

# Hypertension

**The Seventh Report of the  
Joint National Committee on  
Prevention, Detection,  
Evaluation, and Treatment of  
High Blood Pressure (JNC 7)**

# JNC Reclassification of BP Based on Risk

JNC VI				JNC 7			
Category	SBP (mm Hg)		DBP (mm Hg)		Category	SBP (mm Hg)	DBP (mm Hg)
Optimal	<120	and	80	→	Normal	<120	and 80
Normal	120-129	and	80-84	→	Prehypertension	120-139	or 80-89
Hi-normal	130-139	or	85-89	→			
<b>Hypertension</b>							
Stage 1	140-159	or	90-99	→	Stage 1	140-159	or 90-99
Stage 2	160-179	or	100-109	→	Stage 2	≥160	or ≥100
Stage 3	≥180	or	≥110	→			

Source for JNC VI: *Arch Intern Med.* 1997;157:2413-2446.

Adapted with permission from Chobanian AV et al. *Hypertension.* 2003;42:1206-1252.

# Changes in BP Classification

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

# Why the need for JNC 7?

## Greater clinical utility

Simplify BP classification

Limit risk stratification

Management similar in stages 2 and 3

## Incorporate new trial data

- The BP relationship to risk of CVD is continuous, consistent, and independent of other risk factors.
- Each increment of 20/10 mmHg doubles the risk of CVD across the entire BP range starting from 115/75 mmHg.

# *The Initial Confrontation of the Hypertension Problem*

Denial

Counselling !!!

Confirmation & Proper clinical evaluation?

Tell the patient regarding BP readings & the  
**TARGETS**

Emphasise Lifestyle modification  
**CONSISTENTLY**

In case of a treatment, always address  
**COMPLIANCE**

No cure is available,  
but prevention and management  
decrease the incidence of  
hypertension and disease  
sequelae.

**Therapy**



# **Action level !!!**

**The measurements at which the benefits of intervention exceed those of inaction**

# Benefits of Treating Hypertension

Younger than 60 (reducing BP 10/5-6 mmHg)

- reduces the risk of stroke by **42%**

- reduces the risk of coronary event by **14%**

Older than 60 (reducing BP 15/6 mmHg)

- reduces overall mortality by **15%**

- reduces cardiovascular mortality by **36%**

- reduces incidence of stroke by **35%**

- reduces coronary artery disease by **18%**

Older than 60 with isolated systolic hypertension

(SBP  $\geq$ 160 mm Hg and DBP <90 mm Hg)

- 42% reduction in the risk of stroke

- 26% reduction in the risk of coronary events

# Benefits of Lowering BP !!!

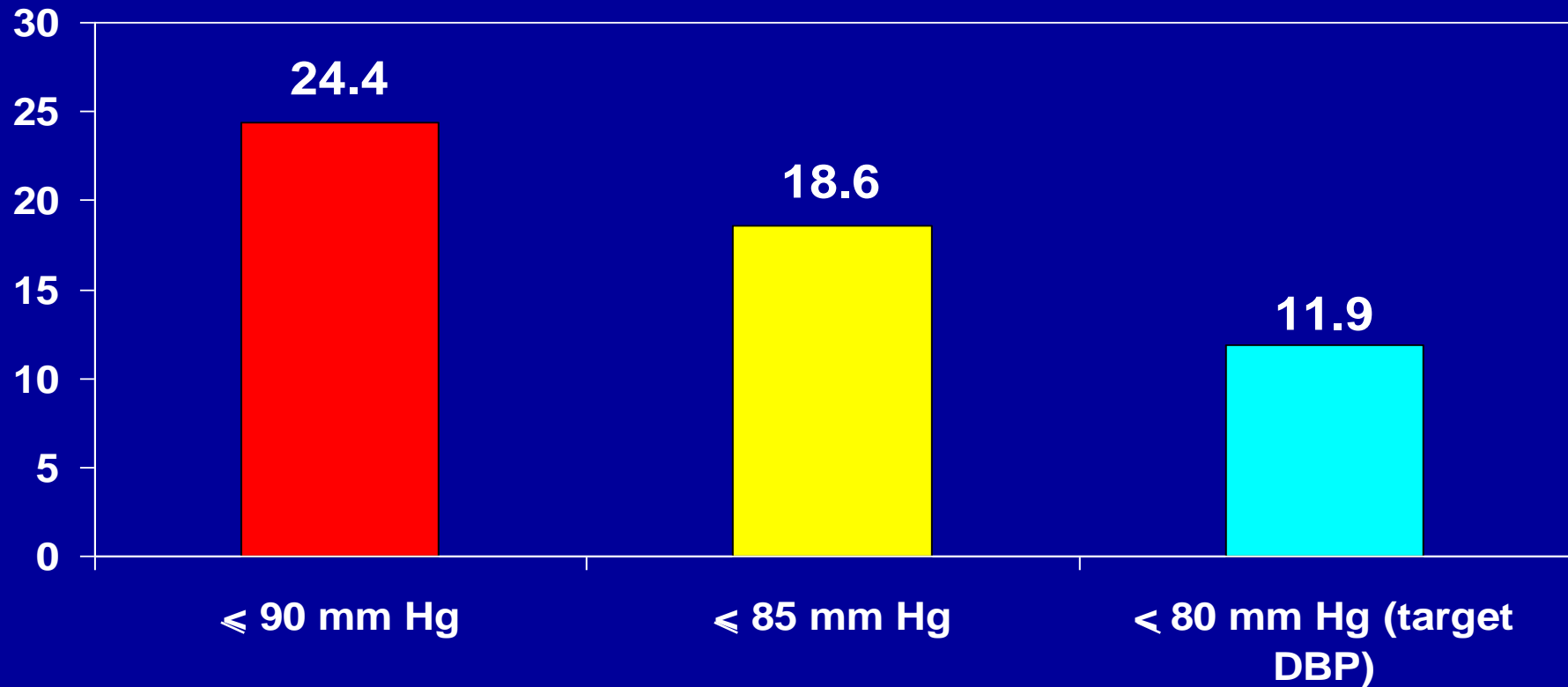
	Average Percent Reduction
Stroke incidence	35–40%
Myocardial infarction	20–25%
Heart failure	50%

