



High-risk screening of cardiovascular disease

- Overview of Hypertension

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- High-risk Screening of CVD
- **Definition of Hypertension**
- Blood Pressure Measurement
- Evaluation of Hypertension
- Treatment of Hypertension
- Summary

Epidemiology

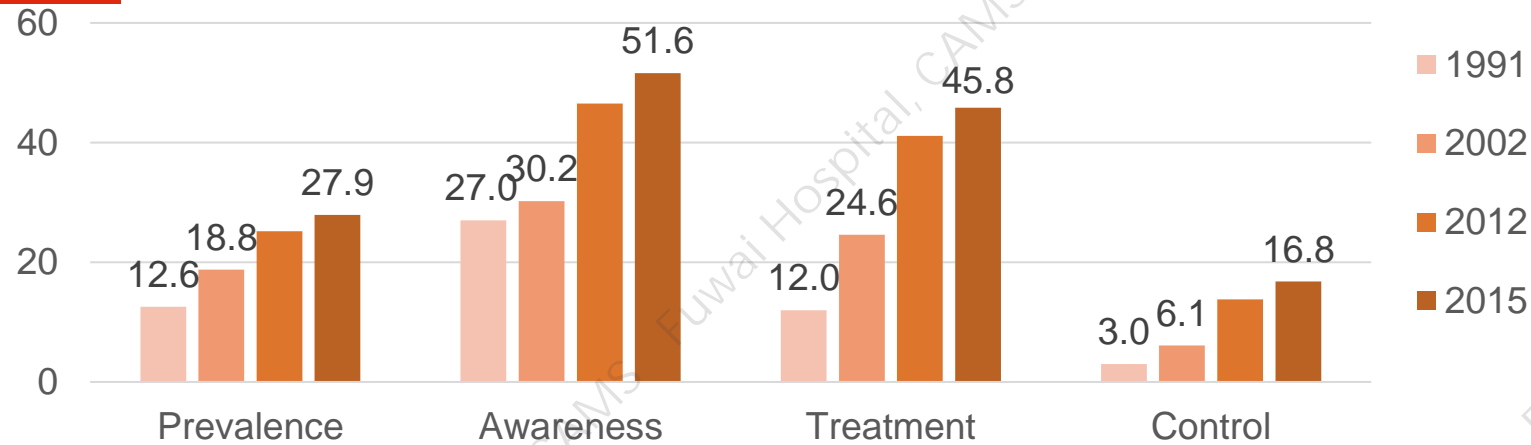
Epidemiology of hypertension in China

- The prevalence of hypertension is still increasing;
- Two major characteristics of the prevalence of hypertension in China: High prevalence in the northern part while low in the southern region; varies among different ethnics;
- The awareness, treatment and control rates are still low: 51.5%、 46.1% and 16.9%, respectively;
- Major risk factors of hypertension in China: High sodium and low potassium diet; overweight and obesity.

Hypertension management in China: 1991-2015



2015 Prevalence, awareness, treatment & control of hypertension in China¹

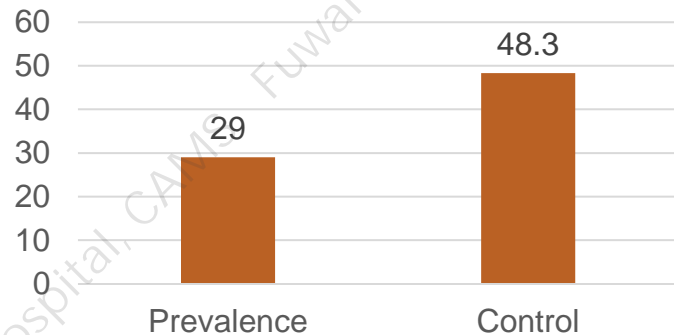


Southeast Asia

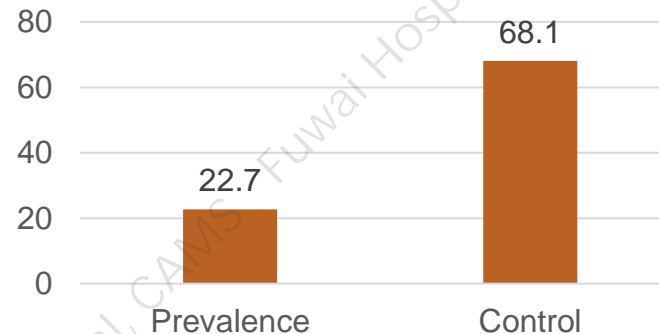
- Awareness level of HTN is less than 50%.
- Of those aware, about half are on treatment.
- Control rates to BP levels below 140/90 mmHg remains dismally low



