HYPERTENSION

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HYPERTENSION

- **INTRODUCTION**
- EPIDEMIOLOGY
- PATHOPHYSIOLOGY
- DIAGNOSIS
- PATIENT EVALUATION
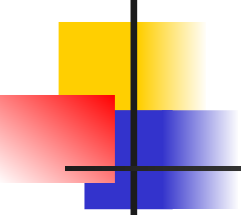- TREATMENT

INTRODUCTION

- CVD is currently a world wide epidemic
- Hypertension is a key CVD risk factor
- The communicable diseases epidemic is not yet under control in our country
- We do not have the resources to handle two epidemics
- We need to act quickly to prevent CVD and treat those already affected

Hypertension: definition

- **BP >/= 140/90** is considered as defining term, but hypertension is a continuum

- Cardiovascular risk doubles with every 20/10mmhg rise BP from 115/75mmhg between age 40 to 70 yrs

- Isolated systolic/diastolic hypertension should be treated like any other hypertension, higher figure determines grade

- White coat hypertension is also associated with increased cardiovascular risk

Hypertension: definition

- It is an asymptomatic lifelong disease requiring life long treatment

- Progressive cardiovascular syndrome associated with target organ damage

- It's assoc with increased risk for stroke, coronary artery disease, heart failure, renal failure, retinopathy and peripheral vascular disease.

- Treatment results in reduction in these complications

- Major challenges exist in diagnosis and treatment

BP CLASSIFICATION

ESH -ESC category (1)	Systolic BP mmHg	Diastolic BP mmHg	JNC-7 category (2)
Optimal	<120	<80	Normal
Normal	120 – 129	80 – 84	Pre hypertension
High normal	130 – 139	85 – 89	
Grade 1 hypertension (mild)	140 – 159	90 – 99	Stage 1 hypertension
Grade 2 hypertension (moderate)	$\geq$ 160 – 179	$\geq$ 100 – 109	Stage 2 hypertension
Grade 3 hypertension (severe)	180	110	

ESH/ESC Guidelines. *2007*

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Global Burden of Hypertension: Analysis of Worldwide Data

- In 2000, 26.4% (95% CI 26.0-26.8%) of the adult population had hypertension, 26.6% of men & 26.1% of women.

- By 2025, 29.2% (28.8-9.7%) were projected to be hypertensive, 29.0% of men & 29.5% of women.

- In 2000, 972 million adults had hypertension; 333 million (329-336 million) in economically developed countries & 639 million (625-654 million) in economically developing countries.

- By 2025, the number of adults with hypertension was predicted to increase by about 60% to a total of 1.56 billion.

Global Burden of Hypertension: Africa

- In Tanzania, > above 37% in an urban area and more than 26% in a rural population

- Kenya –rural – 33%

- Of all patients with hypertension in Africa, only 1/3 are aware.

- Of those diagnosed only 1/3 are on treatment
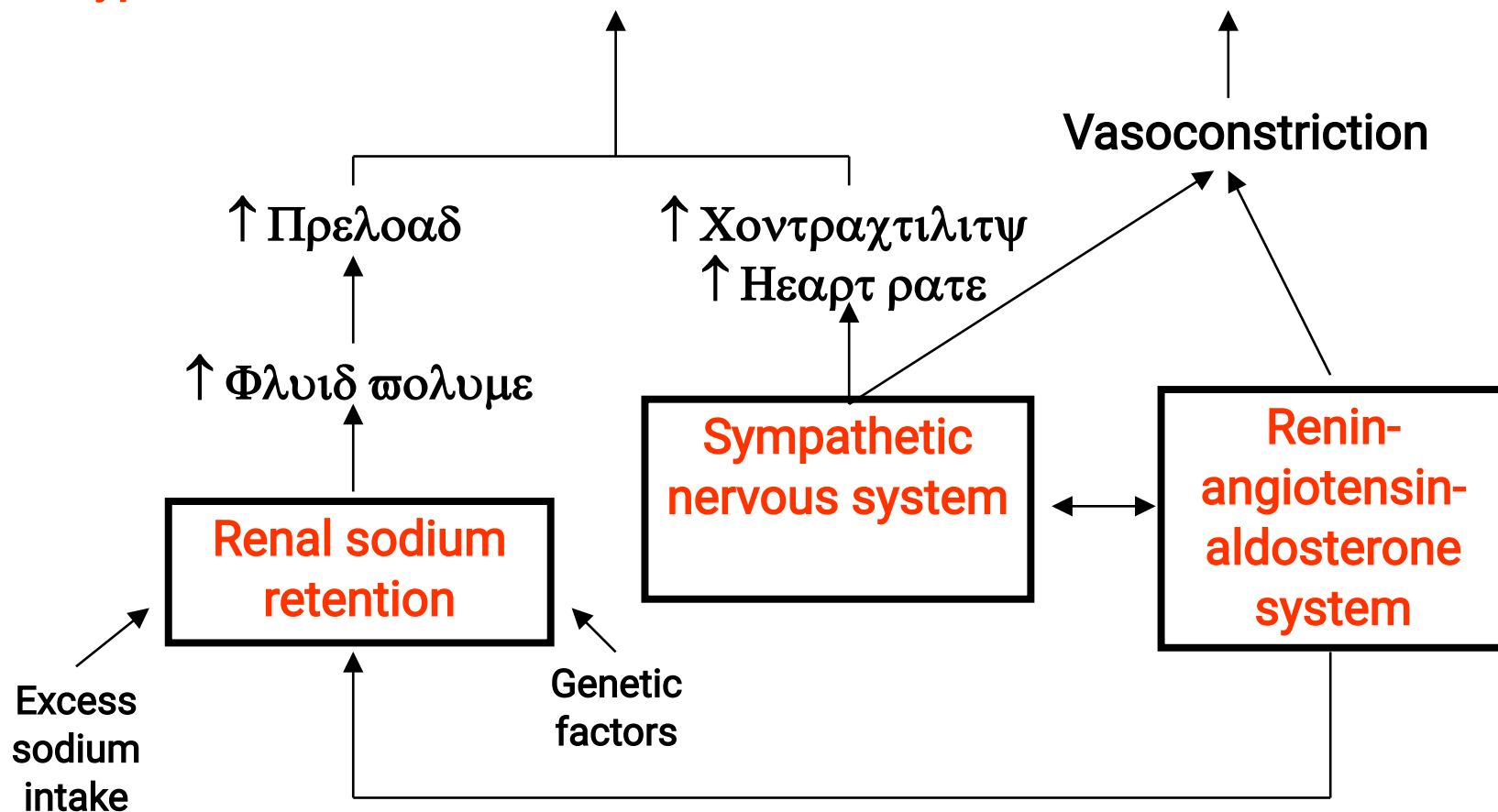
- Of those on treatment only 1/3 are controlled

