The JNC 7 Report On Hypertension – Critical Analysis

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ABSTRACT

The seventh report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7) has provided new guidelines for prevention and management of hypertension. This has been done with a purpose to provide an evidence-based approach to the prevention and management of hypertension. The normal blood pressure (BP) is defined as the systolic BP (SBP) of <120mm Hg and diastolic BP (DBP) of <80 mm Hg. The key points of this report are as follows: a SBP above 140 mm Hg is a more important cardiovascular disease (CVD) risk factor than diastolic BP in individuals above 50 years of age; beginning at 115/75 mm Hg, CVD risk doubles for each increment of 20/10 mm Hg; and those who are normotensive at 55 years of age will have a 90% lifetime risk of developing hypertension. A new category of 'prehypertensives' has been introduced; i.e. individuals who have a SBP of 120-139 mm Hg and/or DBP of 80-89 mm Hg. The report recommends health-promoting lifestyle modifications in this group to prevent the progressive rise in blood pressure and CVD.

The JNC 7 advocates thiazide diuretics as the first-line antihypertensive in uncomplicated hypertension and delineates specific high risk conditions that are indications for the use of other antihypertensive drug classes. The report stresses the importance of empathy on the part of clinicians and their ability to build trust and motivation in the patients. The guidelines have stimulated a lot of discussion, related particularly to the new term 'prehypertension', taking the level of BP alone rather than taking comprehensive CVD risk of the patient for starting intervention and the use of diuretics as first line therapy.

INTRODUCTION

Hypertension (HT) is the third leading killer in the world and is responsible for 1 in every 8 deaths. About 1 billion people are affected by hypertension worldwide.[1] A pooling of epidemiological studies shows that HT is present in 25 % of urban and 10 % of rural population in India.[2] The study also reported 2.3 million deaths by cardiovascular diseases (CVD) in the year 1990 alone.

The prevalence of HT is known to increase with age. Over 50% of individuals aged 60 to 69 and over 75% of those aged 70 years and older are affected. Recent Framingham Heart Study reported that lifetime risk of developing hypertension is approximately 90 % for men and women who are normotensive at 55-65 years old and survived to the age of 80-85 years.[3] Studies have shown that BP is an independent risk factor for CVD. This relationship is independent, consistent and continuous. Observations involving more than 1 million individuals have shown that death from both CVD and stroke increases progressively and linearly from BP levels of as low as 115 mm systolic and 75 mm diastolic upwards. The increased risks are present in all age groups ranging from 40 to 89 years old. For every increment of 20 mm Hg systolic or 10 mm diastolic there was a doubling of mortality from both ischaemic heart disease and stoke.[4]

Evidence also warrants greater attention to the importance of SBP as a major risk factor for CVD. The rise in SBP continues throughout life, in contrast to DBP, which rises until approximately 50 years age, tends to level off over the next decade, and may remain the same or fall later in life. Clinical trials have demonstrated that control of isolated systolic hypertension reduces total mortality, CV mortality, stroke and HF events.[5,6]

However, the SBP control has been reported to be poor and has been observed to be responsible for low rates of overall BP control.[7] It has been observed that poor SBP control is at least in part related to attitudes of physicians.[8] Most physicians are taught that the diastolic pressure is more important that SBP and thus treat accordingly.

US Department of Health and Human Services has reported that despite the fact that the awareness of blood pressure has improved over time, the present control rates of BP are found to be far below the Healthy People 2010 goal of 50%.[9]

Table 1 : Classification of Blood Pressure for Adults

BP Classification	SBP mm Hg	DBP mm Hg
Normal	<120	and < 80
Prehypertension	120-139	or 80-89
Stage 1 hypertension	140-159	or 90-99
Stage 2 hypertension	≥ 160	or ≥100

Effective control of BP would result in significant decrease in morbidity and mortality due to myocardial infarction, stroke, and heart failure (HF). Antihypertensive therapy has been shown to result in 35-40 % decrease in the incidence of stroke, 20-25% in MI and over 50 % in HF.[10] Various prominent organizations (WHO/ISH, ESC/ESH) have provided their guidelines for management of HT.[11,12] The salient features of the JNC 7 guidelines published recently are discussed.[13]

WHY NEW GUIDELINES?

Recent data as shown above, on the lifetime risk of hypertension and significant increase in the risk of CV complications associated with the levels of BP, previously thought to be normal, associated with poor present status of control of BP led the JNC 7 to come out with new classification and guidelines. The last Joint National Committee guidelines (JNC 6) were published in 1997.[14] The expert committee felt the need for newer recommendations due to the following reasons:

- availability of results of new clinical trials and observations;
- to provide a simpler classification of BP;
- to provide clear and concise guidelines; and
- awareness that JNC 6 guidelines are not used to the maximum.