2015-2016 Hypertension prevalence & control rate in USA²



2012-2013 Hypertension prevalence & control rate in Canada³



1. *Circulation* 2018; 137: 2344-2356.
2. *NCHS Data Brief* No. 289, October 2017
3. *Can J Cardiol.* 2016 May;32(5):687-94.
4. *J Hypertens.* 2016 ;34:e4.

Relationship between prevalence of hypertension and risk factors

A

Characteristics

Age

Ethnicity (Han vs. Others)

Gender (Women vs. Men)

Body mass index

<18.5 (Reference)

18.5–23.9

24.0–27.9

≥28.0

Education status

Elementary school (Reference)

Middle school

High school or above

Smoking status

Non-smokers (Reference)

Past smokers

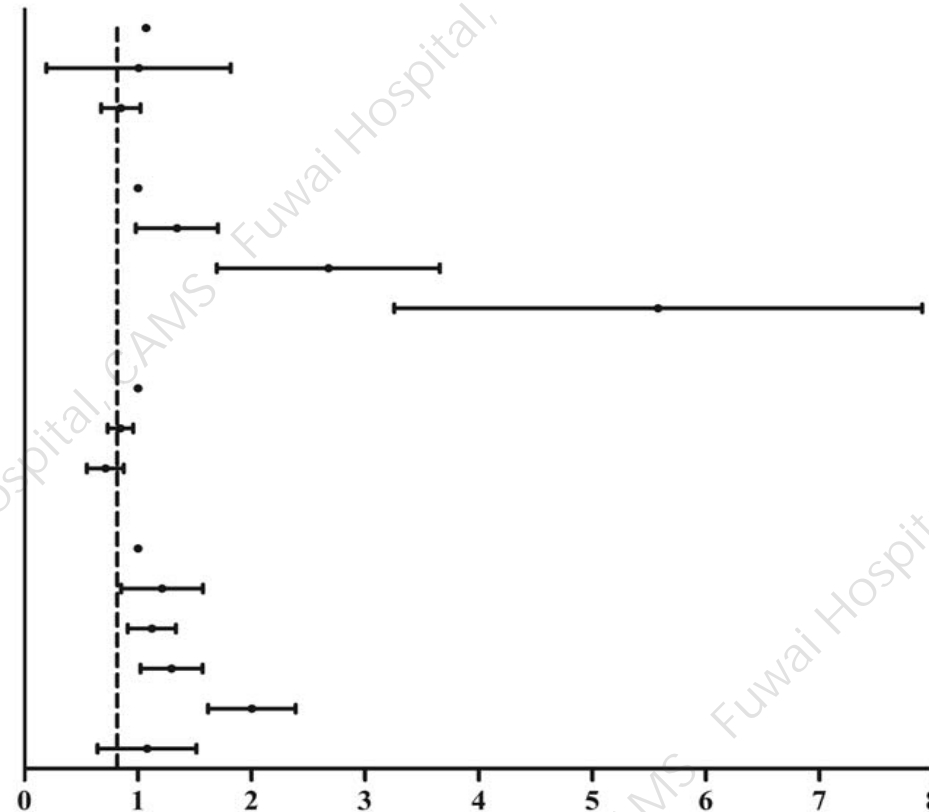
Current smokers

Consumption of alcohol

Family history of hypertension

Region (Rural vs. Urban)

Odds Ratio (OR)