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Control of blood pressure

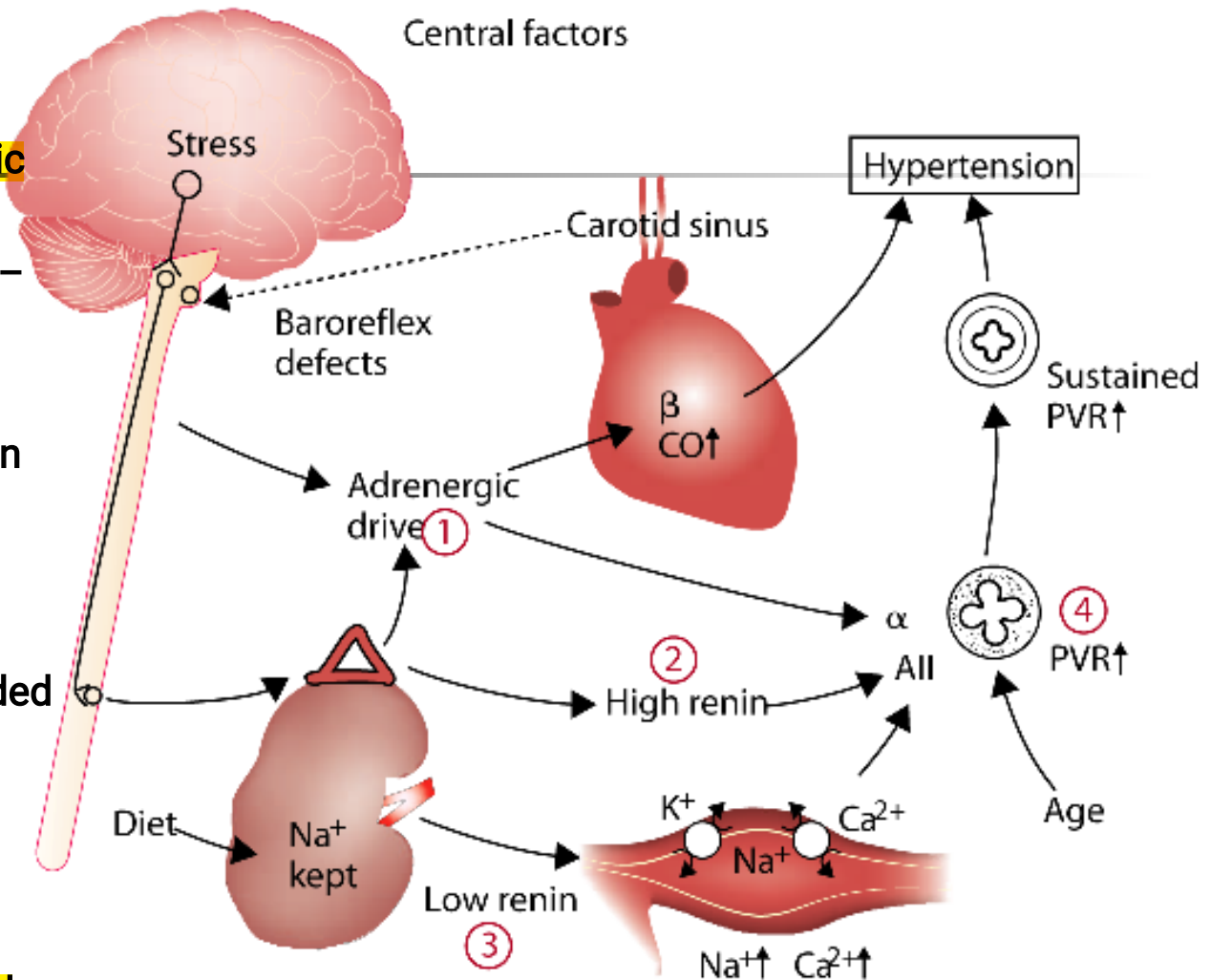Blood pressure = Cardiac output x Peripheral resistance
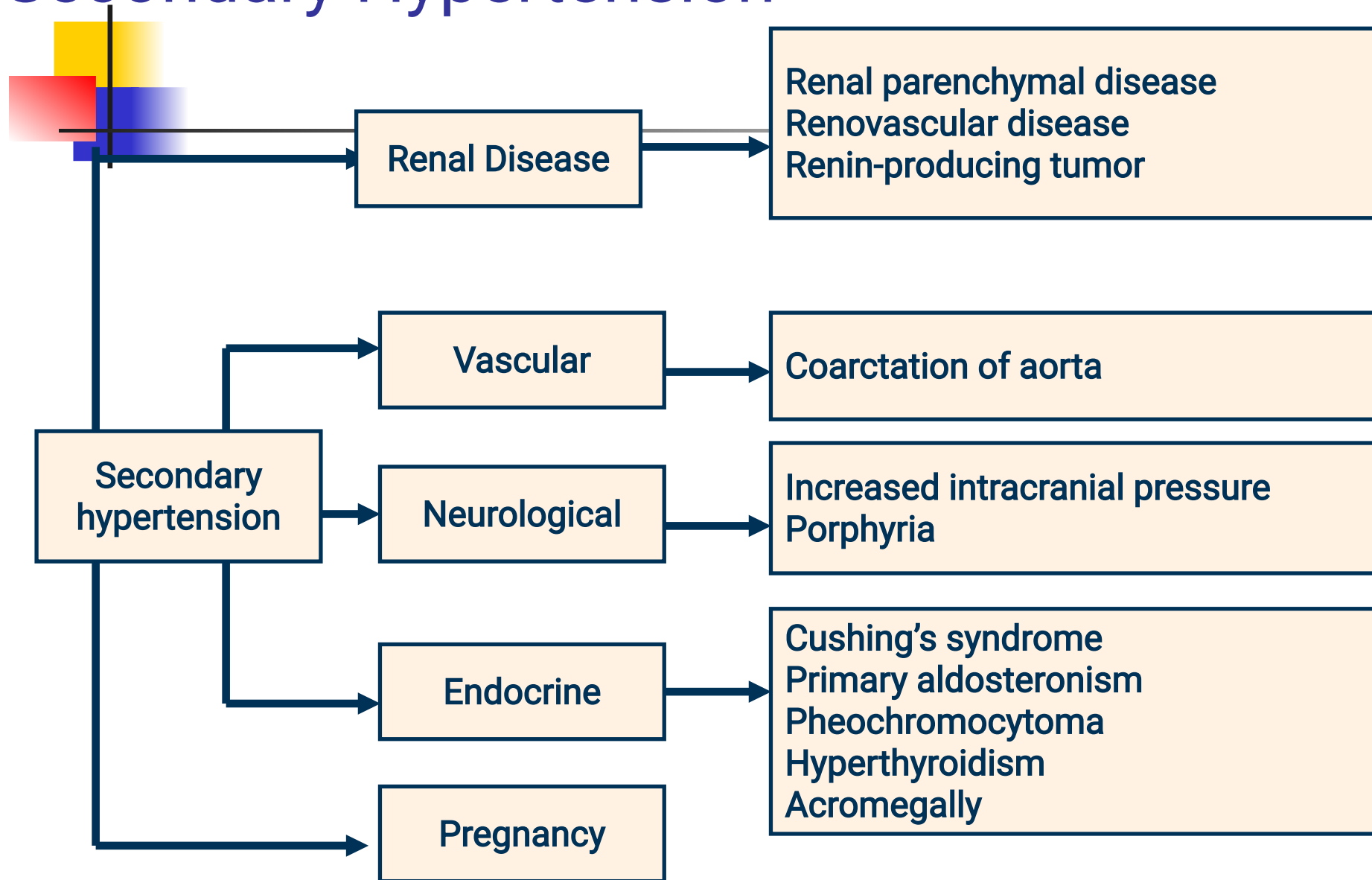
Hypertension = Increased CO and/or Increased PR

