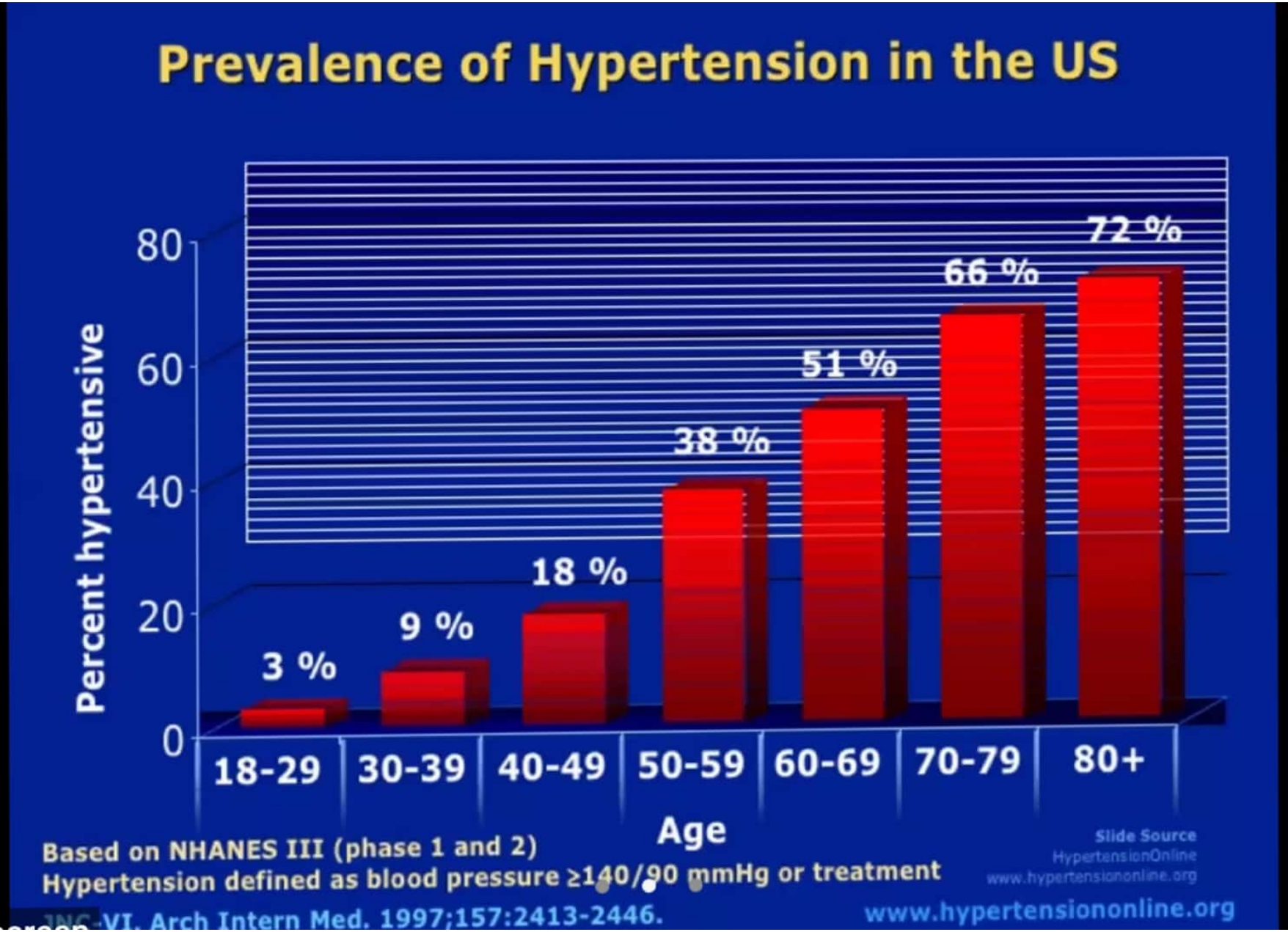
Classification of Hypertension

BP CLASSIFICATION	SBP	DBP
Normal	<120 and	<80
Prehypertension	120-139 or	80-89
Stage 1 HTN	140-159 or	90-99
Stage 2 HTN	≥160	≥100

Table 2. Changes in blood pressure classification

JNC 6 Category		JNC 7 Category
	SBP/DBP	
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) The Sixth Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. Arch Intern Med 1997;157:2413–46.
2) The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. JAMA 2003;289:2560–71.


Prevalence of Hypertension in the US
Percent hypertensive
80
60
40
20
0
3 %
9 %
18 %
38 %
51 %
66 %
72 %
18-29
30-39
40-49
50-59
60-69
70-79
80+
Age
Based on NHANES III (phase 1 and 2)
Hypertension defined as blood pressure ≥140/90 mmHg or treatment
JNC-VI. Arch Intern Med. 1997;157:2413-2446.
Slide Source
HypertensionOnline
www.hypertensiononline.org
www.hypertensiononline.org

Risk of Untreated Hypertension

- Cerebrovascular Accidents
- Coronary events
- Heart failure
- Progression of renal disease
- Progression to severe hypertension
- All cause mortality

Secondary Hypertension

- Renal parenchymal disease
  - UA, spot urine protein/creatinine, serum creatinine, USG.
- Renovascular
  - Captopril scan
- Coarctation
  - Lower Extremity BP
- Primary aldosteronism
  - Serum and urinary K
  - Plasma renin and aldosterone ratio
- Pheochromocytoma
  - Spot urine for metanephrine/creatinine

Basic and Optional Laboratory Tests for Primary Hypertension

Basic testing	Fasting blood glucose*
	Complete blood count
	Lipid profile
	Serum creatinine with eGFR*
	Serum sodium, potassium, calcium*
	Thyroid-stimulating hormone
	Urinalysis
	Electrocardiogram
Optional testing	Echocardiogram
	Uric acid
	Urinary albumin to creatinine ratio

*May be included in a comprehensive metabolic panel.
eGFR indicates estimated glomerular filtration rate.