# Impact of a 5 mmHg Reduction

	Overall Reduction
Stroke	14%
Coronary Heart Disease	9%
All Cause Mortality	7%

# Significant benefits from intensive BP reduction in diabetic patients

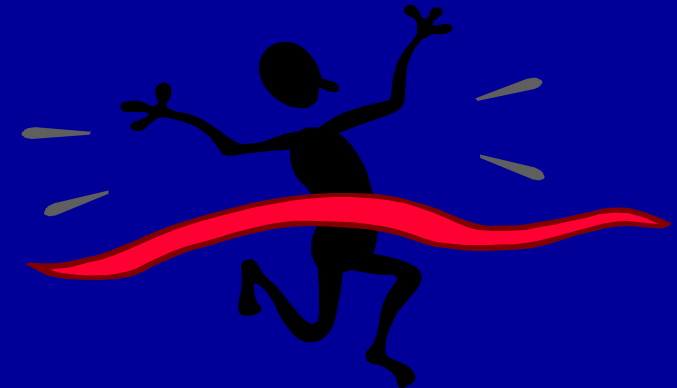
Major CV events / 100 patient-yr



# GOAL of Hypertension Management

Hypertension	-PLUS- Diabetes or Renal Disease
< 140/90 mmHg	< 130/80 mmHg

**"The Goal is to Get to Goal!"**



# Algorithm for Treatment of Hypertension

Hypertension patient



**Lifestyle Modifications**



**Not at Goal Blood Pressure**



**Initial Drug Choices**

**“If I knew I would live  
this long I would have  
taken better care of  
myself”**



**Whether  
lifestyle modification  
is really effective ?**

# Lifestyle Modification

<b>Modification</b>	<b>Approximate SBP reduction (range)</b>
Weight reduction	5–20 mmHg/10 kg weight loss
Adopt DASH eating plan	8–14 mmHg
Dietary sodium reduction	2–8 mmHg
Physical activity	4–9 mmHg
Moderation of alcohol consumption	2–4 mmHg

# Lifestyle Modifications

Should ideally address all possible modifiable risk factors for hypertension.

- Stop smoking
- Limit alcohol intake
- Lose weight or keep fit
- Suitable modification in diet, including salt restriction
- Increase aerobic physical activity
- Decrease psychological stress

## Lifestyle Modifications for Primary Prevention of Hypertension

1. Engage in regular aerobic physical activity such as brisk walking (at least 30 minutes per day, most days of the week).
2. Maintain normal body weight for adults (body mass index 18.5–24.9 kg/m<sup>2</sup>).
3. Limit alcohol consumption to no more than 1 oz (30 mL) ethanol (e.g., 24 oz [720 mL] of beer, 10 oz [300 mL] of wine, or 2 oz [60 mL] 100-proof whiskey) per day in most men and to no more than 0.5 oz (15 mL) of ethanol per day in women and lighter weight persons.
4. Reduce dietary sodium intake to no more than 100 mmol per day (approximately 2.4 g of sodium or 6 g of sodium chloride).
5. Maintain adequate intake of dietary potassium (more than 90 mmol [3,500 mg] per day).
6. Consume a diet that is rich in fruits and vegetables and in lowfat dairy products with a reduced content of saturated and total fat (Dietary Approaches to Stop Hypertension [DASH] eating plan).



FACES ABOUT

## The *DASH* Eating Plan



Research has found that diet alone can lower the development of high blood pressure. The DASH eating plan was developed to help lower blood pressure and reduce the risk of heart disease. It is based on the Dietary Approaches to Stop Hypertension (DASH) clinical trial, which found that the DASH eating plan can lower blood pressure.

Most men and women with high blood pressure who follow the DASH eating plan will see a reduction in blood pressure. The DASH eating plan is based on the Dietary Approaches to Stop Hypertension (DASH) clinical trial, which found that the DASH eating plan can lower blood pressure.

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There are many ways to follow the DASH eating plan. You can find more information about the DASH eating plan on the NHLBI website.



For more information, visit the NHLBI website at [www.nhlbi.nih.gov](http://www.nhlbi.nih.gov).

## Dietary Approaches to Stop Hypertension

Lowers systolic BP

in normotensive patients  
by an average of 3.5 mm  
Hg

In hypertensive patients  
by 11.4 mm Hg

Copies available from  
NHLBI website

# DASH Eating Plan

Low in saturated fat, cholesterol, and total fat

Emphasizes fruits, vegetables, and low fat dairy products

Reduced red meat, sweets, and sugar containing beverages

Rich in magnesium, potassium, calcium, protein, and fiber

3 -1.5 g sodium per day

Can reduce BP in 2 weeks

**What is the colour of salt?**

# Variety of Colors of Salt

White

Black

Red

Yellow

Green

Brown

Clear



Table salt

Soya sauce

Catchup

Papad

Pickles

Soups & gravies

Saline

# Salt

Moderate salt restriction (6g of salt, 100 mEq or 2400 mg Na/day) is recommended for treatment of hypertension which

- Normalize Stage 1 hypertension
- Enhance drug therapy

Unless congestive heart failure, severe salt restrictions are not necessary.