↑ Πρελοαδ

↑ Φλυιδ πολυμε

↑ Χοντραχτιλιτψ
↑ Ηεαρτ ρατε

Vasoconstriction

Renal sodium retention

Sympathetic nervous system

Renin-angiotensin-aldosterone system

Excess sodium intake

Genetic factors

Kaplan (1994)
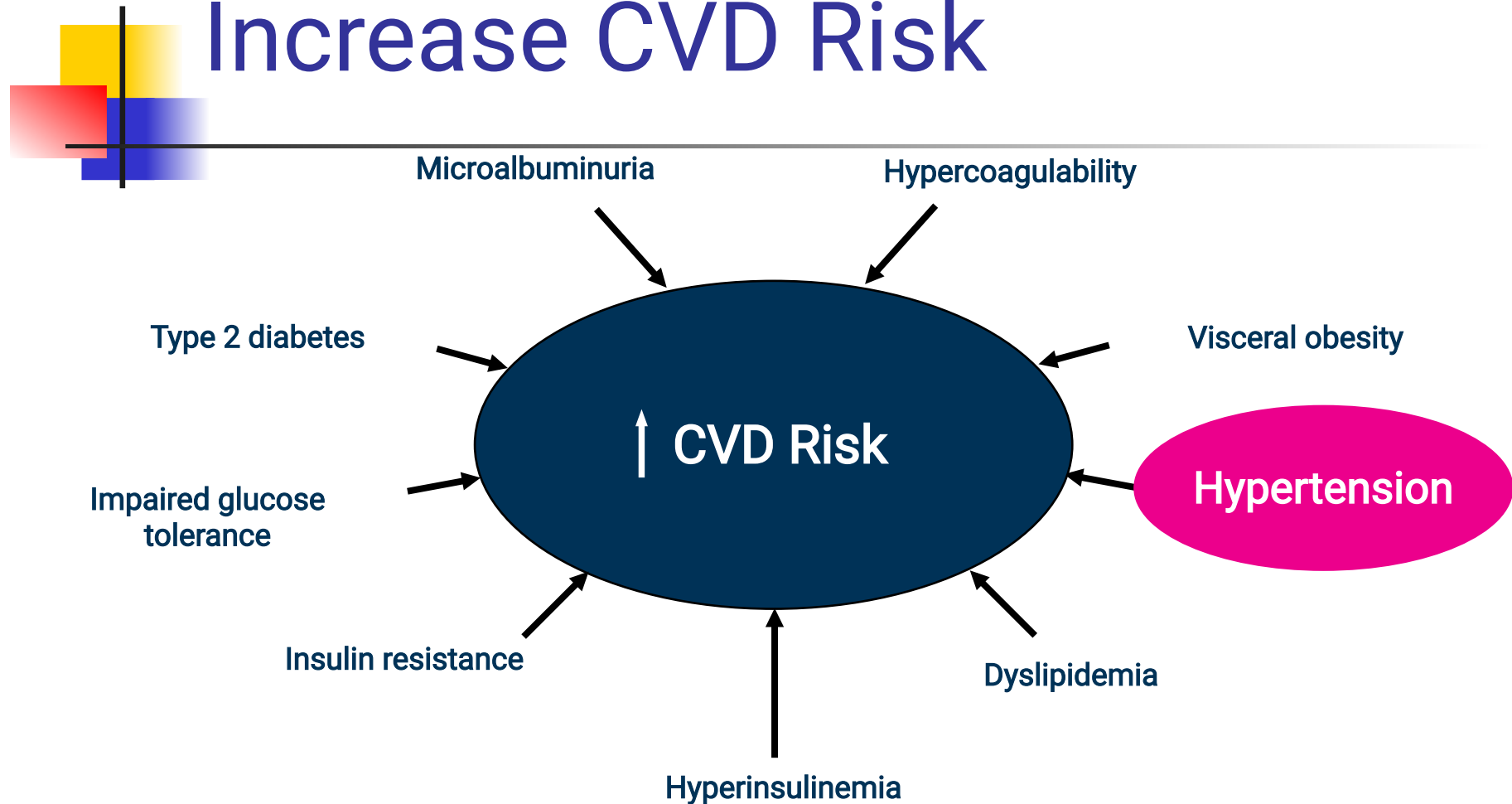
Multifactorial origin of Hypertension

- Major mechanisms
  - (1) increased adrenergic drive, as often found in young people (aged 30–49 years);
  - (2) high-renin hypertension, as seen in individuals with renal dysfunction;
  - (3) low-renin hypertension, as recorded in individuals with inherently raised aldosterone concentrations;
  - (4) increased peripheral vascular resistance (PVR), as seen in elderly patients.

Kaplan NM & Opie LH. Lancet 2006; 367:168-176.

Important Recognized Causes of Secondary Hypertension

Renal Disease
- Renal parenchymal disease
- Renovascular disease
- Renin-producing tumor

Secondary hypertension

Vascular
- Coarctation of aorta

Neurological
- Increased intracranial pressure
- Porphyria

Endocrine
- Cushing's syndrome
- Primary aldosteronism
- Pheochromocytoma
- Hyperthyroidism
- Acromegally