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Investigations

- ECG **CXR**
- Urine analysis
- Blood glucose, hematocrit
- Basic metabolic panel UECs, Uric acid,
- Lipid profile after 9-12 hour fast
- Urine microalbumin

Risk Stratification

- Hypertension
- Smoking
- Obesity (BMI $\geq$ 30kg/m^2)
- Dyslipidemia
- Diabetes
- Microalbuminuria or GFR <60ml/min
- Age > 55 (men), 65 (women)
- Family history of CVD
  (Men< 55, Women <65)

•Metabolic Syndrome

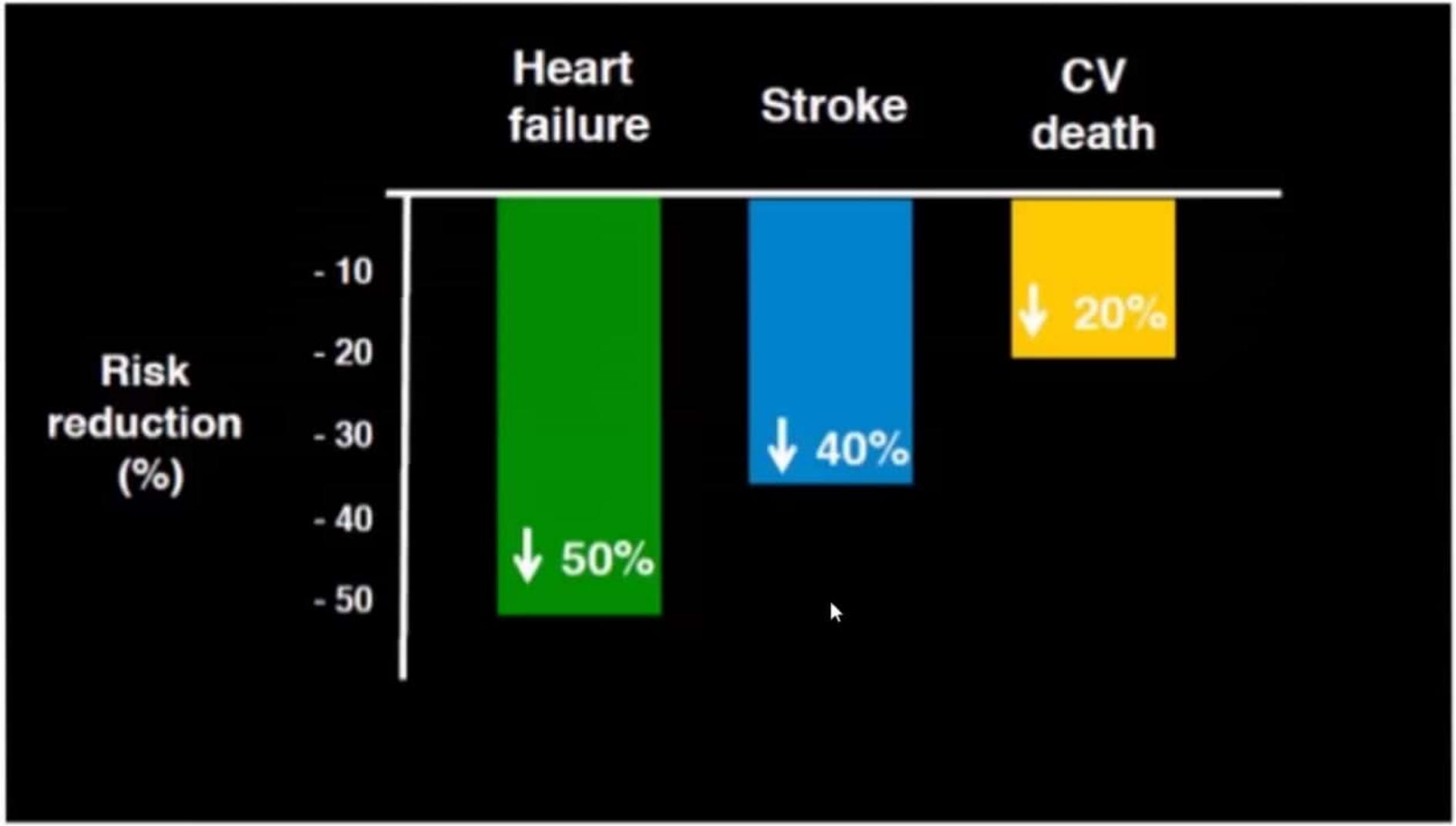
Target Organ Damage

- Heart Disease
  - ***CAD (Angina, myocardial infarction, coronary revascularization***
  - ***Left Ventricular Hypertrophy***
  - **Heart Failure**
- Stroke/TIA
- Chronic kidney disease
- Peripheral arterial disease
- Retinopathy