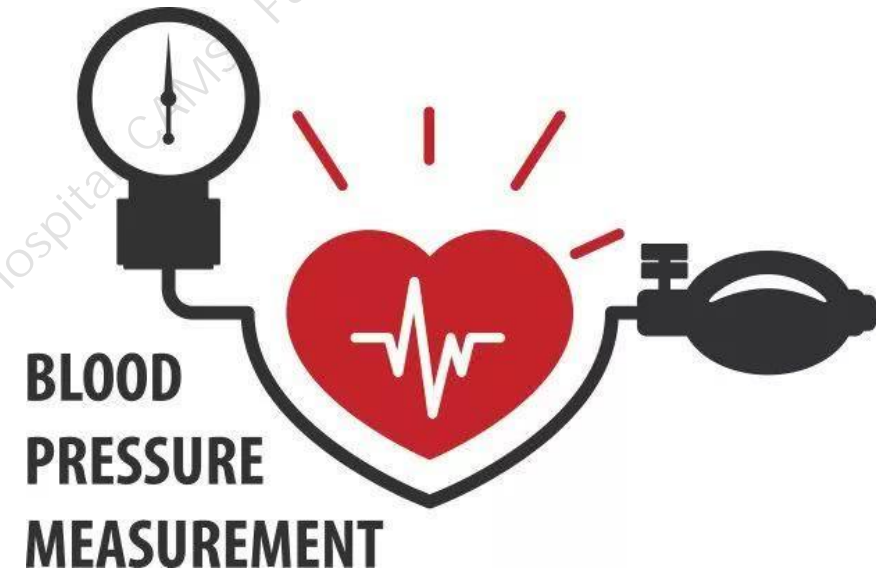
- Men,
- older age,
- high sodium and low potassium diet
- overweight/obesity,
- family history of HTN,
- lower educational level,
- smokers, and alcoholic drinkers

Significantly associated with an increased risk of HTN

Multivariable-Adjusted Odds Ratios for Hypertension.

Definition of hypertension

- A clinic systolic BP ≥ 140 mmHg and/or diastolic BP ≥ 90 mmHg without the use of anti-hypertensive medications.
- Hypertension is divided into grade 1, grade 2 and grade 3 based on the BP levels.

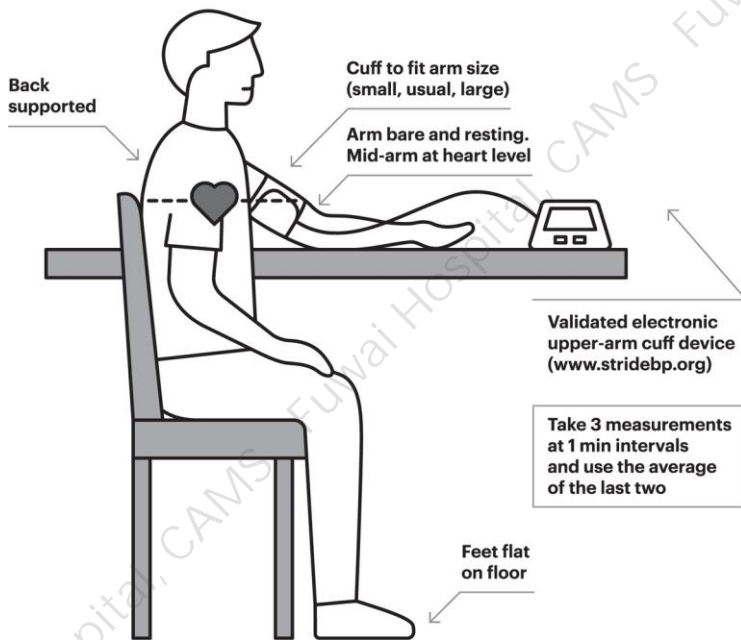
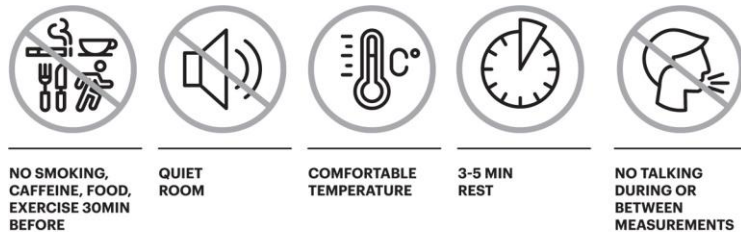