Pregnancy

Associated Conditions Increase CVD Risk

Microalbuminuria

Hypercoagulability

Type 2 diabetes

Visceral obesity

↑ CVD Risk
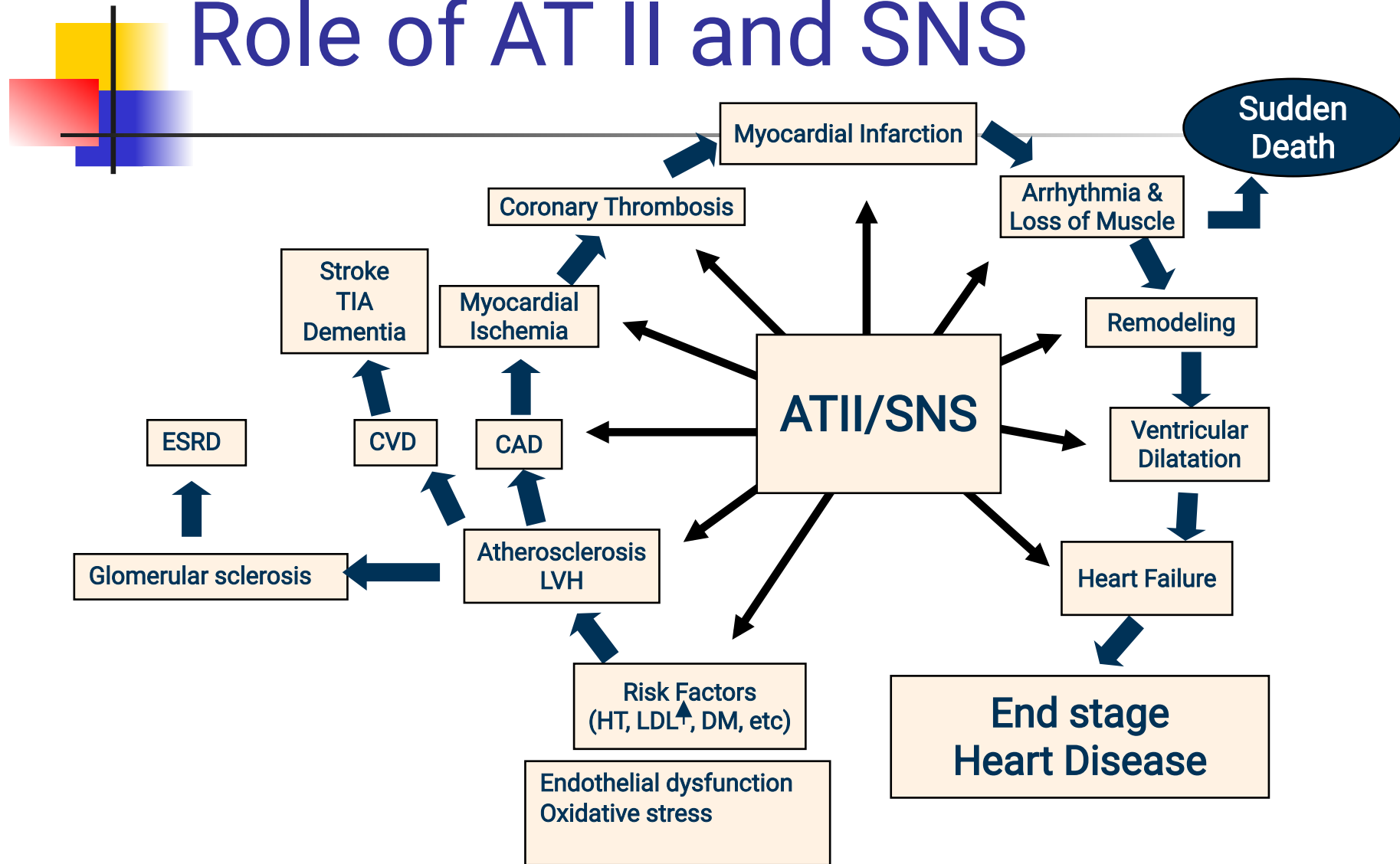
Hypertension

Impaired glucose tolerance

Insulin resistance

Dyslipidemia

Hyperinsulinemia

The high prevalence of hypertension worldwide has contributed to the present pandemic of cardiovascular diseases (CVD) - responsible for 30% of all deaths worldwide

Adapted from Rutter MK et al. *Circulation.* 2003;107:458-454

The cardiovascular continuum
Role of AT II and SNS

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Diagnosis of Arterial Hypertension

- **■ Symptoms**
- ~~Most patients are asymptomatic~~
- Diagnosis at routine medical examination
- Diagnosis when stroke or MI
- Hypertension called "Silent Killer"
- **■ Diagnostic procedures**
  - **■ Aim:**
* Establishing <mark>blood pressure levels</mark>
* Identifying <mark>secondary causes of hypertension</mark>
* Evaluating the overall cardiovascular risk
  - **■ Procedures:**
    * <mark>Repeated blood pressure measurements</mark>
* Medical history
* **Physical examination**

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ESC Guidelines 2007

* **Laboratory and instrumental investigations**

BP measurement

- Patient sits for 5 mins -back supported, arm supported at the level of the heart
- No caffeine/adrenergic stimulants
- No smoking in the preceding 15 mins
- Cuff should encircle and cover two thirds of the length of the arm
- Use a mercury sphygmomanometer or validated electronic BP machine
- Two recordings at each visit at least three sets of readings one week apart
- Deflate at 2mm/hg/second
- Record Korotkoff sound I -SBP, V – DBP

Diagnosis of Arterial Hypertension
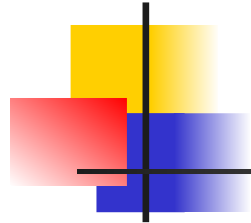
- **Medical history** with particular attention to:

- Hypertension

- <u>Life style factors</u> – smoking, alcohol, diet, physical exercise, family history etc

- Diabetes

- Dyslipidemia

- Premature coronary heart disease

- Stroke

- Renal disease

- **Physical examination**

- Signs suggesting secondary hypertension obesity height, weight, BMI, WC, HC, HWR

- Signs of organ damage:

* Brain* Retina

* Heart * Peripheral arteries

Diagnosis of Arterial Hypertension

Laboratory and instrumental investigations

- **Routine tests**

- Plasma <u>glucose</u>

- Total <u>cholesterol</u>, HDL-cholesterol, fasting serum triglycerides

- Serum <u>creatinine</u>, <u>uric acid</u>

- <u>Serum potassium</u>

- <u>Hemoglobin and hematocrit</u>

- <u>Urinalysis</u> (dipstick, urinary sediment)

- <u>Electrocardiogram</u>

Diagnosis of Arterial Hypertension

Laboratory and instrumental investigations

Recommended tests

- Echocardiogram, Carotid ultrasound

- Postprandial plasma glucose (if FBS > 6.1 mmol/l or 110 mg/l)

- C-reactive protein (high sensitivity)

- Microalbuminuria (essential in diabetics)

- 24hr proteinuria (if dipstick positive)

- Funduscopy (in severe hypertension)

Diagnosis of Arterial Hypertension

Factors influencing prognosis

Risk factors for cardiovascular disease used for stratification

- Levels of systolic and diastolic BP

- Men > 55 years; Women > 65 years

- Smoking

- Dyslipidemia

- Family history of PCAD

- Abdominal obesity (circ) M > 102 cm, W > 88 cm)

- C-reactive protein > 1 mg/dl

- Diabetes mellitus

- Fasting plasma glucose > 7.0 mmol/l

- Postprandial plasma glucose > 11.0 mmol/l

Diagnosis of Arterial Hypertension

Factors influencing prognosis

Target organ damage (TOD)

- LVH (ECG/ echo)

- Carotid arterial wall thickening or atherosclerotic plaque (US)