Goals of Therapy

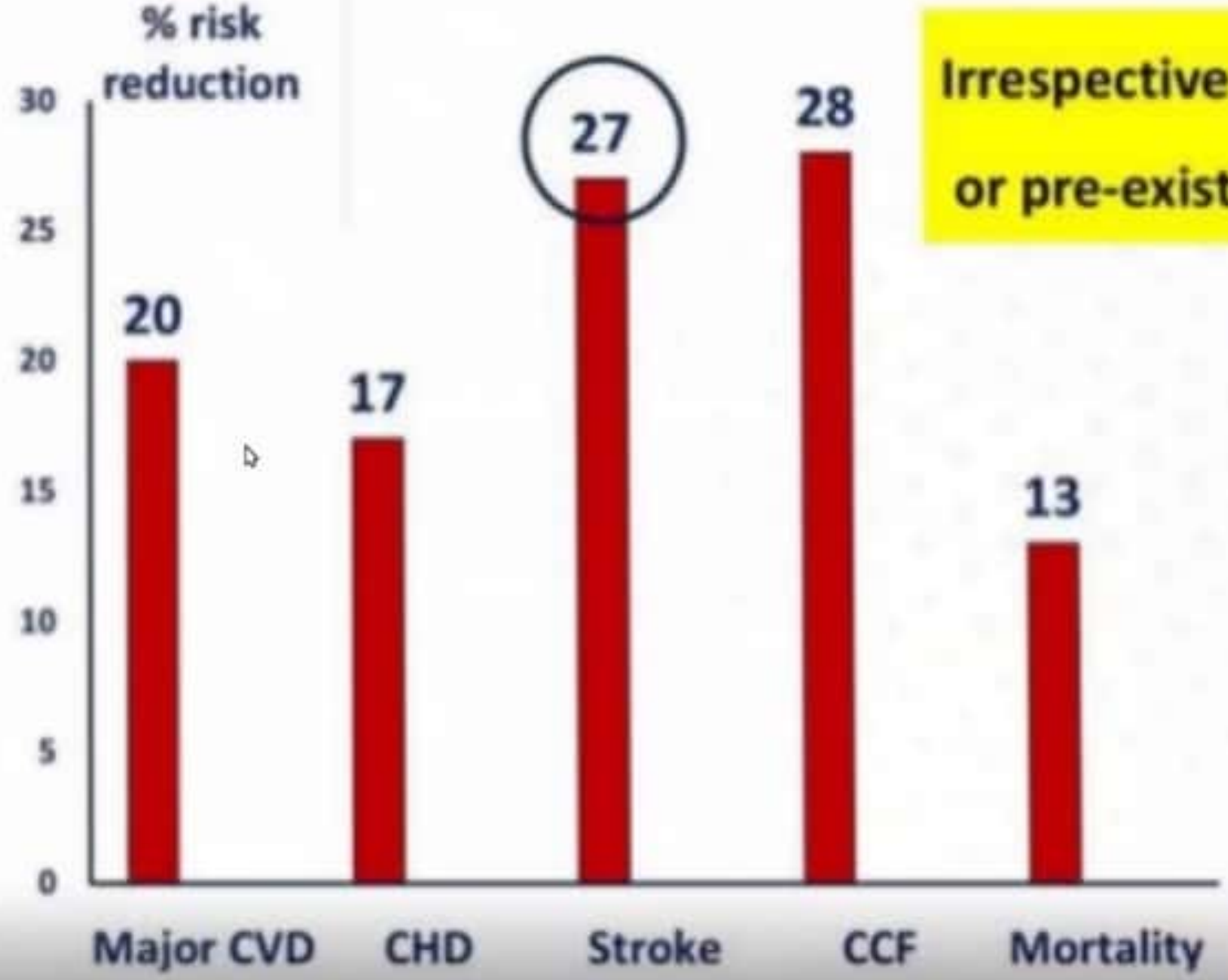
- BP <140/90 mmHg
- BP <130/80 mmHg in patients with diabetes or chronic kidney disease.
- Achieve SBP goal especially in persons ≥50 years of age.

Cardiovascular Benefits of Treatment of Hypertension



Hebert et al, Archives Int Med 1993

Risk Reduction (%) for 10 mm Hg fall in SBP – 613,815 patients



Irrespective of baseline BP or pre-existing conditions

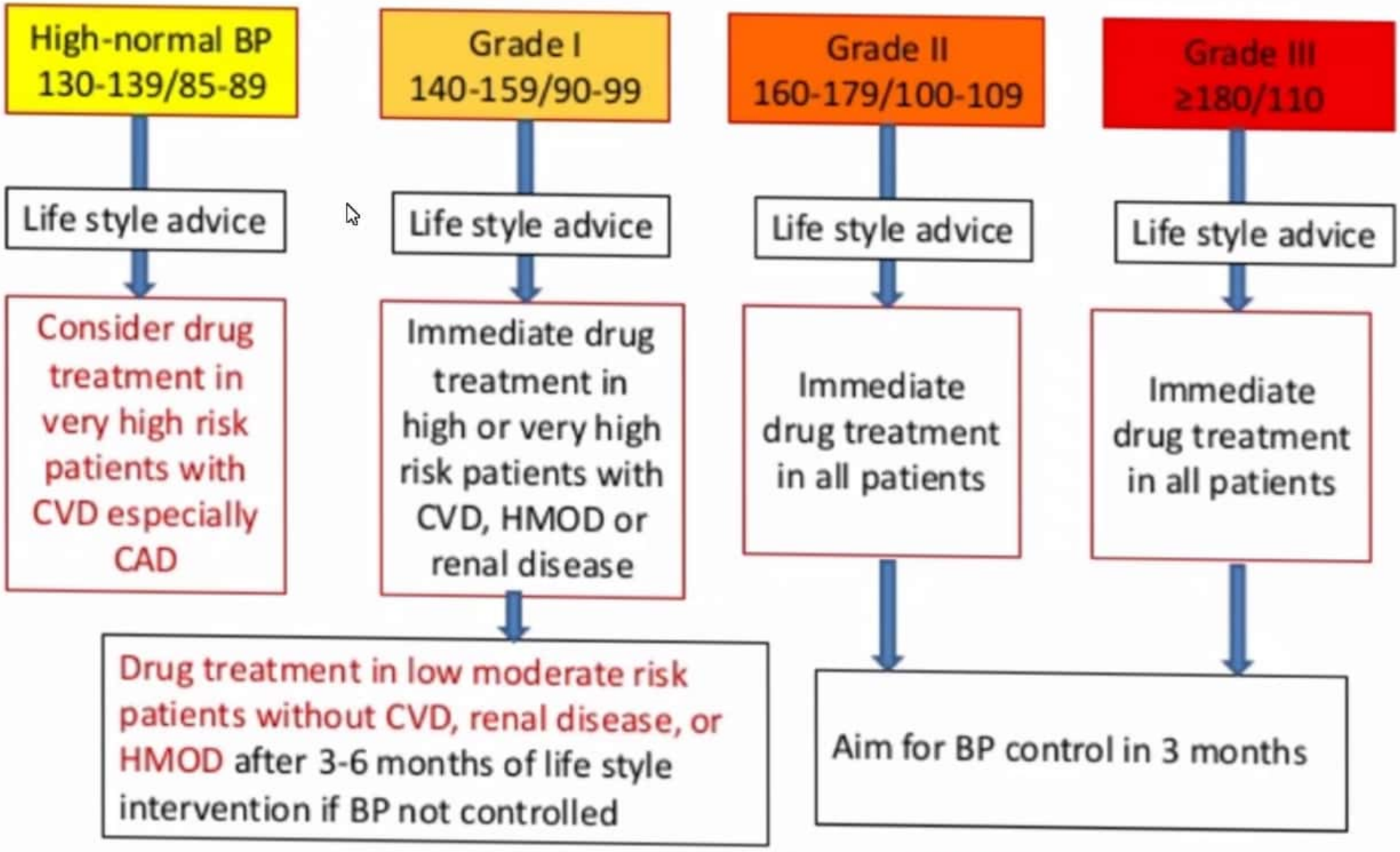
Ettehad D et al, Lancet. 2016;387:957-967