Office BP categories in Chinese Guidelines

BP Category	SBP	DBP
Normal	<120	<80
High Normal	120~139 and (or)	80~89
Hypertension	≥ 140 and (or)	≥ 90
Grade 1	140~159 and (or)	90~99
Grade 2	160~179 and (or)	100~109
Grade 3	≥180 and (or)	≥110
Isolated Systolic Hypertension	≥140 and	<90

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OBP Measurement Procedures



- Quiet room with comfortable temperature.
- No smoking, caffeine, food or exercise for 30 min before measurement.
- Remain seated and relaxed for 3--5 min.
- No talking by patient or staff during or between measurements.

Posture

- Sitting with back supported by chair.
- Legs uncrossed, feet flat on floor.
- Bare arm resting on table; mid-arm at heart level.

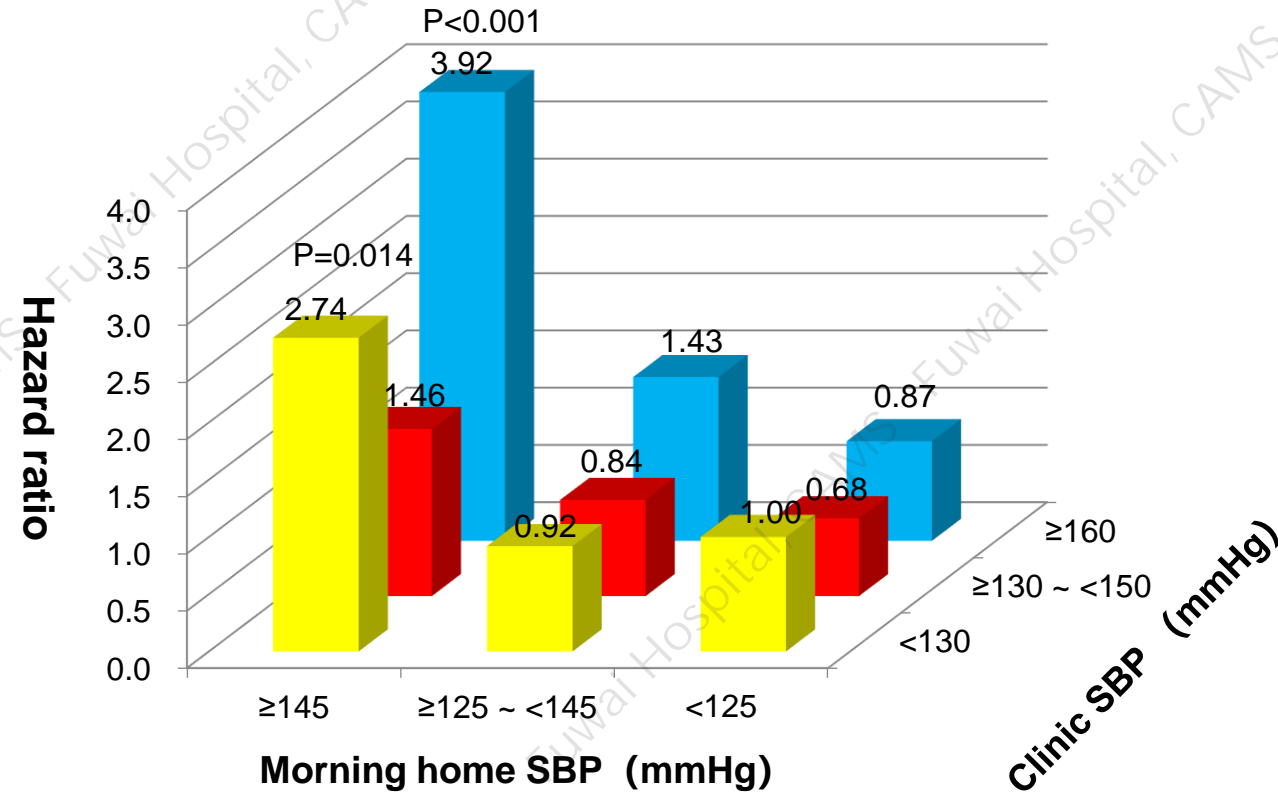
Measurements

- Take 3 OBP readings (2 if they are normal) with 1 min interval between readings.
- Use the average of the last 2 readings.