Consuming 100 mEq/day or less of sodium was associated with a 2.2 mmHg fall in SBP

The rise in SBP seen with aging over 30 years would be 9 mmHg less and the rise in DBP 4.5 mmHg less if the average sodium intake were lowered by 100 mEq/day



# Key Diet history questions

Do you use additional salt?

Do you taste your food before you add salt?

How often do you eat salty foods, such as chips, pickles, papad, salted nuts, canned and smoked foods?

Do you read labels for sodium content?

How many servings of fruits and vegetables do you eat everyday?

How often do you eat or drink dairy products? What kind?

How often do you eat out? What kinds of restaurants?

Do you like to drink alcohol? How much?

How often do you exercise, including walking?

# Lifestyle Modifications

## For Prevention and Management

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Lose weight if overweight

Limit alcohol intake

Increase aerobic physical activity

Reduce sodium intake

Maintain adequate intake of potassium

## For Overall and Cardiovascular Health

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Maintain adequate intake of calcium and magnesium

Stop smoking

Reduce dietary saturated fat and cholesterol

# Life-style modification

Before drug therapy is begun, three to six months of compliant life-style modification should be tried (in select cases)

Life-style modification can't completely correct the BP, but they will help increase the efficacy of pharmacological agents and improve other CVD risk factor.

# Principle of Drug Therapy

- Drug therapy should be individualistic
- A **low dose** of initial drug therapy
- **Combination therapies** may provide additional efficacy with fewer adverse effects.
- Optimal formulation should provide 24-hour efficacy with **once-daily** dose.

# Factors affecting choice of antihypertensive drug

- The cardiovascular risk profile of the patient
- Coexisting disorders
- Target organ damage
- Interactions with other drugs used for concomitant conditions
- Tolerability of the drug
- Cost of the drug

# Algorithm for Treatment of Hypertension (continued)

## Initial Drug Choices

No associated clinical condition

Associated clinical condition

I stage hypertension:  
Diuretics,  
BB,CCB,ACEI,ARB

II stage hypertension:  
Two drugs  
combination therapy

Choice the drugs  
according to ACC

## Not at Goal Blood Pressure

Increase dosage or add another agent from different class. Optimize dosages or add additional drugs until goal blood pressure is achieved. Consider consultation with hypertension specialist.

# Blood Pressure Classification

BP Classification	SBP mmHg*	DBP mmHg	Lifestyle Modification	Drug Therapy**
Normal	<120	and <80	Encourage	No
Prehypertension	120-139	or 80-89	Yes	No
Stage 1 Hypertension	140-159	or 90-99	Yes	Single Agent
Stage 2 Hypertension	≥ 160	or ≥ 100	Yes	Combo

\*Treatment determined by highest BP category; \*\*Consider treatment for compelling indications regardless of BP

# Antihypertensive Drugs ?



# Antihypertensive Drugs

- **Diuretics**
  - **$\beta$ -Adrenergic receptor blockers (BB)**
  - **Calcium channel blockers (CCB)**
  - **ACE inhibitors (ACEI)**
  - **Angiotensin II receptor blockers (ARB)**
- etc.

# Diuretics

## *Example:* Hydrochlorothiazide

Act by decreasing blood volume and cardiac output  
Decrease peripheral resistance during chronic therapy  
Drugs of choice in elderly hypertensives

## *Drawbacks*

Hypokalaemia

Hyponatraemia

Hyperlipidaemia

Hyperuricaemia (hence contraindicated in gout)

Hyperglycaemia (hence not safe in diabetes)

Not safe in renal and hepatic insufficiency

# ALLHAT: Conclusions

## Antihypertensive and Lipid-Lowering to Prevent Heart Attack Trail (ALLHAT)

ACEI and Dihydropyridine CCB's are no better than thiazide type diuretics at reducing cardiovascular risk

Antihypertensive therapy based on thiazide type diuretics yields better BP control

Thiazide type diuretics are significantly less expensive

Thiazide type diuretics are an effective economical first choice antihypertensive

# **Diuretics as a first line antihypertensive drug**

**Because of the superiority of thiazide-type diuretics in preventing one or more major forms of CVD and their lower cost, they should be the drugs of choice for first-step antihypertensive drug therapy.**

# Beta blockers

## *Example: Atenolol*

Block  $\beta_1$  receptors on the heart

Block  $\beta_2$  receptors on kidney and inhibit release of renin

Decrease rate and force of contraction and thus reduce cardiac output

Drugs of choice in patients with co-existent coronary heart disease

## *Drawbacks*

Adverse effects: lethargy, impotence, bradycardia

Not safe in patients with co-existing asthma and diabetes

Have an adverse effect on the lipid profile

# Calcium channel blockers

## *Example: Amlodipine*

Block entry of calcium through calcium channels

Cause vasodilation and reduce peripheral resistance

Drugs of choice in elderly hypertensives and those with co-existing asthma

Neutral effect on glucose and lipid levels

## *Drawbacks*

Adverse effects: Flushing, headache, Pedal edema

# ACE inhibitors

*Example:* Lisinopril, Enalapril

Inhibit ACE and formation of angiotensin II  
and block its effects

Drugs of choice in co-existent diabetes  
mellitus

*Drawbacks*

Adverse effect: dry cough, hypotension,  
angioedema

# Angiotensin II receptor blockers

*Example:* Losartan

Block the angiotensin II receptor and inhibit effects of angiotensin II

Drugs of choice in patients with co-existing diabetes mellitus

*Drawbacks*

Adverse effect: dry cough, hypotension, angioedema



# Alpha blockers

## *Example:* Doxazosin

Block  $\alpha$ -1 receptors and cause vasodilation

Reduce peripheral resistance and venous return

Exert beneficial effects on lipids and insulin sensitivity

Drugs of choice in patients with co-existing hyperlipidaemia, diabetes mellitus and BPH