CVD Risk Factors Common in Patients With Hypertension

Modifiable Risk Factors*	Relatively Fixed Risk Factors†
• Current cigarette smoking, secondhand smoking • Diabetes mellitus • Dyslipidemia/hypercholesterolemia • Overweight/obesity • Physical inactivity/low fitness • Unhealthy diet	• CKD • Family history • Increased age • Low socioeconomic/educational status • Male sex • Obstructive sleep apnea • Psychosocial stress

*Factors that can be changed and, if changed, may reduce CVD risk.
†Factors that are difficult to change (CKD, low socioeconomic/educational status, obstructive sleep apnea, cannot be changed (family history, increased age, male sex), or, if changed through the use of current intervention techniques, may not reduce CVD risk (psychosocial stress).
CKD indicates chronic kidney disease; and CVD, cardiovascular disease.

Initiation of BP Lowering Treatment (Life style changes and medications) at different initial office BP levels



HMOD – Hypertension Mediated Organ Damage

Nonpharmacological Interventions

COR	LOE	Recommendations for Nonpharmacological Interventions
I	A	Weight loss is recommended to reduce BP in adults with elevated BP or hypertension who are overweight or obese.
I	A	A heart-healthy diet, such as the DASH (Dietary Approaches to Stop Hypertension) diet, that facilitates achieving a desirable weight is recommended for adults with elevated BP or hypertension.
I	A	Sodium reduction is recommended for adults with elevated BP or hypertension.
I	A	Potassium supplementation, preferably in dietary modification, is recommended for adults with elevated BP or hypertension, unless contraindicated by the presence of CKD or use of drugs that reduce potassium excretion.

Nonpharmacological Interventions (cont.)

COR	LOE	Recommendations for Nonpharmacological Interventions
I	A	Increased physical activity with a structured exercise program is recommended for adults with elevated BP or hypertension.
I	A	Adult men and women with elevated BP or hypertension who currently consume alcohol should be advised to drink no more than 2 and 1 standard drinks* per day, respectively.

*In the United States, 1 "standard" drink contains roughly 14 g of pure alcohol, which is typically found in 12 oz of regular beer (usually about 5% alcohol), 5 oz of wine (usually about 12% alcohol), and 1.5 oz of distilled spirits (usually about 40% alcohol).

Drug Therapy

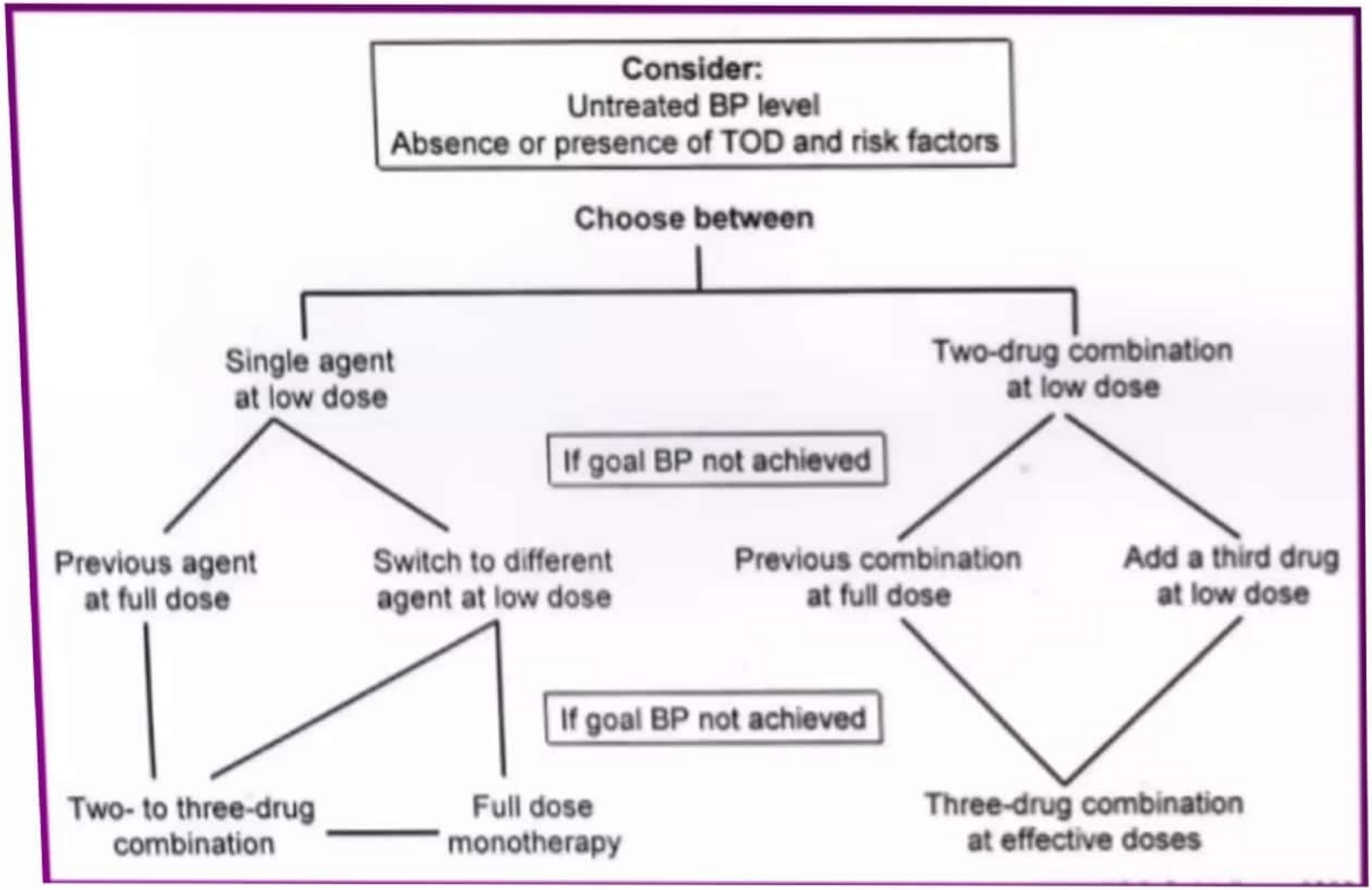
In previous guidelines 5 major drug classes (ACEIs, ARBs, BBs, CCBs, Ds) were recommended based on