- Slight increase in serum creatinine (M 115-133, W 107-124µmol/l)

- Microalbuminuria (30-300 mg/24 h; albumin-creatinine ratio M > 2.5, W > 3.5

- Cardiovascular disease; CVA/TIA

- Heart disease: AMI, angina, CABG, CHF

- -Renal disease: diabetic nephropathy

- -Peripheral vascular disease

- -Advanced retinopathy: haemorrhages or exudates, papilloedema

Cardiovascular Risk Stratification to Quantify Prognosis

	Normal SBP 120-129 or DBP 80-84	High normal SBP 130-139 or DBP 85-89	Grade 1 SBP 140-159 or DBP 90-99	Grade 2 SBP 160-179 or DBP 100-109	Grade 3 SBP ≥180 or DBP ≥110
No other Risk Factors (RF)	Average risk	Average risk	Low added risk	Moderate added risk	High added risk
1 or 2 Additional RF	Low added risk	Low added risk	Moderate added risk	Moderate added risk	Very high added risk
3 or more RF, or Met synd or TOD	Moderate added risk	High added risk	High added risk	High added risk	Very high added risk
Established CV or Renal disease	High added risk	Very high added risk	Very high added risk	Very high added risk	Very high added risk

Absolute added 10 year risk of cardiovascular disease (Framingham):
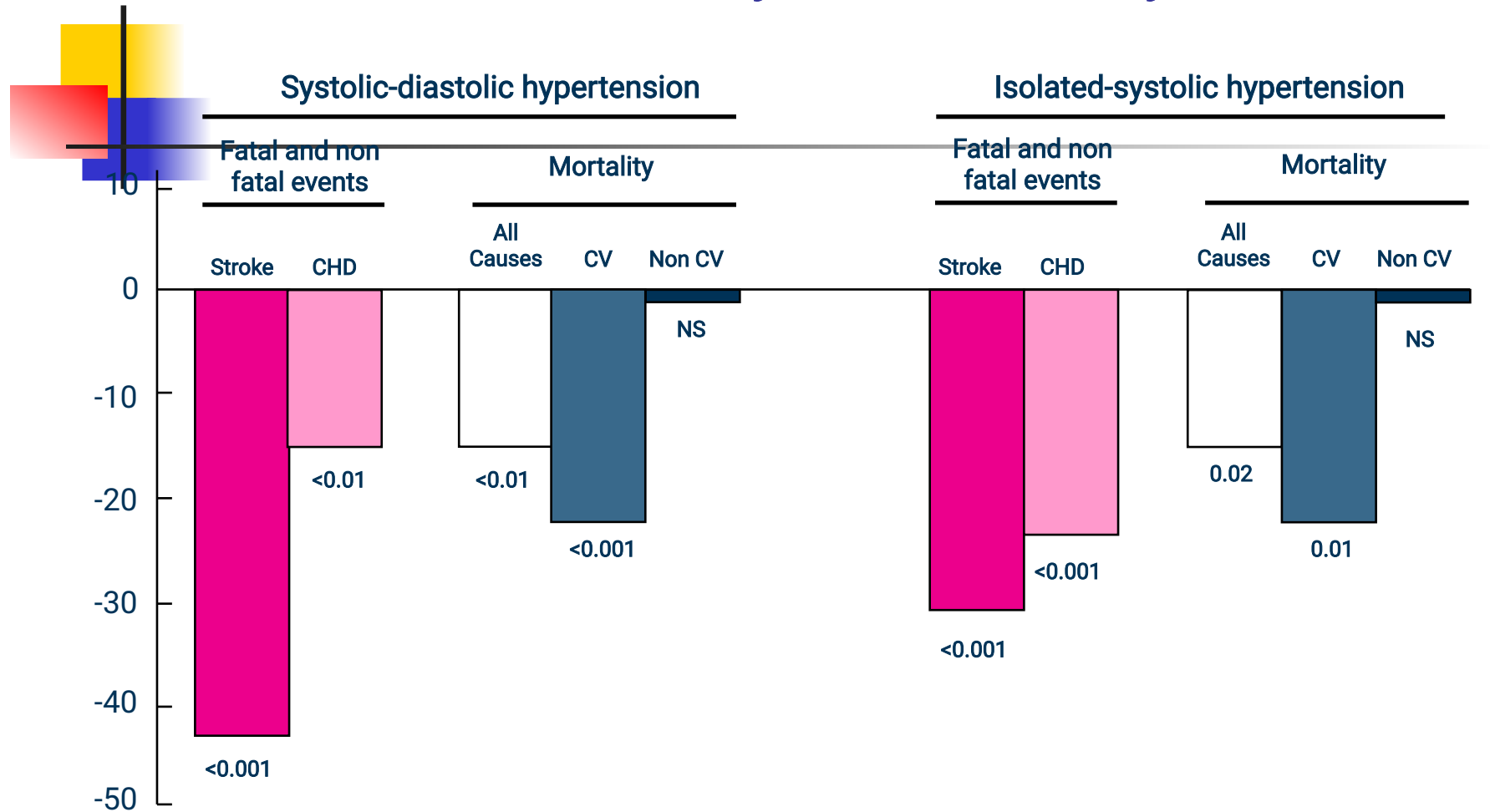
< 15%   15-20%   20-30%   > 30%

TOD = Target Organ Dammage

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Effective Blood Pressure Control Reduces Cardiovascular Morbidity and Mortality

Event reduction in patients on active antihypertensive treatment versus placebo or no treatment.
CHD: coronary heart disease; CV: cardiovascular

ESC Guidelines. *J Hypertens* 2003; 21:1779–1786.

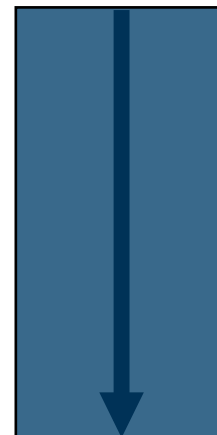# BP Reductions as Little as 2 mm Hg Reduce Risk of CV Events by Up to 10%
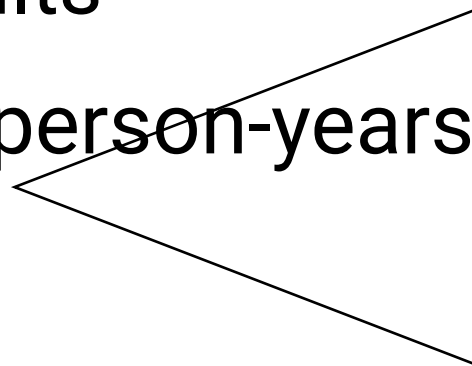
- Meta-analysis of 61 prospective, observational studies