## *Drawbacks*

Adverse effects: Postural hypotension

# Drug therapy for hypertension

<b>Class of drug</b>	<b>Example</b>	<b>Initiating dose</b>	<b>Usual maintenance dose</b>
Diuretics	Hydrochlorothiazide	12.5 mg o.d.	12.5-25 mg o.d.
$\beta$ -blockers	Atenolol	25-50 mg o.d.	50-100 mg o.d.
Calcium channel blockers	Amlodipine	2.5-5 mg o.d.	5-10 mg o.d.
$\alpha$ -blockers	Doxazosin	1 mg o.d.	1-8 mg o.d.
ACE- inhibitors	Lisinopril	2.5-5 mg o.d.	5-20 mg o.d.
Angiotensin-II receptor blockers	Losartan	25-50 mg o.d.	50-100 mg o.d.

# Antihypertensive therapy: Side-effects and Contraindications

<b>Class of drugs</b>	<b>Main side-effects</b>	<b>Contraindications/ Special Precautions</b>
Diuretics (e.g. Hydrochlorothiazide)	Electrolyte imbalance, total and LDL cholesterol levels, HDL cholesterol levels, glucose levels, uric acid levels	Hypersensitivity, Anuria
$\beta$ -blockers (e.g. Atenolol)	Impotence, Bradycardia, Fatigue	Hypersensitivity, Bradycardia, Conduction disturbances, Diabetes, Asthma, Severe cardiac failure

# Antihypertensive therapy: Side-effects and Contraindications (Contd.)

Class of drug	Main side-effects	Contraindications/ Special Precautions
Calcium channel blockers (e.g. Amlodipine, Diltiazem)	Pedal edema, Headache	Non-dihydropyridine CCBs (e.g diltiazem)– Hypersensitivity, Bradycardia, Conduction disturbances, Congestive heart failure, Left ventricular dysfunction. Dihydropyridine CCBs– Hypersensitivity
$\alpha$ -blockers (e.g. Doxazosin)	Postural hypotension	Hypersensitivity
ACE-inhibitors (e.g. Lisinopril)	Cough, Hypertension, Angioneurotic edema	Hypersensitivity, Pregnancy, Bilateral renal artery stenosis
Angiotensin-II receptor blockers (e.g. Losartan)	Headache, Dizziness	Hypersensitivity, Pregnancy, Bilateral renal artery stenosis

# Questions !!!

Drug of choice for HBP in a pt. with Asthma

Drug of choice for HBP in a pt. with DM

Drug of choice for HBP in a pt. with BPH

Drug of choice for HBP in a pt. with high  
cholesterol

Antihypertensive drug to be avoided in a pt. with  
asthma

# Choosing the right antihypertensive

Condition	Preferred drugs	Other drugs that can be used	Drugs to be avoided
Asthma	Calcium channel blockers	$\alpha$ -blockers/Angiotensin-II receptor blockers/Diuretics/ACE-inhibitors	$\beta$ -blockers
Diabetes mellitus	$\alpha$ -blockers/ACE inhibitors/Angiotensin-II receptor blockers	Calcium channel blockers	Diuretics/ $\beta$ -blockers
High cholesterol levels	$\alpha$ -blockers	ACE inhibitors/ Angiotensin-II receptor blockers/ Calcium channel blockers	$\beta$ -blockers/ Diuretics
Elderly patients (above 60 years)	Calcium channel blockers/Diuretics	$\beta$ -blockers/ACE-inhibitors/Angiotensin-II receptor blockers/ $\alpha$ - blockers	
BPH	$\alpha$ -blockers	$\beta$ -blockers/ ACE inhibitors/ Angiotensin-II receptor blockers/ Diuretics/ Calcium channel blockers	

## Limitations on use of antihypertensives in patients with coexisting disorders

Coexisting Disorder	Diuretic	$\beta$ -blocker	ACE inhibitor	All antagonist	CCB	$\alpha_1$ -blocker
Diabetes	Caution/x	Caution/x	√	√	√	√
Dyslipidaemia	x	x	√	√	√	√
CHD	√	√	√	√	√	√
Heart failure	√	√ /Caution	√	√	Caution	√
Asthma/COPD	√	x	√ /Caution	√	√	√
Peripheral vascular disease	√	Caution	Caution	Caution	√	√
Renal artery stenosis	√	√	x	x	√	√