- Proven ability to reduce BP
- CV event reduction in placebo-controlled studies
- Broad equivalence in overall CV morbidity/mortality
- Conclusion that benefit predominantly derives from BP lowering

Approach of Antihypertensive treatment

- Increasing dose of initial monotherapy.
- Monotherapy substitution.
- "Stepped - care" approach (monotherapy with subsequent addition of other drugs).
- Initial two drug combination treatment.
- Use of single pill combinations.

Monotherapy vs. Combination



TOD -Terminal Organ Damage

Rationale for initial two drug-combination therapy in most patients

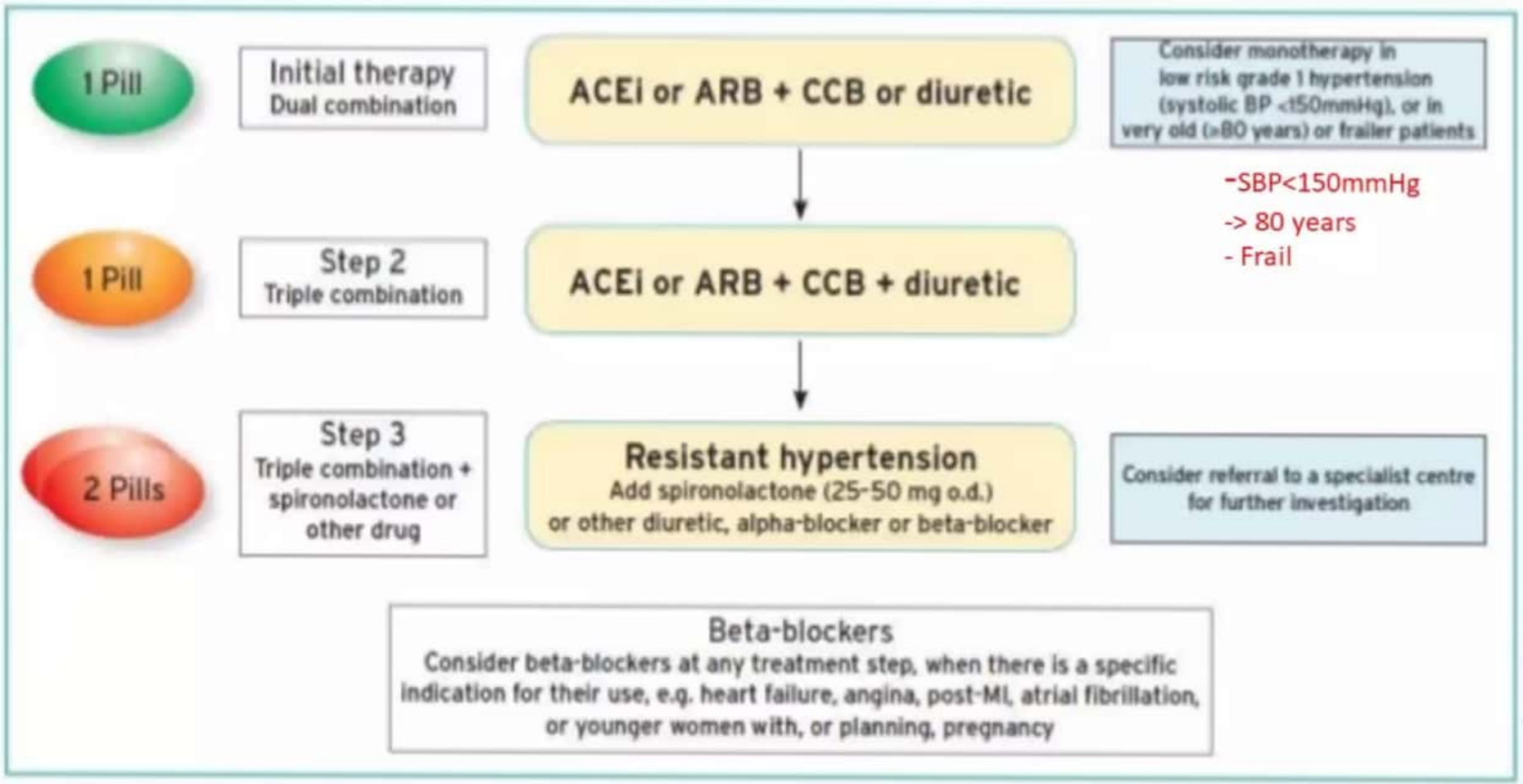
- Greater BP reduction even vs maximum dose monotherapy.
- Reduced heterogeneity of the BP response to initial therapy.
- Steeper dose-response relationship with treatment up-titration.
- No/small increase in risk of hypotensive episodes (even in grade I hypertension).
- More frequent BP control after 1 year
  - Better adherence to treatment
  - Reduced therapeutic inertia
- Reduce CV events (grade I hypertension, HOPE-3)

Guideline Basis for Compelling Indications for Individual Drug Classes

High Risk Conditions With Compelling Indication	Recommended Drugs					
	Diuretic	β-blocker	ACE inhibitor	ARB	CCB	Aldosterone Antagonist
Heart failure	•	•	•	•		•
Post-myocardial infarction		•	•			•
High coronary disease risk	•	•	•		•	
	•	•	•	•	•	
Diabetes			•	•	•	
Chronic Kidney Disease	•		•			
Recurrent stroke prevention						