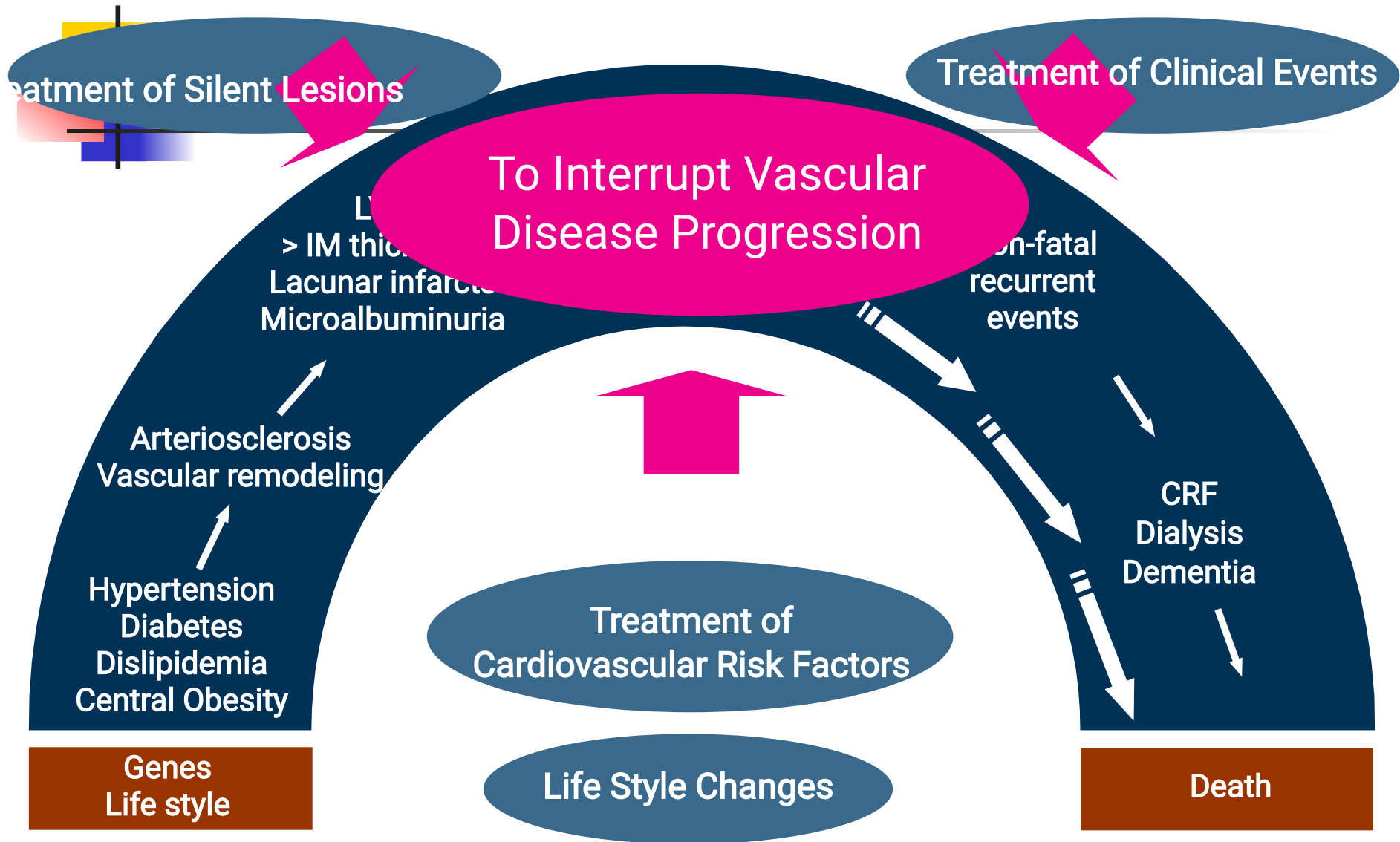- 1 million adults

- 12.7 million person-years

2 mm Hg decrease in mean SBP

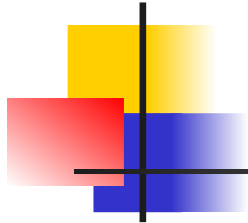7% reduction in risk of ischemic heart disease mortality

10% reduction in risk of stroke mortality

Lewington S et al. *Lancet* 2002; 360:1903-1913.

Natural History of Cardiovascular Disease

Treatment of Silent Lesions

Treatment of Clinical Events

To Interrupt Vascular Disease Progression

LV
> IM thick
Lacunar infarcts
Microalbuminuria

Non-fatal recurrent events

Arteriosclerosis
Vascular remodeling

Hypertension
Diabetes
Dislipidemia
Central Obesity

CRF
Dialysis
Dementia

Treatment of Cardiovascular Risk Factors

Life Style Changes

Genes
Life style

Death

Dzau V and Braunwald E. *Am Heart J* 1991; 121:1244-1263

Goals of Treatment

- **Maximum decrease in long-term total CV risk**
- **Lower level of systolic and diastolic BP per se**

- **Treat all reversible risk factors and associated conditions**
- Target BP:
  - At least < 140/90 mmHg in all HT patients
  - < 130/80 mmHg in diabetics and other high risk patients eg renal dysfunction, CVA, proteinuria, post AMI
  - Difficult to achieve in the elderly
- **Start anti hypertensive** before cardiovascular complications develop

Lifestyle Changes

Purpose: lower BP, control other risk factors, reduce number of drugs required to reach target

❖ *This is for all and should be normal way of life in all to prevent hypertension*

- Smoking cessation
- Weight reduction
- Reduction of excessive alcohol intake
- Physical exercise
- Reduction of salt intake
- Increase in fruit and vegetable intake
- Decrease in saturated and total fat intake

Initiation of antihypertensive treatment

Other risk factors and disease history	Blood pressure (mmHg)				
	Normal SBP 120-129 or DBP 80-84	High normal SBP 130-139 or DBP 85-89	Grade 1 SBP 140-159 or DBP 90-99	Grade 2 SBP 160-179 or DBP 100-109	Grade 3 SBP ≥180 or DBP ≥110
No other Risk Factors (RF)	No BP intervention	No BP intervention	LIfestyle changes for several months, then drug treatment	Lifestyle changes for several wks then drug treatment	Immediate drug treatment and lifestyle changes
1- 2 Additional RF	Lifestyle changes	Lifestyle changes	Lifestyle changes for several wks then drug treatment	Lifestyle changes for several wks, then drug treatment	Immediate drug treatment and lifestyle changes
3 or more RF, or Diabetes or TOD	Lifestyle changes + drug treatment if DM	Drug treatment and lifestyle changes	Drug treatment and lifestyle changes	Drug treatment and lifestyle changes	Immediate drug treatment and lifestyle changes
Established CV or Renal disease	Drug treatment and lifestyle changes	Immediate drug treatment and lifestyle changes	Immediate drug treatment and lifestyle changes	Immediate drug treatment and lifestyle changes	Immediate drug treatment and lifestyle changes