## Drug choices in hypertension patient associated with clinical condition

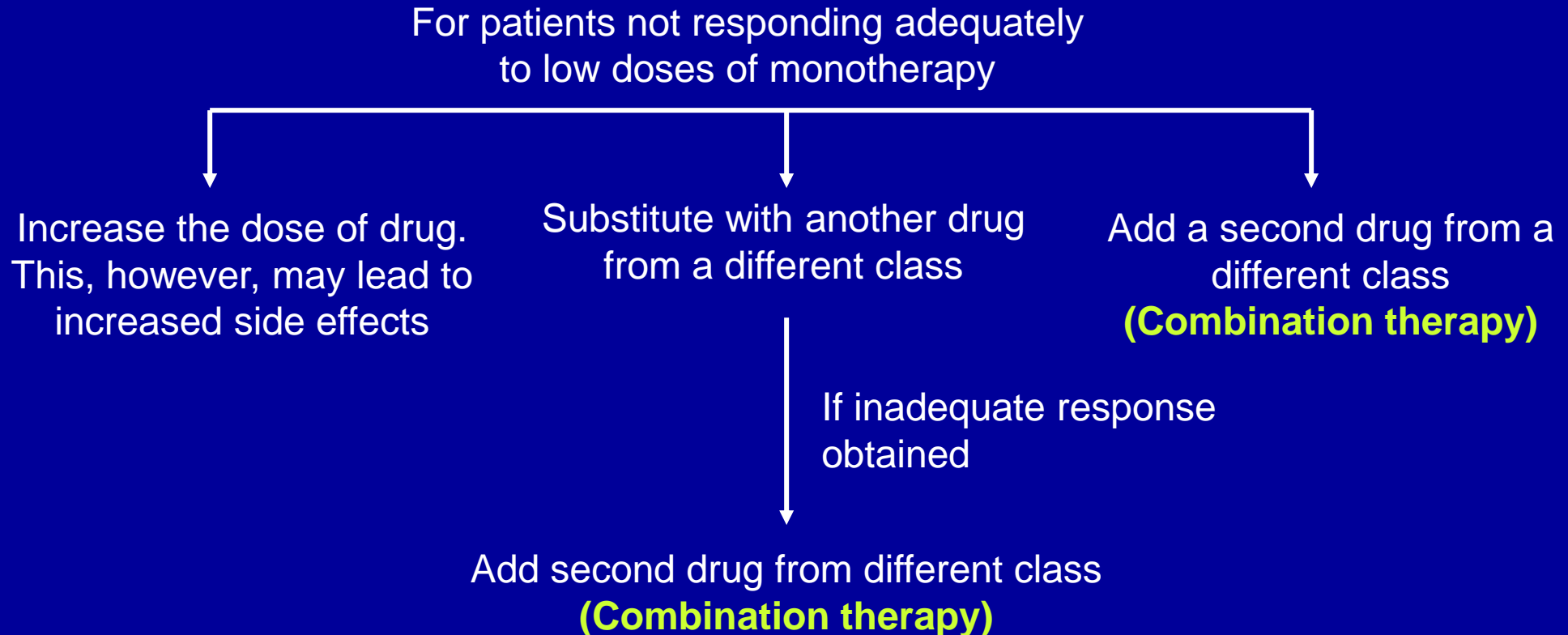
ACC	Drug					
	Diuretics	BB	ACEI	ARB	CCB	Antialdosterone
HF	√	√	√	√		
MI		√	√			√
CAD	√	√	√		√	
DM	√	√	√	√	√	
CRF			√	√		
Stroke	√		√			



# Combination therapy for hypertension – Recommended by JNC-VI guidelines and 1999 WHO-ISH guidelines

With any single drug, not more than 25–50% of hypertensives achieve adequate blood pressure control

*J Hum. Hypertens 1995; 9:S33–S36*



# Advantages of fixed-dose combination therapy

- Better blood pressure control
- Lesser incidence of individual drug's side-effects
- Neutralisation of side-effects
- Increased patient compliance
- Lesser cost of therapy

## Is it appropriate to start 2 agents?

In ALLHAT, 60% of patients achieved SBP control

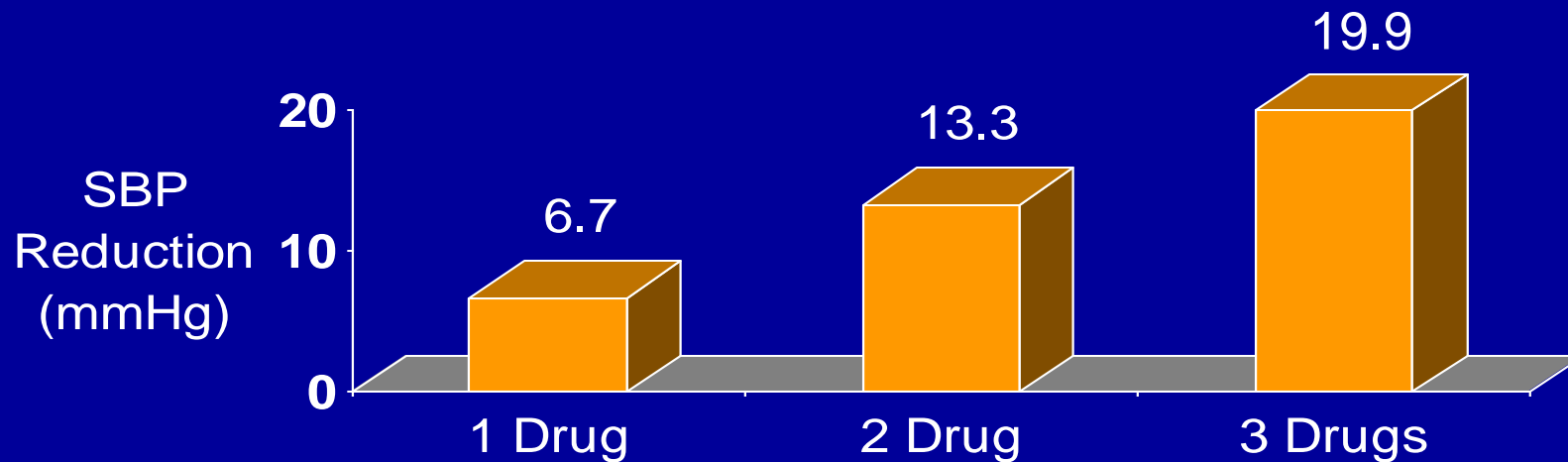
The mean number of drugs to achieve BP control was 1.6

Inadequate titration of drug regimens is a primary reason patients do not reach BP goal

Patients and providers should be educated that more than one antihypertensive is the norm not the exception

