Renal failure</td>
<td>Pregnancy</td>
</tr>
<tr>
<td><strong>Diuretics</strong> (anti-aldosterone)</td>
<td>HF&lt;br&gt; Post-myocardial infarction&lt;br&gt; Resistant hypertension</td>
<td>Hyperkalaemia</td>
<td></td>
</tr>
<tr>
<td><strong>CCBs</strong></td>
<td>Elderly patients&lt;br&gt; ISH&lt;br&gt; Angina pectoris&lt;br&gt; Peripheral vascular disease&lt;br&gt; Carotid atherosclerosis&lt;br&gt; Pregnancy (nifedipine only)</td>
<td>Tachyarrhythmias</td>
<td></td>
</tr>
<tr>
<td><strong>Non-dihydropyridine</strong> CCBs (verapamil, diltiazem)</td>
<td>Angina pectoris&lt;br&gt; Carotid atherosclerosis&lt;br&gt; Supraventricular tachycardia</td>
<td>AV block (grade 2 or 3)</td>
<td>Constipation (verapamil)</td>
</tr>
<tr>
<td><strong>ACE-Is</strong></td>
<td>HF&lt;br&gt; LV dysfunction&lt;br&gt; Post-myocardial infarction&lt;br&gt; Non-diabetic nephropathy&lt;br&gt; Type 1 diabetic nephropathy&lt;br&gt; Prevention of diabetic microalbuminuria&lt;br&gt; Proteinuria</td>
<td>Pregnancy β-blockers (especially atenolol)</td>
<td>Bilateral renal artery stenosis&lt;br&gt; Angioneurotic oedema (more common in blacks than in whites)</td>
</tr>
<tr>
<td><strong>ARBs</strong></td>
<td>Type 2 diabetic nephropathy&lt;br&gt; Type 2 diabetic microalbuminuria&lt;br&gt; Non-diabetic nephropathy&lt;br&gt; LVH&lt;br&gt; ACE-I cough or intolerance&lt;br&gt; Patients at high CV risk</td>
<td>Pregnancy β-blockers (especially atenolol)</td>
<td>Bilateral renal artery stenosis</td>
</tr>
<tr>
<td><strong>β-blockers</strong></td>
<td>Angina pectoris&lt;br&gt; Post-myocardial infarction&lt;br&gt; HF (selected)&lt;br&gt; Tachyarrhythmias</td>
<td>Asthma&lt;br&gt; Chronic obstructive pulmonary disease&lt;br&gt; AV block (grade 2 or 3)&lt;br&gt; Pregnancy (atenolol)</td>
<td>Peripheral vascular disease&lt;br&gt; Bradycardia&lt;br&gt; Glucose intolerance&lt;br&gt; Metabolic syndrome&lt;br&gt; Athletes and physically active patients&lt;br&gt; Non-dihydropyridine CCBs (verapamil, diltiazem)</td>
</tr>
</tbody>
</table>
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

SAHS Practice Guidelines, CVJA, 2014
South African GP Study

Stage 1 HT – lercanidipine  Stage 2 HT – lercanidipine/enalapril
BP lowering Efficacy of perindopril and amlodipine combination

Reduction in blood pressure (mm Hg)

–11
–21
–29
–41.9
–23.2
–41.9
–23.2
–29

15 days
30 days
60 days
Stage 3 hypertension (SBP>180 mm Hg)

n=161

SBP
DBP

n=1,250

Amlodipine/Valsartan: Superior Systolic BP-lowering Efficacy Versus Amlodipine Monotherapy in Black Patients with Stage 2 Hypertension

MSSBP = mean sitting systolic BP
Baseline MSSBP = 170 mmHg
LSM=least square mean

Flack et al. J Hum Hypertens 2009 (E-pub ahead of print)
Dose Dependent Efficacy

- Perindopril 5 mg & Indapamide 1,25 mg
  - SBP*: 156/94 (mmHg)
  - DBP*: 129/81 (mmHg)
  - Change: -28/13 (6 months, P<0.001)

- Perindopril 10 mg & Indapamide 2,5 mg
  - SBP*: 170/99 (mmHg)
  - DBP*: 128/79 (mmHg)
  - Change: -43/20 (6 months, P<0.001)

n = 397; Duration = 6 months
*SBP = Systolic blood pressure; *DBP = Diastolic blood pressure
Effects of switching from free combinations to the corresponding single-pill combinations (SPCs) on medication adherence in the whole study population (A) and patients categorized according to the number of concurrent antihypertensive drugs (B). *P values are for between-group medication possession ratio differences by using the 1-way ANOVA, followed by post hoc

Spironolactone versus placebo, bisoprolol, and doxazosin to determine the optimal treatment for drug-resistant hypertension (PATHWAY-2): a randomised, double-blind, crossover trial

Prof Bryan Williams, FRCP, Prof Thomas M MacDonald, FRCP, Steve Morant, PhD, Prof David J Webb, FMedSci, Prof Peter Sever, FRCP, Prof Gordon McInnes, FRCP, Prof Ian Ford, PhD, Prof J Kennedy Cruickshank, FRCP, Prof Mark J Caulfield, FMedSci, Prof Jackie Salsbury, RGN, Isla Mackenzie, FRCP, Sandosh Padmanabhan, FRCP, Prof Morris J Brown, FMedSci

The Lancet
Volume 386, Issue 10008, Pages 2059-2068 (November 2015)
DOI: 10.1016/S0140-6736(15)00257-3
436 screened

88 excluded
13 did not take study drug*

335 randomised

21 no follow-up for any drug

314 with any follow-up (ITT analysis)
- 285 for spironolactone
- 282 for doxazosin
- 285 for bisoprolol
- 274 for placebo
- 230 completed all treatment cycles
KEY MESSAGES

• Hypertension is major world wide epidemic
• There are substantial differences in awareness, prevalence and control rates, and CV outcomes especially in S. Africa
• The SA Hypertension Guideline 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
• 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
GUIDELINE CONSENSUS

• Broad consensus for BP thresholds for intervention (140/90)
• ACC/AHA has recommended a new target of < 130/80 mmHg in most at risk patients, but S Africa is not ready for this and this recommendation is also controversial in low risk patients
• Importance of accurate BP measurement within and out of office
• Much closer agreement on optimal drug treatment (ACE or ARB, CCB, diuretic or all 3)
• Recognition for the wider use of single pill drug combinations for optimal BP control, and earlier initial use of combinations in high risk e.g. > 160/100
• Spironolactone low dose for resistant hypertension, caution if eGFR < 45, monitor K+
• Routine use of statins