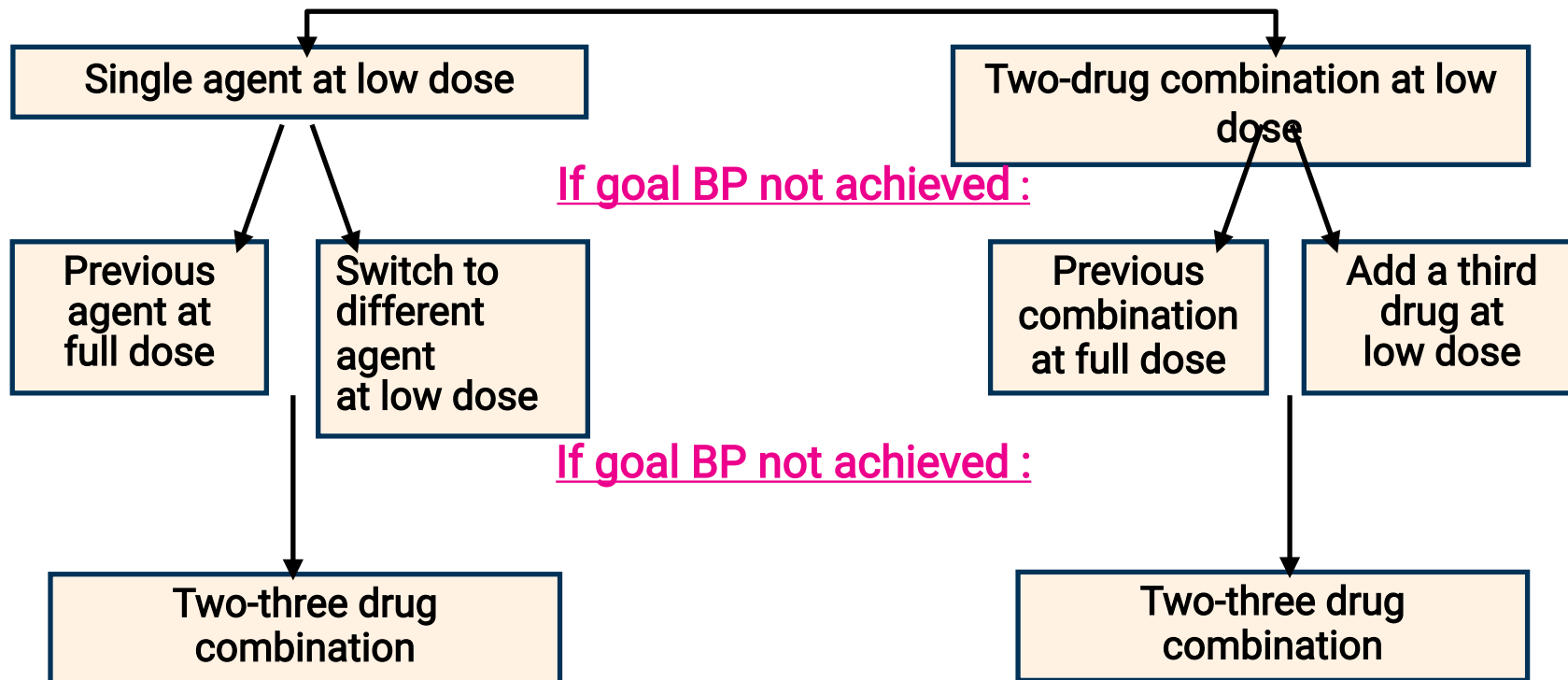TOD, target organ damage; SBP, systolic blood pressure; DBP, diastolic blood pressure.

Algorithm for Pharmacological Treatment of Hypertension
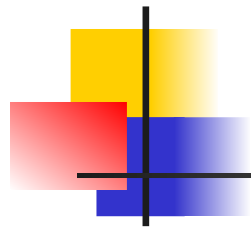
Consider :
Blood pressure level before treatment
Absence or presence of TOD and risk factors

Choose between :

| Single agent at low dose |

| Two-drug combination at low dose |

If goal BP not achieved :

| Previous agent at full dose |

| Switch to different agent at low dose |

| Previous combination at full dose |

| Add a third drug at low dose |

If goal BP not achieved :

| Two-three drug combination |

| Two-three drug combination |

Recommendations by ADA, ISHIB, and NKF consistent with JNC 7

- Drug therapy is recommended for *all* patients with hypertension (SBP/DBP >140/90 mmHg)
- BP goals
    - <140/90 mmHg
    - <130/80 mmHg for patients with diabetes mellitus
    - <125/75mmHg CRF + proteinuria >1g/day
- *Multiple drug therapy* with 2 or more agents at adequate doses (thiazide diuretic, ACE inhibitor, ARB, beta-blocker, CCB) is usually required to achieve BP targets
- ISHIB guidelines: *consider initiating* treatment with 2 drugs if BP is ≥15/10 mmHg above goal
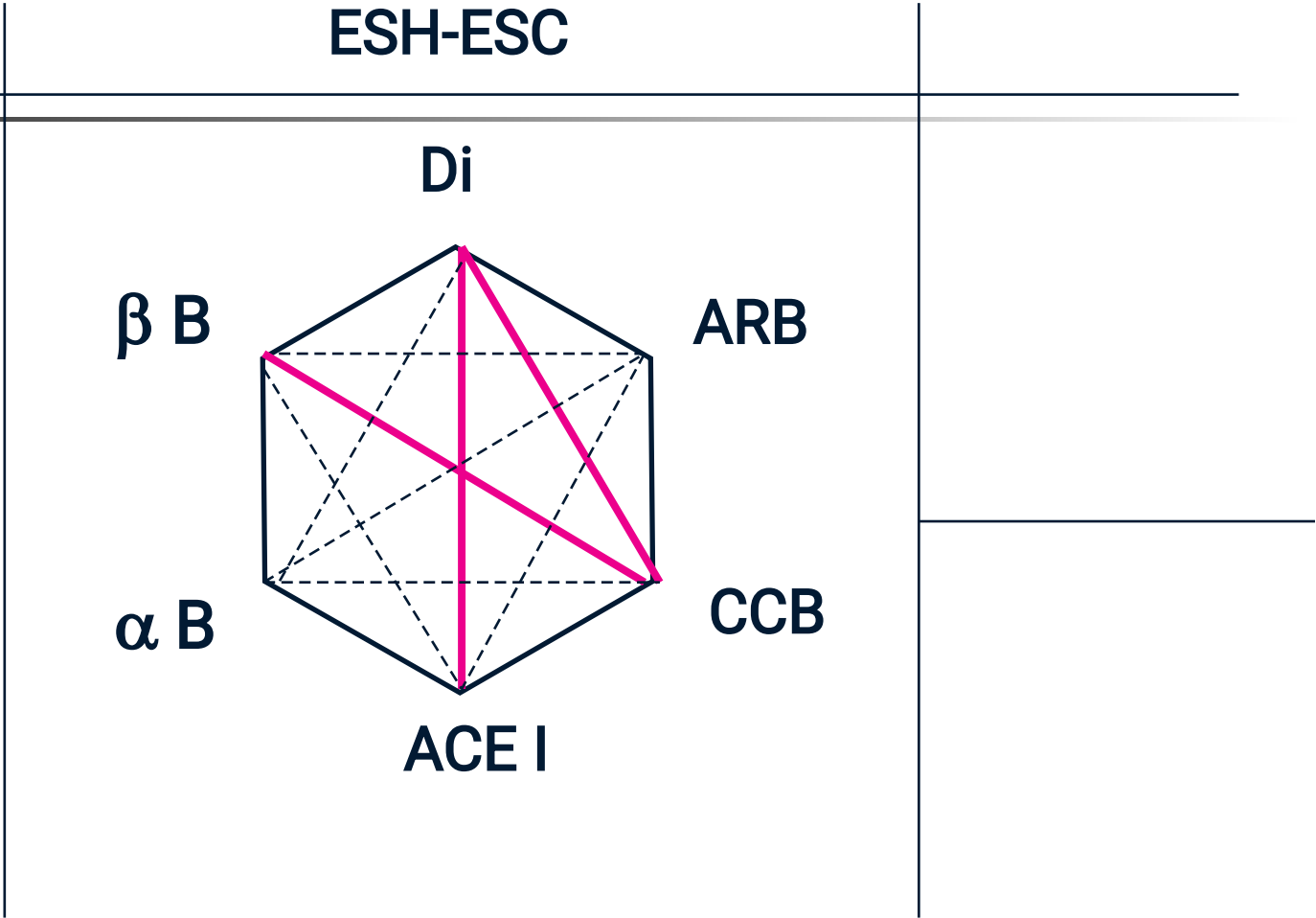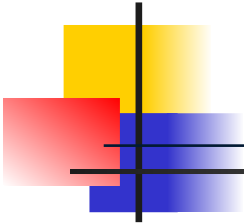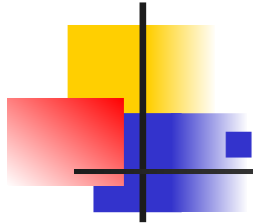
Compelling drug indications