# Low Dose Combinations

BP lowering effects from different drug categories were additive



# Low Dose Combinations

Adverse effects in all drug categories, except ACEI, were dose related

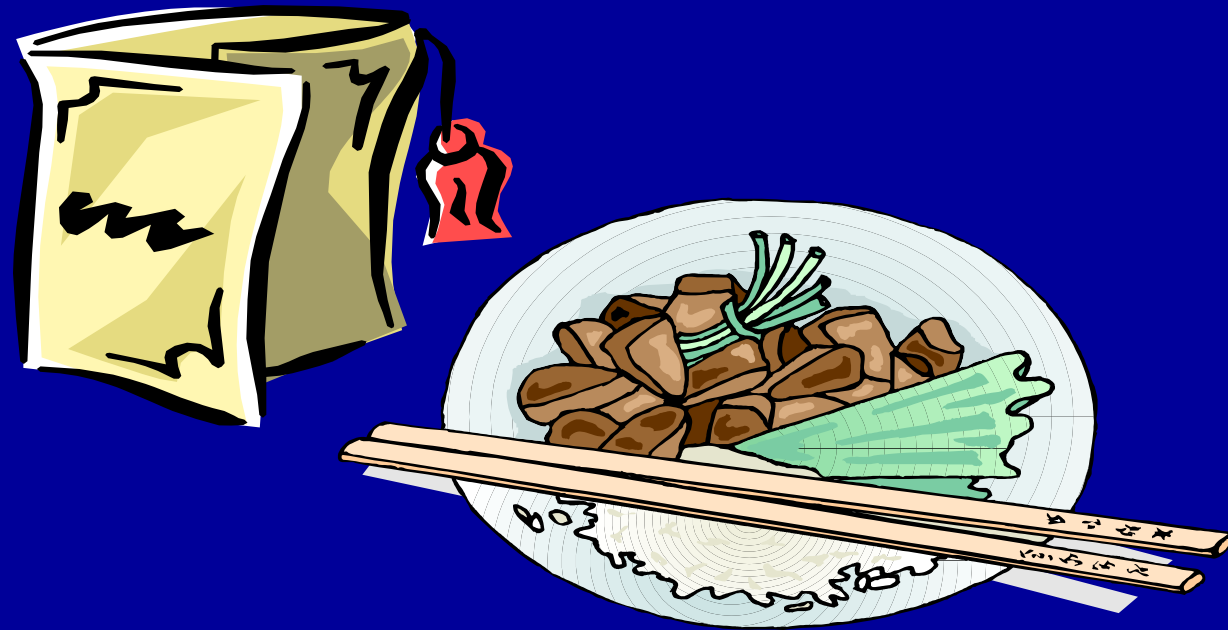
Prevalence of adverse effects in combination was less than additive

## Conclusion:

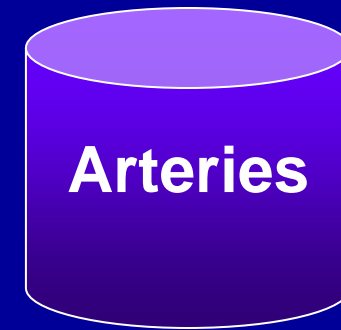
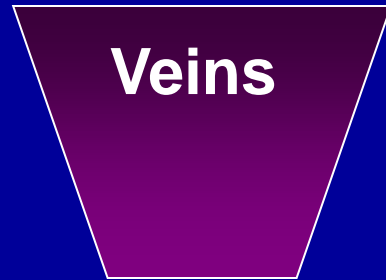
Utilization of low dose combination therapy can effectively reduce blood pressure while limiting the incidence of side effects

# Rational Combination Therapy:

## Chinese Menu Approach

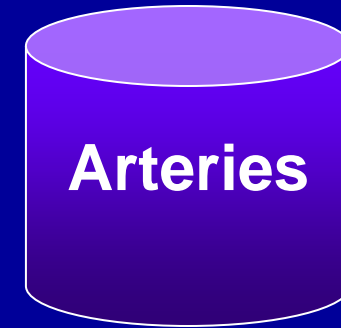
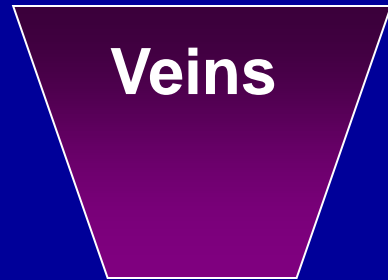


# Pharmacologic Sites of Action



Thiazides	Beta Blockers	Dihydropyridine
Loops	Diltiazem	CCBs
Aldosterone Ant.	Verapamil	Hydralazine
Nitrates		Minoxidil
	Via Central	Alpha <sub>1</sub> Blockers
ACEI	Mechanism:	ACEI
ARB	Clonidine	ARB

# Chinese Menu Approach



<p>✓ <b>Thiazides</b></p> <p>Loops</p> <p>Aldosterone Ant.</p> <p>Nitrates</p> <p>ACEI</p> <p>ARB</p>	<p>✓ <b>Beta Blockers</b></p> <p>Diltiazem</p> <p>Verapamil</p> <p>Via Central</p> <p>Mechanism:</p> <p>Clonidine</p>	<p>Dihydropyridines</p> <p>Hydralazine</p> <p>Minoxidil</p> <p>Alpha<sub>1</sub> Blockers</p> <p>✓ <b>ACEI</b></p> <p>ARB</p>
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✓ Choose one agent from each category