HONEST study: Out-of-office BP also plays important role in hypertension management

Relationship between the primary end point and systolic blood pressure (SBP)

Cardiovascular risk was increased in patients with morning HBP ≥ 145 mmHg and clinic blood pressure < 130 mmHg (HR, 2.47; 95% CI, 1.20–5.08) compared with morning HBP < 125 mmHg and clinic blood pressure < 130 mmHg.



This study aimed to investigate the relationship between on-treatment morning home blood pressure and incidence of cardiovascular events using data from the Home Blood Pressure Measurement With Olmesartan Naïve Patients to Establish Standard Target Blood Pressure (HONEST) study, a prospective observational study of 21591 outpatients with essential hypertension (mean age, 64.9 years; women, 50.6%) enrolled between 2009 and 2010 at clinics and hospitals in Japan.

Out-of-Office and Self-Monitoring of BP

COR	LOE	Recommendation for Out-of-Office and Self-Monitoring of BP
I	A ^{SR}	Out-of-office BP measurements are recommended to confirm the diagnosis of hypertension and for titration of BP-lowering medication, in conjunction with telehealth counseling or clinical interventions.

SR indicates systematic review.

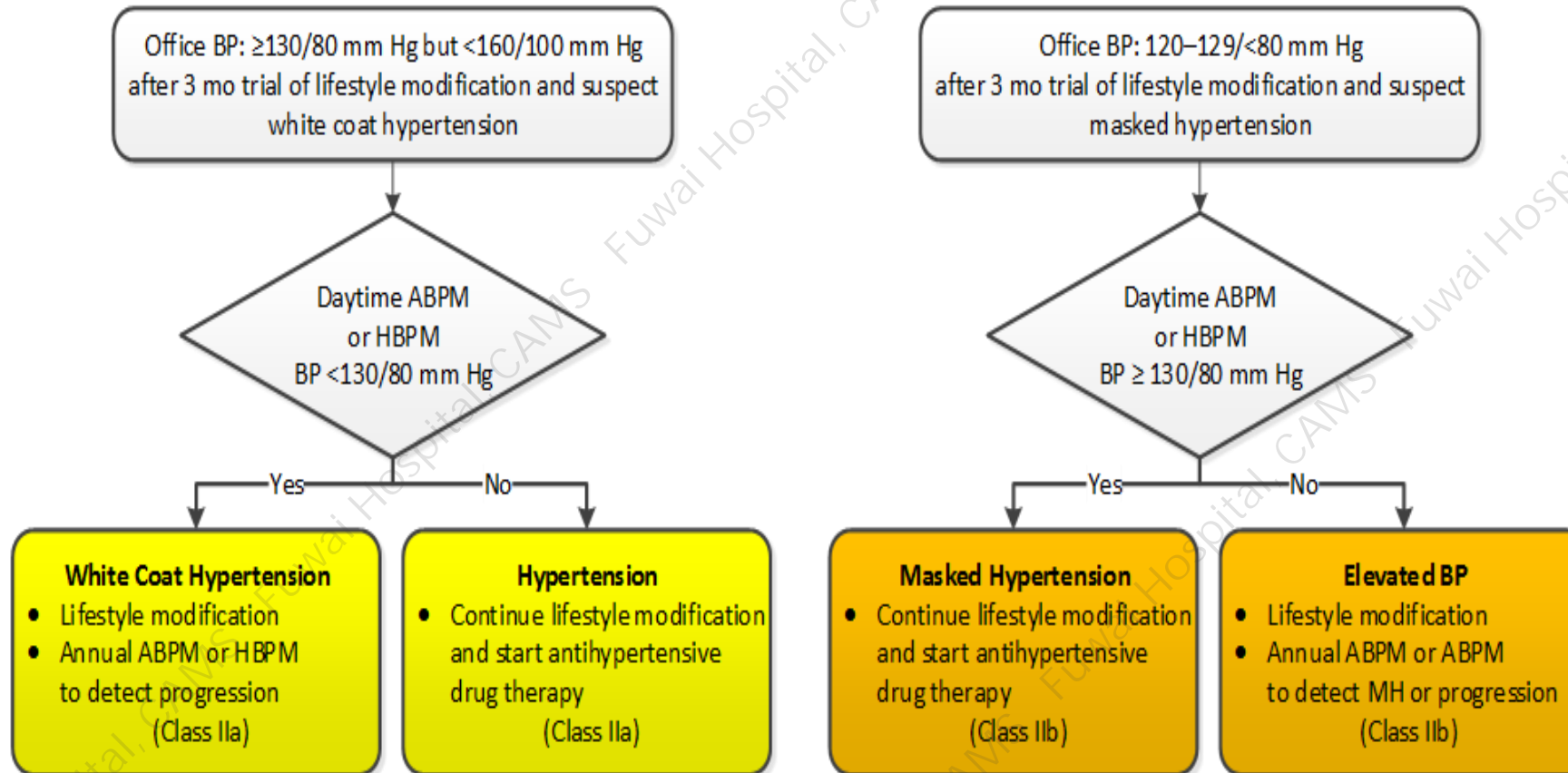
Definitions of hypertension by office and out-of-office blood pressure levels