CLASSIFICATION OF BP

The classification of BP for adults aged 18 years and older in shown in Table 1. This classification is based on an average of two or more properly measured, seated BP readings on each of two or more office visits.

Because of the new data on lifetime risk of hypertension and increase in the risk of CV complications associated with levels of BP previously considered to be normal, the JNC 7 report has introduced a new term called 'prehypertension' for those with BPs ranging from 120-139 mm Hg systolic and/or 80 to 89 mm Hg diastolic. This new designation is intended to identify those individuals in whom early intervention by adoption of healthy lifestyles could reduce BP, decrease progression of BP to hypertensive levels with age, or prevent hypertension.

Another change in classification from JNC 6 is the combining of stage 2 and stage 3 into a single stage category as the approach to the management of the two groups is similar. The changes in the classification in JNC 7 from JNC 6 are shown in Table 2.

PATIENT EVALUATION

Clinical Evaluation

There are three main objectives for evaluation of hypertensive patients:

Table 2 : Changes in Blood Pressure Classification

JNC 6 Category	SBP/DBP (mm Hg)	JNC 7 Category
Optimal	<120/80	Normal
Normal	120-129/80-84	Prehypertension
Borderline	130-139/85-89	
Hypertension	> 140/90	Hypertension
Stage 1	140-159/90-99	Stage 1
Stage 2	160-179/100-109	Stage 2
Stage 3	> 180/110	

1. *To assess lifestyle and identify other cardiovascular risk factors or concomitant disorders that may affect prognosis and guide treatment.* The major risk factors to be looked for are the age (>55 year for men, >65 years for women), the presence of obesity (BMI>30), diabetes mellitus, cigarette smoking, sedentary lifestyle, dyslipidemia, microalbuminuria and family history of premature cardiovascular disease (men <55 years or women 65 years).
2. *To reveal identifiable causes of high BP* like chronic kidney disease, primary aldosteronism, renovascular disease, chronic steroid therapy and Cushing syndrome, pheochromocytoma, coarctation of the aorta, thyroid or parathyroid disease, sleep apnea, and drug-induced or drug-related.
3. *To assess the presence or absence of target organ damage and CVD* e.g. left ventricular hypertrophy, angina or prior myocardial infarction, prior coronary revascularization, heart failure, stroke or transient ischemic attack, chronic kidney disease, peripheral arterial disease, and retinopathy.

The physical examination should include measurement of BP in both the arms, an evaluation of BMI, optic fundus, thyroid gland, presence of arterial bruits, and a detailed systemic examination.

Laboratory Tests

Routine tests recommended before starting therapy include; 12-lead ECG, urinalysis, hematocrit, blood sugar, serum potassium, creatinine, serum calcium and lipid profile. Urine for microalbuminuria is an optional test. More extensive tests are not recommended, unless guided by the physical examination. Certain new investigations like highly sensitive C-reactive protein (HS-CRP) and homocysteine may be considered in those patients with CVD who have no other risk factors. Additional diagnostic work up would be needed to identify causes in those individuals in whom: findings suggest possibility of a cause; sudden onset of severe HT; poor response to standard treatment; and when after being well controlled, BP tends to increase for unknown cause.

The screening tests for specific causes of hypertension are shown in Table 3.

TREATMENT

Goals of Therapy

The ultimate public health goal is the reduction of CV and renal morbidity and mortality. As majority of hypertensive patients aged 50 years and above will reach diastolic BP goal when their SBP is controlled, the JNC-7 recommends that the primary focus

should be achieving the SBP goal. The target BP in patients with and without diabetes and renal disease are shown in Box.