# Compelling Indications for Individual Drug Classes

Compelling Indication	Initial Therapy	Clinical Trial Basis
Heart failure	THIAZ, BB, ACEI, ARB, ALDO ANT	ACC/AHA Heart Failure Guideline, MERIT-HF, COPERNICUS, CIBIS, SOLVD, AIRE, TRACE, ValHEFT, RALES
Postmyocardial infarction	BB, ACEI, ALDO ANT	ACC/AHA Post-MI Guideline, BHAT, SAVE, Capricorn, EPHEBUS
High CAD risk	THIAZ, BB, ACE, CCB	ALLHAT, HOPE, ANBP2, LIFE, CONVINC

# Compelling Indications for Individual Drug Classes

Compelling Indication	Initial Therapy Options	Clinical Trial Basis
Diabetes	THIAZ, BB, ACE, ARB, CCB	NKF-ADA Guideline, UKPDS, ALLHAT
Chronic kidney disease	ACEI, ARB	NKF Guideline, Captopril Trial, RENAAL, IDNT, REIN, AASK
Recurrent stroke prevention	THIAZ, ACEI	PROGRESS

# Follow up and Monitoring

- follow-up for adjustment of medications until the BP goal is reached.
- More frequent visits for stage higher stages or with complicating comorbid conditions.
- Serum potassium and creatinine monitored 1–2 times per year.
- After BP at goal and stable, follow-up visits at 3- to 6-month intervals.
- Comorbidities, such as heart failure, associated diseases, such as diabetes, and the need for laboratory tests influence the frequency of visits.
- Recognize that high-risk patients often require high dose or combination therapies and shorter intervals between changes in medications.
- Consider reasons for lack of responsiveness if blood pressure is uncontrolled after reaching full dose.
- Consider reducing dose and number of agents after 1 year at or below goal.

# Causes of Resistant Hypertension

- Improper BP measurement
- Excess sodium intake
- Inadequate diuretic therapy
- Medication
  - Inadequate doses
  - Drug actions and interactions:
    - Nonsteroidal antiinflammatory drugs (NSAIDs), illicit drugs, sympathomimetics, oral contraceptives
  - Over-the-counter (OTC) drugs and herbal supplements
- Excess alcohol intake
- Presence of Identifiable causes of HTN

# Drug-Induced Hypertension: Prescription Medications

Steroids

Estrogens

NSAIDS

Phenylpropanolamines

Cyclosporine/tacrolimus

Erythropoietin

Sibutramine

Methylphenidate

Ergotamine

Ketamine

Desflurane

Carbamazepine

Bromocryptine

Metoclopramide

Antidepressants

Venlafaxine

Buspirone

Clonidine

# Guidelines for Improving Adherence to Therapy

Be aware of signs of non-adherence.

Establish & inform goal of therapy.

Encourage a positive attitude about achieving goals.

Educate patients about the disease and therapy.

Encourage lifestyle modifications.

Keep care inexpensive and simple.

# **Guidelines for Improving Adherence to Therapy (continued)**

Integrate therapy into daily routine.

Prescribe long-acting drugs, lesser doses

Adjust therapy to minimize adverse effects.

Continue to add drugs systematically to meet goal.

Utilize other health professionals, if needed.

Try a new approach if current regime is inadequate.

# Special Considerations

- Compelling Indications
- Other Special Situations
  - Obesity and the metabolic syndrome
  - Left ventricular hypertrophy
  - Peripheral arterial disease
  - Hypertension in older persons
  - Postural hypotension
  - Dementia
  - Hypertension in women
  - Hypertension in children and adolescents
  - Hypertension urgencies and emergencies



# Hypertension in Older Persons

- Hypertension is common.
- SBP is a better predictor of events than DBP.
- Increased age on its own should not be a consideration in determining the need for antihypertensive drug therapy. Drug therapy for the elderly should be based on the same criteria as in younger adults however caution should be exercised in elderly patients who are frail or have postural hypotension.

# Hypertension in Older Persons

- This population has the lowest rates of BP control.
- Primary hypertension is the most common cause, but common identifiable causes (e.g., renovascular hypertension) should be considered.
- Treatment, including those with isolated systolic HTN, should follow same principles outlined for general care of HTN.
- Therapy should begin with lifestyle modifications.
- Lower initial drug doses may be indicated to avoid symptoms
- Standard doses & multiple drugs needed to reach BP targets.
- Goal of therapy is the same (< 140/90 mm Hg), although an interim goal of SBP < 160 mm Hg may be necessary.

# Hypertension in Women

- Clinical trials have not demonstrated significant differences between men and women in treatment response and outcomes.
- Oral contraceptives may increase BP, and BP should be checked regularly. In contrast, Hormone Replacement Therapy (HRT) does not raise BP.
- In case of development of HTN—consider other forms of contraception.

# Pregnant Women

- Pregnant women with HTN should be followed carefully.
- Chronic hypertension is high blood pressure present before pregnancy or diagnosed before the 20th week of gestation.
- Pre-eclampsia is increased blood pressure that occurs in pregnancy (generally after the 20th week) and is accompanied by edema, proteinuria, or both.
- **ACE inhibitors (ACEI) and angiotensin II receptor blockers (ARB) are contraindicated for pregnant women.**
- Methyldopa is for women diagnosed for hypertension during pregnancy.

# Diabetes Mellitus

Drug therapy should begin along with lifestyle modifications to reduce blood pressure to < 130/80 mm Hg.

ACE inhibitors,  $\alpha$ -blockers, calcium antagonists, and low-dose diuretics are preferred.

Insulin resistance or high peripheral insulin levels may cause hypertension, which can be treated with lifestyle changes, insulin-sensitizing agents, vasodilating antihypertensive drugs, and lipid-lowering agents.

# Renal Disease

Hypertension may result from renal disease that reduces functioning nephrons.

Evidence shows a clear relationship between high blood pressure and end-stage renal disease (ESRD).