BPM method	Diagnosis threshold
Office BP	$\geq 140/90\text{mmHg}$
ABPM	24h average: SBP/DBP $\geq 130/80\text{mmHg}$ Daytime average: SBP/DBP $\geq 135/85\text{mmHg}$ Nighttime average: SBP/DBP $\geq 120/70\text{mmHg}$
HBPM	$\geq 135/85\text{mmHg}$

Diagnosis of hypertension based on OBP

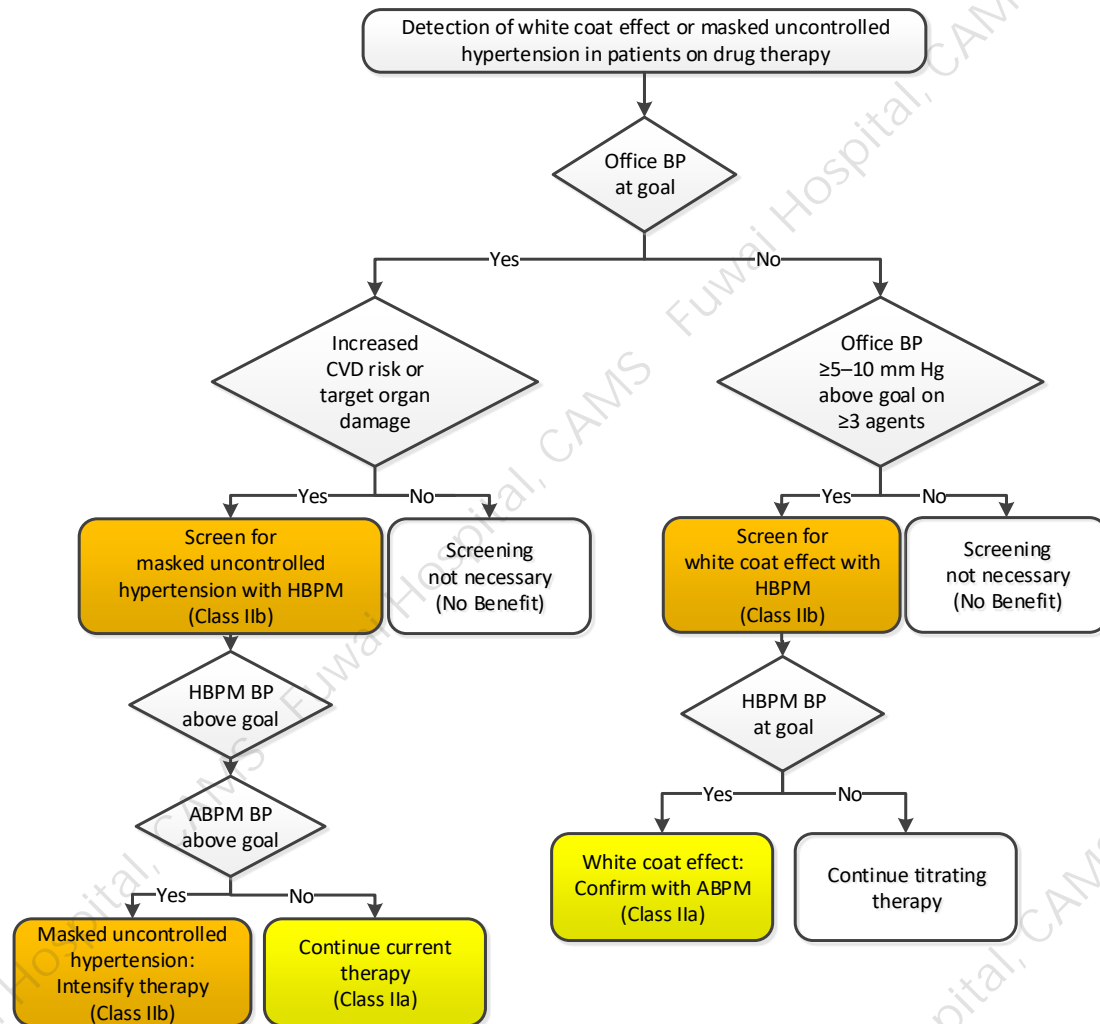
- At least 2-3 office visits at 1--4-week intervals
- A diagnosis should not be made on a single office visit, unless
 - OBP very high ($\geq 180/110$ mmHg)
 - evidence of target organ damage or CVD
- Confirmed by HBPM or ABPM.
 - If N/A, take more OBP measurements