Box 1 :Target BP

No diabetes and/or renal disease

SBP	< 140 mmHg
DBP	< 90 mmHg

In diabetic and/or renal disease:

SBP	< 130 mmHg
DBP	< 80 mmHg

Table 3 : Screening Tests for Identifiable Hypertension

Diagnosis	Diagnostic Test
Chronic kidney disease	Estimated GFR
Coarctation of the aorta	CT angiography
Cushing syndrome and other glucocorticoid excess states including chronic steroid therapy	History/dexamethasone suppression test
Drug-induced/related	History, drug screening
Pheochromocytoma	24-hour urinary metanephrine and normetanephrine
Primary aldosteronism and other mineralocorticoid excess states	24-hour urinary aldosterone level or specific measurement of other mineralocorticoids
Renovascular hyertension	Doppler flow study; magnetic resonance angiography
Sleep apnea	Sleep study with O_2 saturation
Thyroid/parathyroid disease	TSH; serum PTH

GFR - glomerular filtration rate; CT - computed tomography; TSH - thyroid stimulating hormone; PTH – parathyroid hormone

Lifestyle Modification

Adopting a healthy lifestyle is an integral and indispensable component of antihypertensive management. Besides reducing the BP, the lifestyle modifications also increase the drug efficacy and reduce CV risk. Reduction of weight, diet low in salt, rich in calcium and potassium, regular physical activity and moderate alcohol consumption are the components of life style measures. The recommended lifestyle modifications and their effect on BP reduction are shown in Table 4.

Pharmacological Treatment

A number of antihypertensive drugs are available for effective control of BP. Single drug though preferable for control of the HT can achieve the goal only in one-third of patients. ALLHAT trial showed that 60% of controlled hypertensives were on two or more drugs.[15]

Thiazide diuretics have been used in most outcome-based clinical trials. The efficacy of these agents has been virtually unsurpassed in preventing CV complications. The report of recently conducted trial ALLHAT also strengthens the same notion. In this trial, in over 40,000 hypertensive individuals, chlorthalidone was compared to lisinopril or amlodipine. There was no difference in primary CVD outcome or mortality between chlorthalidone and lisinopril or amlodipine groups. Second Australian National Blood Pressure (ANBP 2) study however, favored ACE inhibitors in White men compared to diuretics as initial agents.[16] A network meta- analysis compared the efficacy of diuretics, angiotensin converting enzyme inhibitors (ACEI), beta–blockers (BB), calcium channel blockers (CCB) and alpha-blockers in long term randomized controlled trials between January 1995 and December 2002. It showed low dose diuretics to be the most effective first-line treatment for preventing the recurrence of CV morbidity and mortality.[17]

Potential side effects of thiazide diuretics (hyperglycemia, hypercholesterolemia) were observed, but did not affect

Table 4 : Lifestyle Modifications to Manage Hypertension*

Modification	Recommendation	Approximate Systolic BP Reduction**
Weight reduction	Maintain normal body weight (BMI, 18.5-24.9)	5-20 mm Hg/10 kg weight loss
Adopt DASH eating plan	Consume a diet rich in fruits, vegetables, and low fat dairy products with a reduced content of saturated and total fats	8-14 mm Hg
Dietary sodium reduction	Reduce dietary sodium intake to no more than 100 mmol per day (2.4 g sodium or 6 g sodium chloride).	2-8 mm Hg
Physical activity	Engage in regular aerobic physical activity such as brisk walking (at least 30 minutes per day, most days of the week)	4-9 mm Hg
Moderation of alcohol consumption	Limit consumption to no more than 2 drinks per day (1 oz or 30 mL ethanol {e.g. 24 oz beer, 10 oz wine, or 3 oz 80-proof whiskey}) in most men and no more than 1 drink per day in women and lighter-weight persons	2-4 mm Hg

Abbreviations: BMI, body mass index calculated as weight in kilograms divided by the square of height in meters; BP, blood pressure; DASH, Dietary Approaches to Stop Hypertension

*For overall cardiovascular risk reduction, stop smoking.