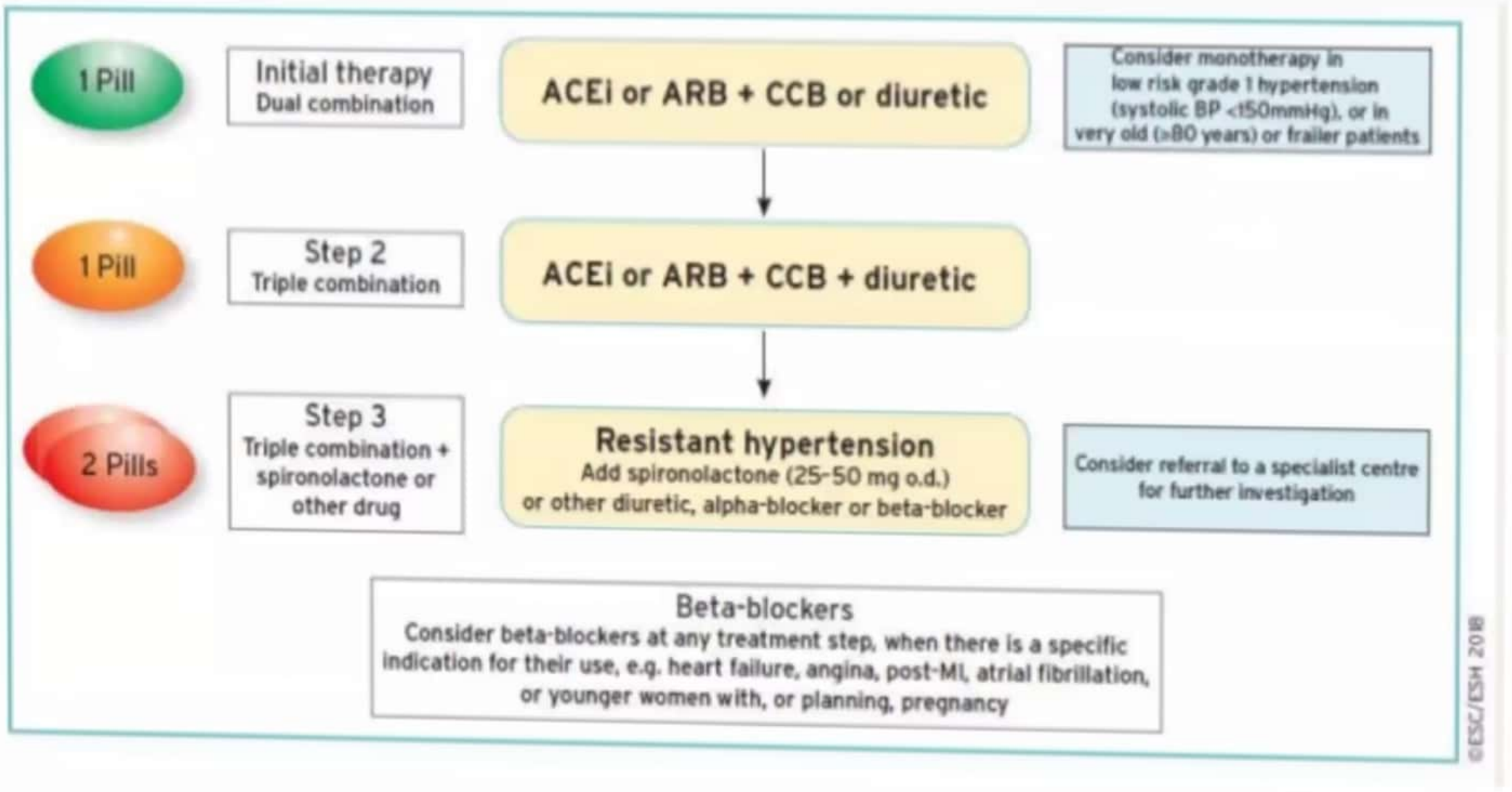
JNC - VII Report, *JAMA* , 2003;289:2560-2572