Detection of White Coat Hypertension or Masked Hypertension in Patients Not on Drug Therapy



ABPM, ambulatory blood pressure monitoring;
BP, blood pressure;
HBPM, home blood pressure monitoring.

Detection of White Coat Effect or Masked Uncontrolled Hypertension in Patients on Drug Therapy



ABPM, ambulatory blood pressure monitoring;
BP, blood pressure; HBPM, home blood pressure monitoring.

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Classification and stratification of hypertension in different hypertension Guidelines

SBP		DBP	China 2018	AHA 2017	ESC/ESH 2018	JSH 2019
<120	and	<80	Normal	Normal	Optimal	Normal
120~129	and	<80	High normal	Elevated	Normal (DBP 80~84)	High normal
130~139	and (or)	80~89		Stage 1	High normal (DBP 85~89)	Elevated
140~159	and (or)	90~99	Grade I	Stage 2	Stage 1	Grade I
160~179	and (or)	100~109	Grade II		Stage 2	Grade II
≥180	and (or)	≥110	Grade III		Stage 3	Grade III
≥140	and	<90	ISH		ISH	ISH

1. *Hypertension*. 2018;71:1269-1324.
2. *Journal of Hypertension* 2018, 36:1953-2041
3. *Chin J Cardiovasc Med*, February 2019, Vol. 24, No. 1
4. *Hypertens Res*. 2019 Sep;42(9):1235-1481.

Risk stratification

SBP DBP	130~139 85~89	140~159 90~99	160~179 100~109	≥180 ≥110
NA	Low risk	Low risk	Moderate risk	High risk
1~2 other risk factors	Low risk	Moderate risk	Moderate to high risk	Very high risk
≥3 other risk factors , TOD , CKD grade 3 , DM without organ damage	Moderate to high risk	High risk	High risk	Very high risk
Established CVD, CKD grade ≥4 , or DM with organ damage	High to very high risk	Very high risk	Very high risk	Very high risk