**The effects of implementing these modifications are dose and time-dependent and could be higher for some individuals.

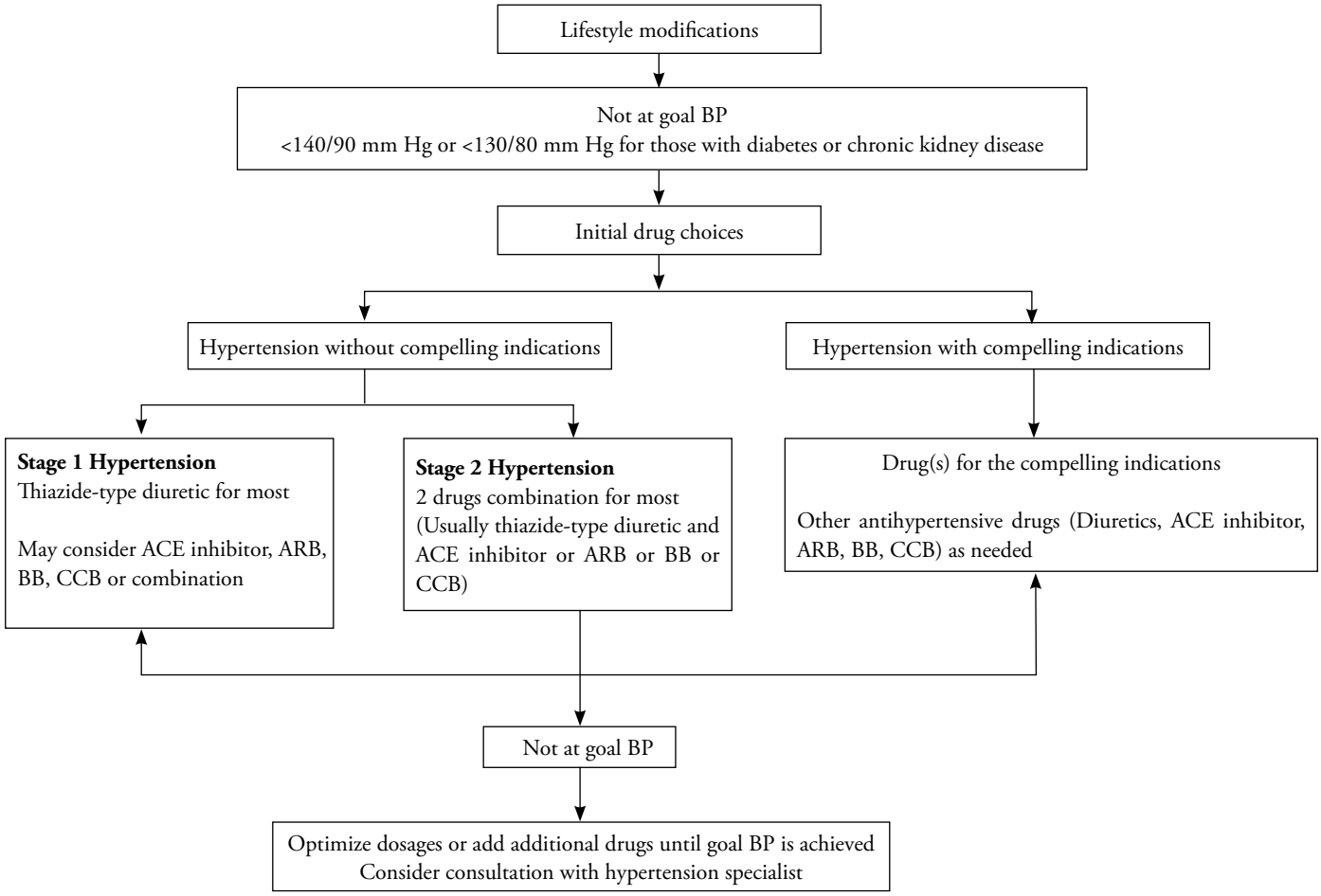

Fig. 1: Algorithm for Treatment of Hypertension

the effectivity of diuretics in preventing CV complication. Hyperuricemia was observed in many patients, but clinical gout was very uncommon with <50 mg hydrochlorthiazide or <25 mg of chlorthalidone.

JNC 7 recommends low dose thiazides as first-line antihypertensives either alone or in combination with ACEI, BB or CCB in uncomplicated hypertension.

Achieving BP Control in an Individual

An algorithm for the treatment of hypertension in an individual patient is shown in Figure 1. Therapy starts with lifestyle modification. If goal BP is not achieved, then initial treatment with diuretic is started and other drugs are combined. ACEI/BB/CCB/ARB can be used as an initial drug if diuretics cannot be used or there are compelling indications like DM, HF, IHD and chronic renal disease. The recommended first-line agents other than diuretics in these indications are shown in Table 5.

JNC 7 has given recommendations for management of HT in special situations like pregnant women, children and adolescents and hypertensive urgencies and emergencies. These are beyond the scope of this article.

The JNC 7 recommendations for the follow-up of patients based on their initial blood pressure measurements in patients without end-organ damage is shown in Table 6.

Resistant Hypertension

Resistant hypertension is described as the failure to reach goal BP in patients who are adhering to full doses of appropriate three-drug regimen that includes a diuretic. JNC 7 report recommends that after excluding potential identifiable hypertension, the clinicians should carefully explore the reasons for resistance. These could be related to improper blood pressure measurement, volume overload and pseudotolerance, drug-induced or other causes, associated conditions like obesity, excess alcohol intake, and identifiable causes of hypertension.