Core drug treatment strategy for uncomplicated hypertension

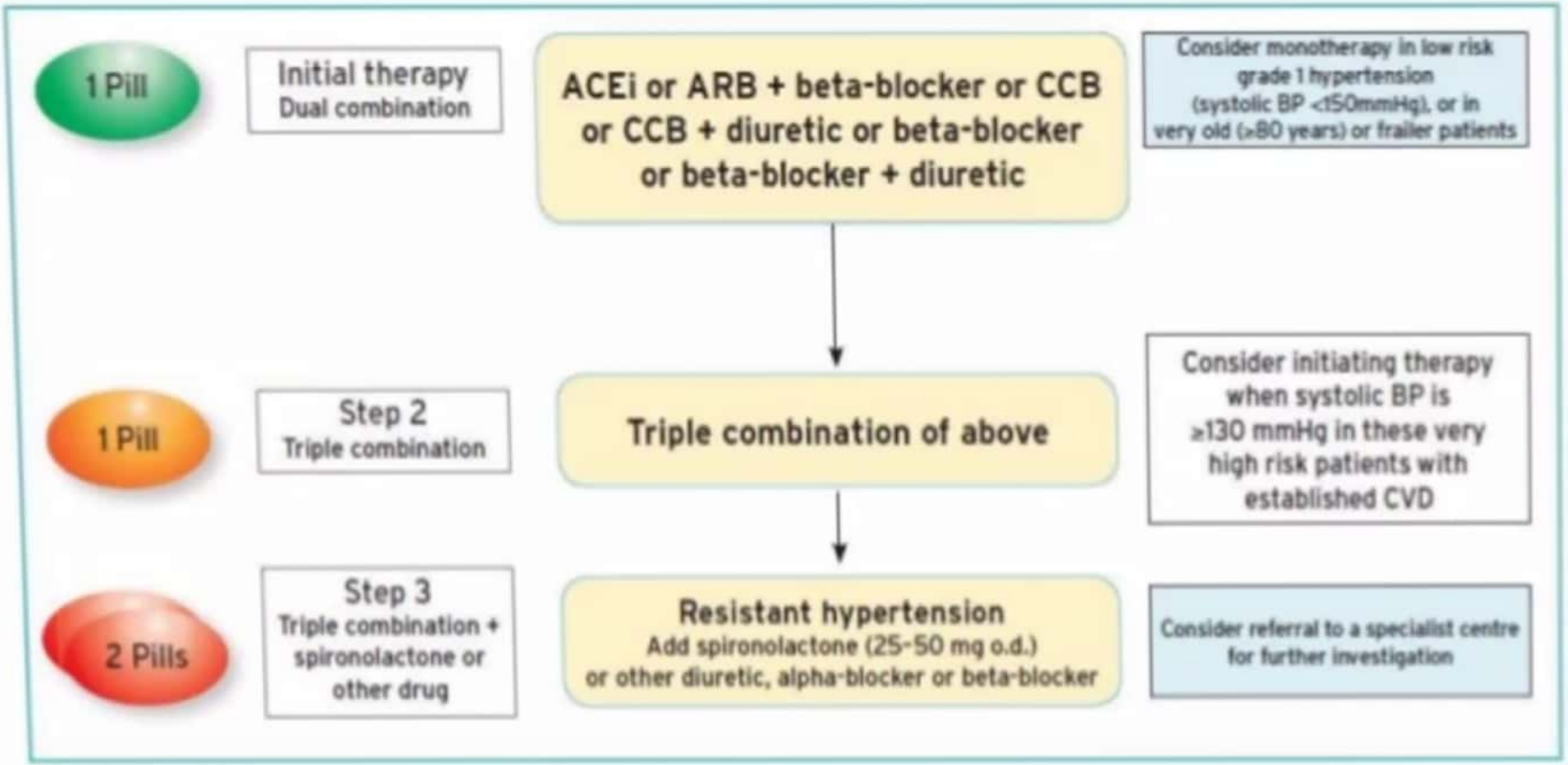


The core algorithm is also appropriate for most patients with HMOD, CVA, DM, or PAD

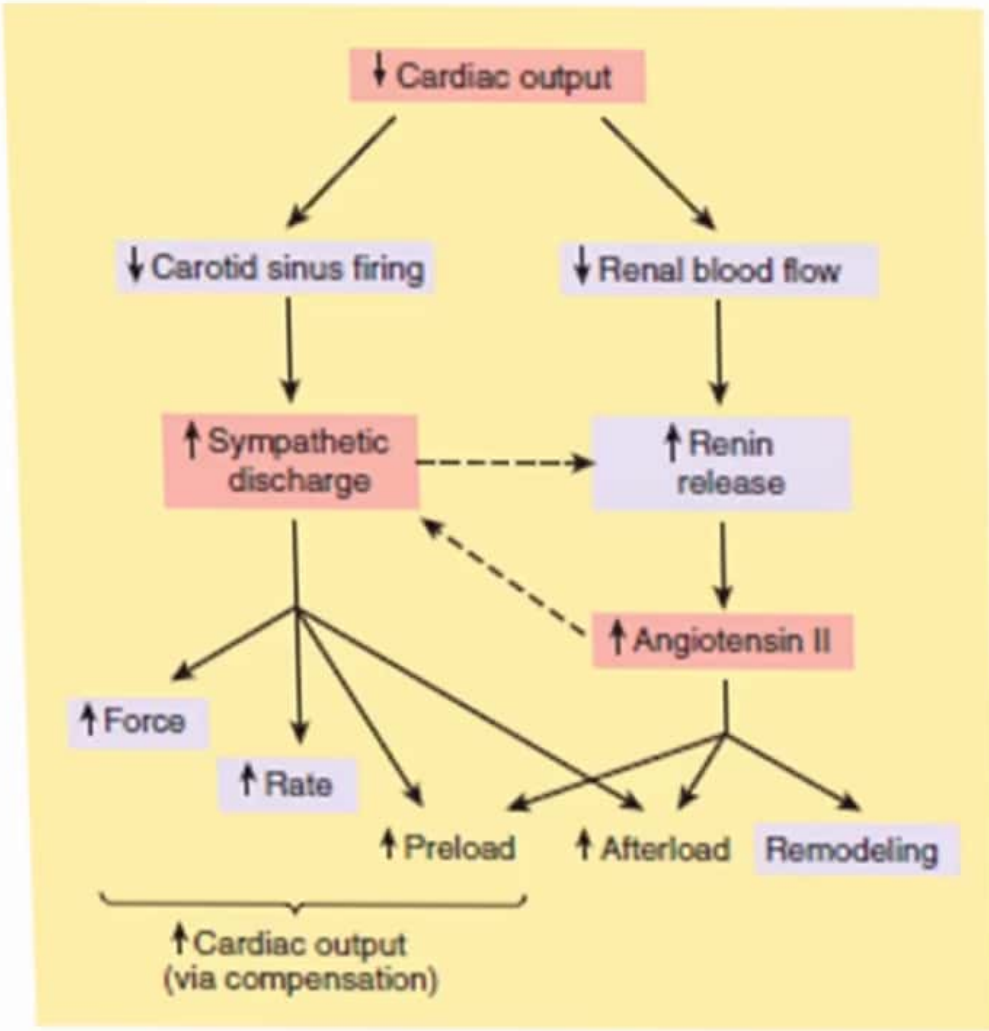
Drug treatment strategy for hypertension + DM