Blood pressure should be controlled more strictly especially in patients with proteinuria in excess of 1 gram per 24 hours.

ACE inhibitors work well to control blood pressure and slow progression of renal failure.

# Left Ventricular Hypertrophy

- LVH is an independent risk factor that increases the risk of CVD.
- Regression of LVH occurs with aggressive BP management: weight loss, sodium restriction, and treatment with all classes of drugs except the direct vasodilators.

What is hypertensive crisis?

What is hypertensive emergencies?

What is hypertensive urgencies?

What is the difference between them?



# Hypertensive crisis

- **Hypertensive Emergencies and Urgencies**
- **Emergencies:** The blood pressure is elevated **severely** and **associated with** target organ damage, such as hypertensive encephalopathy, AMI, pulmonary edema, require immediate blood pressure reduction.
- **Urgencies:** The blood pressure is elevated **severely** but **no** target organ damage has acute target organ damage.
- **Management of hypertensive emergencies requires immediate action, whereas urgencies benefit from reducing blood pressure within a few hours.**
- **Fast-acting** drugs are available.

# Public Health Goals Related to Hypertension (HTN)

Prevent the rise of blood pressure with age

Decrease the existing prevalence of HTN

Increase hypertension awareness and detection

Improve control of hypertension

Reduce cardiovascular risks

Improve recognition of the importance of high normal blood pressure

Improve opportunities for treatment

Enhance community programs

# Prevention

Observational studies from the US and Europe have identified the following areas for prevention:

- Tobacco cessation

- Physical activity

- Weight reduction

- Hypertension control

- Lipid management

- Aspirin (fish oil) to high risk groups

# Prevention

- Primary prevention
  - Population strategy
  - High risk strategy
- Secondary prevention

# Primary prevention

- A population strategy:** lower the blood pressure in general population, Attempt is to shift the blood pressure of entire population to “biological normalcy” (decrease in case of HBP)
- A targeted (High Risk) strategy:** direct intervention with more intensive efforts to lower blood pressure in individuals who are at greatest risk of developing hypertension.

# Strengths of the high-risk preventive strategy

1. Intervention is appropriate for the individual.
2. It avoids interference with those who are not at special risk.
3. It is readily accommodated within the ethos and organization of medical care.
4. It offers a cost-effective use of resources.
5. Selectivity improves the benefit-to-risk ratio.
6. Subject motivation present – can see reason to change !!!
7. Physician motivation - can see results of change!

# Weaknesses of the high-risk preventive strategy

1. Prevention becomes medicalized.
2. Success is only palliative and temporary.
3. The strategy is behaviourally inadequate/inappropriate.
4. It is limited by a poor ability to predict the future of individuals.
5. Problems of feasibility and costs.
6. The contribution to overall control of a disease may be disappointingly small.

# Secondary prevention

- Early case detection
- Prompt & adequate treatment
- Patient compliance
  - Drugs
  - Lifestyle modification



# New Features and Key Messages

- Above 115/75 mmHg, CVD risk doubles with each BP increase of 20/10 mmHg
- Prehypertension
  - SBP 120–139 mmHg
  - DBP 80–89 mmHg
  - Require health-promoting lifestyle modifications to prevent CVD
  - Patient involvement is key

# New Features and Key Messages

- Thiazide-type diuretics should be included in initial drug therapy for most
- Compelling indications for other drug classes remain in the guideline
- Most patients require two or more drugs to achieve goal BP
- If BP is  $>20/10$  mmHg above goal, initiate therapy with two agents

# Patient Evaluation

1. Two consecutive blood pressure measurements
2. Assess lifestyle and identify other CV risk factors or concomitant disorders that affects prognosis and guides treatment
3. Reveal identifiable causes of high BP
4. Assess the presence or absence of target organ damage and CVD

# Summary

Hypertension is a major cause of morbidity and mortality, and needs to be treated

It is an extremely common condition; however it is still under-diagnosed and undertreated

Life style modification is desirable and required in all patients with hypertension. Even a person with a better lifestyle in terms of hypertension do have scopes to improve further.

Hypertension is not controlled with monotherapy in at least 50% of patients; in these patients combination therapy is required

**Case**



# Diagnosis

AB is a 56 yo female with no significant Past H. Her BMI is 26 kg/m<sup>2</sup> and she has a family history positive for Type 2 Diabetes. Her BP measured on two consecutive clinic visits is 132/84. What is AB's BP classification?

Normal

Prehypertensive

Stage 1 Hypertension

Stage 2 Hypertension

# Therapy

What therapy should be initiated for AB?

Enalapril 5 mg PO daily

Hydrochlorothiazide 25 mg PO daily

No therapy is indicated

Lifestyle modifications including weight loss and  
DASH eating plan should be encouraged

# Goal of Therapy

What is the goal of lifestyle modification in AB?

Goal BP < 140/90, the goal is to get to goal

Goal BP < 130/80, the goal is to get to goal

Improve patients quality of life

Prevent onset of hypertension



## 3 years later

AB, now 59, returns to clinic with marginal success at lifestyle changes. Her BP has repeatedly measured around 146/92. What is AB's BP classification?

Normal

Prehypertensive

Stage 1 Hypertension

Stage 2 Hypertension

## 5 years later

AB, now 59, returns to clinic with marginal success at lifestyle changes. Her BP has repeatedly measured around 146/92. What should be done?

Enalapril 5 mg PO daily

Hydrochlorothiazide 25 mg PO daily

No therapy is indicated

Reinforce lifestyle modifications including weight loss and the DASH eating plan.

Said is not heard,  
heard is not understood,  
understood is not agreed upon,  
agreed upon is not applied,  
applied is not at all maintained.

**Thank You**

**Any Questions?**