Improving Blood Pressure Control

Finally, JNC 7 report discusses the public health approaches, like reducing saturated fats and salt in processed foods and increasing physical activity levels. The report suggests that the successful prevention of hypertension requires will to act by clinicians, healthcare system administrators, patients and communities. The most effective treatment prescribed by competent clinician will control BP only if patient is motivated. Positive experience of patient with physician improves motivation and trust in doctor. Empathy builds trust and is a very effective motivator. It has stressed the role of patient education, and motivation.

Table 5 : Guidelines for Individual Drug Classes for Compelling Indications

High-Risk Conditions with Compelling Indication	Recommended Drugs					
	Diuretic	B-Blocker	ACE Inhibitor	ARB	CCB	Aldosterone Antagonist
Heart failure	*	*	*	*		*
Post-myocardial infarction		*	*			*
High coronary disease risk	*	*	*		*	
Diabetes	*	*	*	*	*	
Chronic kidney disease			*	*		
Recurrent stroke prevention	*		*			

Table 6 : Recommendations for Follow-up Based on Initial Blood Pressure Measurements for Adults without Acute End Organ Damage

Initial Blood Pressure (mm Hg)	Follow-Up Recommended
Normal	Recheck in 2 years
Prehypertension	Recheck in 1 year
Stage 1 hypertension	Confirm within 2 months
Stage 2 hypertension	Evaluate or refer to source of care within 1 month.
	For those with higher pressure (e.g. >180/110 mm Hg), evaluate and treat immediately or within 1 week depending on clinical situation and complications

DISCUSSION

JNC 7 report has raised certain important issues and a lot of debate regarding some of its recommendations.[18]

Classification

Major debate on new guidelines is on the new concept of categorizing BP values of SBP 120-139 mm Hg and 80-89 mm Hg as *prehypertension*. These values were categorized as high normal in ESC, WHO and JNC 6 guidelines. Though the morbidity is higher in this group compared to those with SBP < 120 mm Hg and DBP < 80 mm Hg, it is felt by some that such a category will create anxiety in the general population and the physicians might have to deal with almost 50% of the overall population. According to these guidelines even young woman of 20 years of age with a BP of 120/80 would be categorized as prehypertensive despite no other CV risk factors. Besides this, the term prehypertension has potential socioeconomic implications resulting from application of the label 'prehypertensive' to persons previously considered normotensive and may have an impact on insurability issues. JNC 7 however preferred the term prehypertension instead of high normal because a better patient response is expected with this term rather than 'high normal' term, which is often ignored. The committee feels that the use of categories like prediabetic / precancerous has also resulted in better patient compliance towards lifestyle modification and/or treatment.

Comprehensive Risk Assessment Preferred

JNC 7 recommendations are based solely on the level of BP rather than comprehensive risk assessment of the patient. It may be more advisable to have comprehensive assessment of vascular health along with other parameters like fundus examination, microalbuminuria before the individual is committed to lifestyle/drug measures. WHO/ISH and ESC guidelines suggest comprehensive risk assessment as an integral part of the management of the patient before starting any intervention.

JNC 7 report has laid a lot of stress on controlling systolic BP. Given the inaccuracies of the sphygmomanometric measurements in individual patients and the fact that the root cause of isolated systolic hypertension in elderly can be attributed to increasing pressure due to effects of arterial stiffness, deciding to treat an elderly person simply on the basis of systolic BP value seems to be unjustified. Therefore, instead of taking only the value of SBP, other cardiovascular risk factors should also be taken into account, before starting the treatment.

Drug Recommendations

JNC 7 recommends the use of diuretics as first-line drug in uncomplicated hypertension. Diuretics are inexpensive and need to be given once daily doses. The side effects of the diuretics are minimal and with little more vigilance on the part of clinician, can easily be managed. It has been argued that simply restricting salt intake can double the effects of ARB/ACEI and therefore, these agents should be used as first-line drugs. But, JNC 7 committee feels that in practice it is very difficult to adhere to lifelong salt restriction. In developing countries like India, this is an important issue.

SUMMARY

The JNC 7 report advocates lowering of BP levels for classifying prehypertension, more stress on the lifestyle modifications, use of inexpensive thiazide diuretics as first-line treatment and empathy on the part of clinicians. JNC 7 further recognizes the fact that present healthcare delivery system has not been effective in translating the present knowledge into action. Hypertension is a preventable disease and can be controlled effectively. However, this requires commitment of the system providing healthcare. For an efficient technology transfer, there are three components: technology to be transferred, system to deliver and lastly, the will to succeed. It is the last component which is far below the expected level.

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