Drug treatment strategy for hypertension CAD



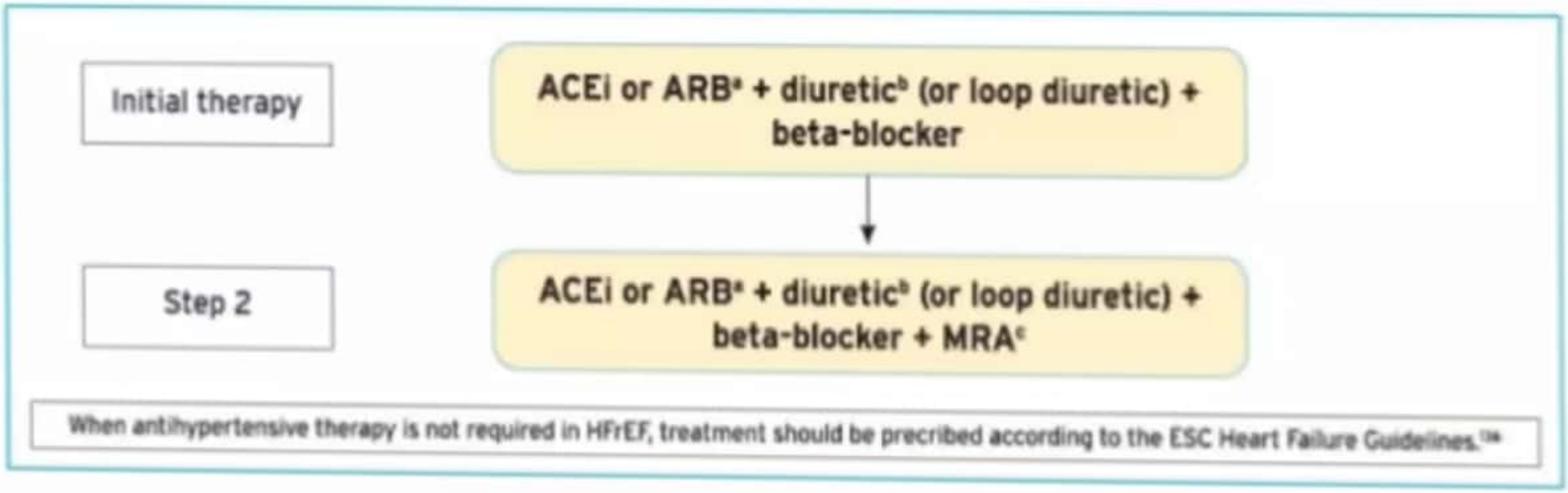
Pathophysiology of heart failure



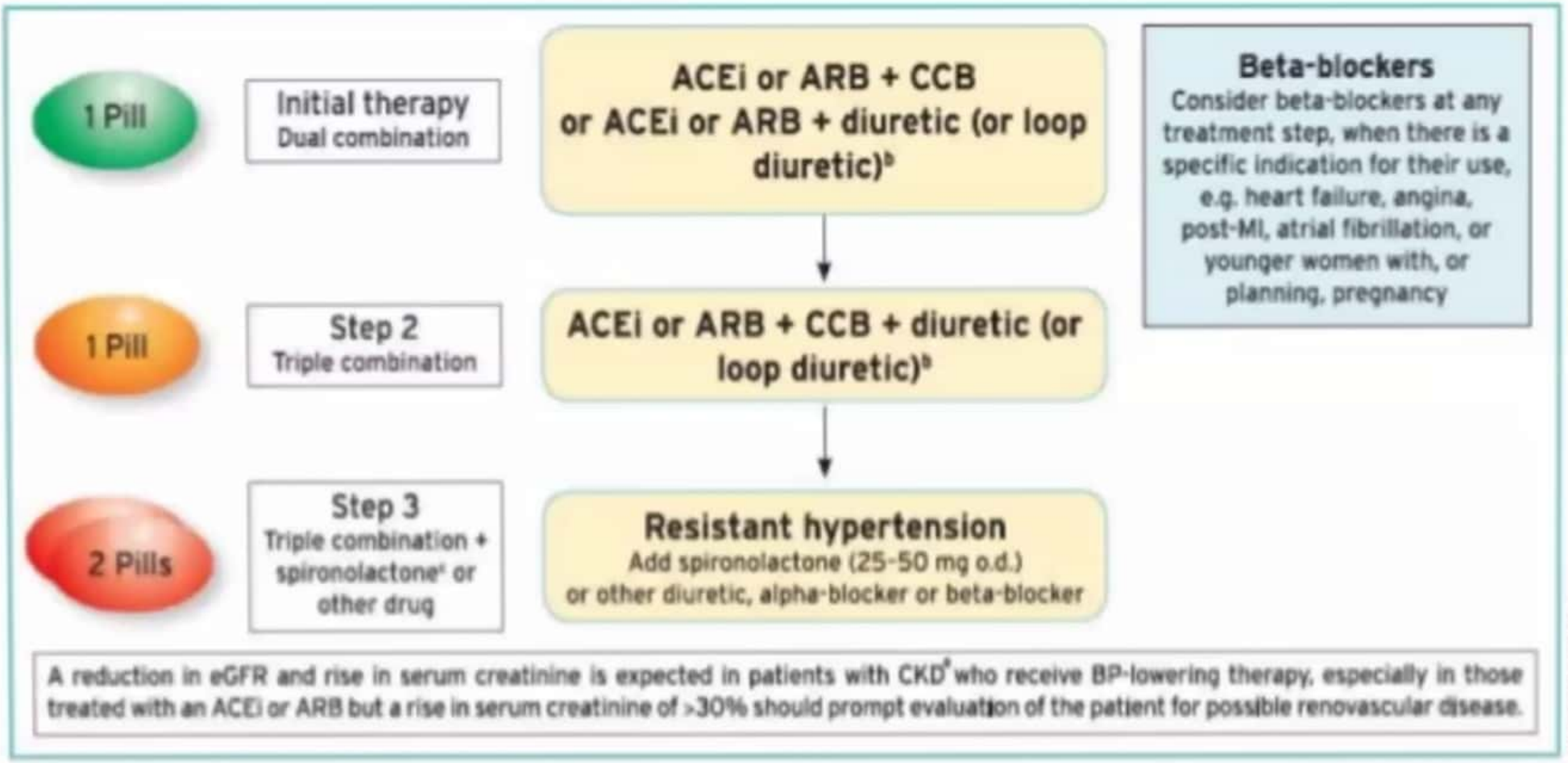
→ Vasoconstriction
↑Aldosterone
↑Catecholamines
↑IGF
Dipsogenic

FIGURE 13–2 Some compensatory responses that occur during congestive heart failure. In addition to the effects shown, sympathetic discharge facilitates renin release, and angiotensin II increases norepinephrine release by sympathetic nerve endings (*dashed arrows*).

Hypertension and Heart Failure With Reduced EF



Drug treatment strategy for hypertension and CKD



Drug treatment strategy for hypertension and AF