- In case of Sub clinical organ damage
  - LVH – ARB, ACE, CCB
  - Microalbuminuria/ renal dysfunction – ARB, ACE
  - Heart failure – ACE, BB, ARB, diuretics, aldosterone inhibitors
  - Metabolic syndrome – ARB, ACE, CCB
  - ISH (elderly) – diuretics, CCB
  - Pregnancy – BB, CCB, alpha methyldopa

Recommended combinations

ESH-ESC

Di

β B

ARB

α B

CCB

ACE I

Control is often poor

- **Poor compliance**
  - Denial
  - Inadequate patient education
  - Inadequate life style change
  - Cost
  - Side effects
  - Competing alternative therapies
  - Fatigue
  - Poly pharmacy
- **Poor drug combinations**
- **Sub optimal dosing**

Lifestyle Changes are not easy to implement and sustain
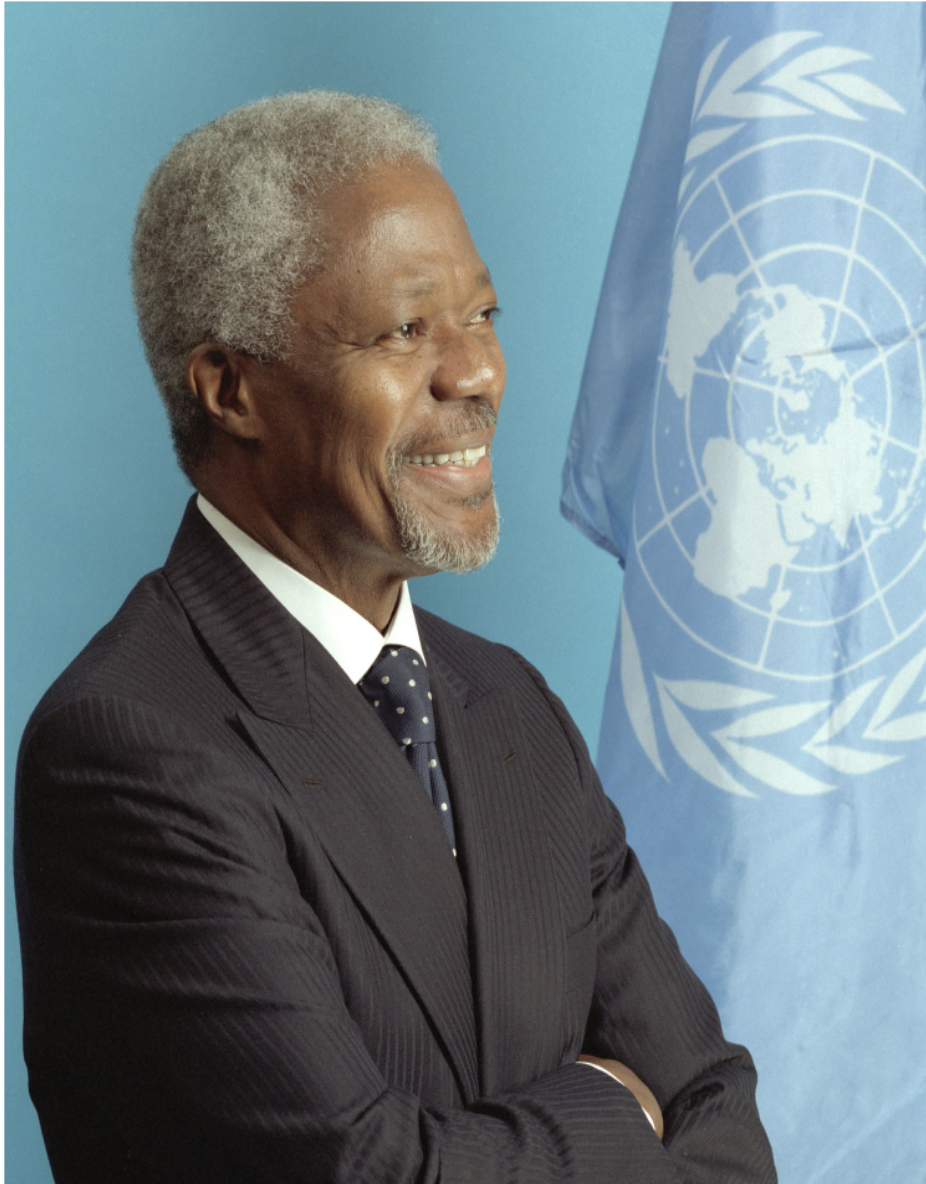
CANINE CONSTITUTIONAL

HK resident smoking through SARS mask

Physical (In)Activity

Towards a Culture of Prevention

"Today no one disputes that prevention is better and cheaper than reacting to crises after the fact. And yet our political and organizational cultures and practices remain oriented far more towards reaction than prevention."

Kofi Annan, September 9, 1999