Risk factors in the CVD stratification

CVD risk factors
· Hypertension (Grade 1~3)
· Age (men ≥ 55 years; women ≥ 65 years)
· Smoking or passive smoking
· Glucose intolerance (2 h post-prandial plasma glucose 7.8~11.0 mmol/L) and/or fasting plasma glucose 6.1~6.9 mmol/L
· Dyslipidemia: TC≥ 5.2 mmol/L (200 mg/dL) or LDL-C > 3.3 mmol/L (130 mg/dL) or HDL-C < 1.0 mmol/L (40 mg/dL)
· Family history of premature CVD (age< 50 years)
· Abdominal obesity (male: WC ≥ 90 cm, female: WC ≥ 85 cm) or obesity (BMI ≥ 28 kg/m ²)
· Hyperhomocystinemia (Hcy≥ 15 mol/L)

Target organ damages

Target organ damages
· LVH: ECG: Sokolow-Lyon voltage>3.8 mV or Cornell voltage duration product>244 mV·ms UCG: LVMI: Male≥115 g/m ² , Female≥95 g/m ²
· Carotid IMT≥0.9 mm or carotid plaque
· Carotid-femoral PWV ≥12 m/s (*if feasible)
· Ankle-brachial index<0.9 (*if feasible)
· eGFR 30~59 ml/ (min▪1.73 m ²) (BSA) or mildly elevated plasmin creatinine: male: 115~133 mol/L (1.3~1.5 mg/dl) , female: 107~124 mol/L (1.2~1.4 mg/dl)
· Microalbuminuria : 30~300 mg/24 h or albumin–creatinine ratio: ≥30 mg/g (3.5 mg/mmol)

Comorbidities

Comorbidities

- Cerebrovascular disease: ischaemic stroke; cerebral haemorrhage; transient ischaemic attack
- Cardiac disease: myocardial infarction; angina; myocardial revascularization with PCI or CABG, heart failure, **atrial fibrillation**
- Renal disease: Diabetic nephropathy; $\text{eGFR} < 30 \text{ ml/min/1.73 m}^2$, elevated plasma creatinine: male $\geq 133 \text{ mol/L}$ (1.5 mg/dL), female $\geq 124 \text{ mol/L}$ (1.4 mg/dL) , proteinuria ($\geq 300 \text{ mg/24 h}$)
- Peripheral artery disease
- Advanced retinopathy: haemorrhages or exudates, papilloedema
- Diabetes: **newly diagnosed** : fasting plasma glucose $\geq 7.0 \text{ mmol/L}$ (126 mg/dL) post prandial glucose $\geq 11.1 \text{ mmol/L}$ (200 mg/dL)
uncontrolled diabetes: $\text{HbA1c} \geq 6.5\%$

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Principles of Treatment

- The main purpose of the treatment of hypertension is to reduce the total risk of the cardiovascular and renal morbidity and mortality.
- The main benefits of antihypertensive treatment are due to BP lowering *per se*
- Antihypertensive agents should be administered on the basis of life style modification and according to the risk stratification of the individual patient while treatment on amendable risk factors, organ damages and comorbidities should be given.
- Intensive blood pressure lowering treatment should be applied in those who are tolerated.

Life style modification

- Life style modification should be applied to all patients of hypertension as well as in those whose BP is in high normal ranges
- Major treatment:
 - Reduction on sodium intake, sodium salt < 6g; increase on potassium intake (I , B)
 - Balanced diet is recommended (I , A)
 - Weight control, BMI < 24kg/m²; WC: male < 90cm; female < 85cm (I , B)
 - Smoking cessation and avoid passive smoking (I , C)
 - Limitation on alcohol intake (I , B)
 - Physical exercise is recommended (I , A)
 - Management on mental stress and psychological abnormalities (II a , C)

Choice of anti-hypertensive drugs

- **All five classes** of anti-hypertensive drugs commonly used are suitable for the initiation of antihypertensive therapy.
- The choice of antihypertensive drugs should be **based on the individual conditions** of the patient, the patients' comorbidities, drug efficacy and tolerance, as well as the personal will and the long-term financial reach.
- It is preferred to use **long-acting agents** to control 24-h BP, which can prevent cardio- and cerebro-vascular complications more effectively.

钙通道阻滞剂 (CCB)

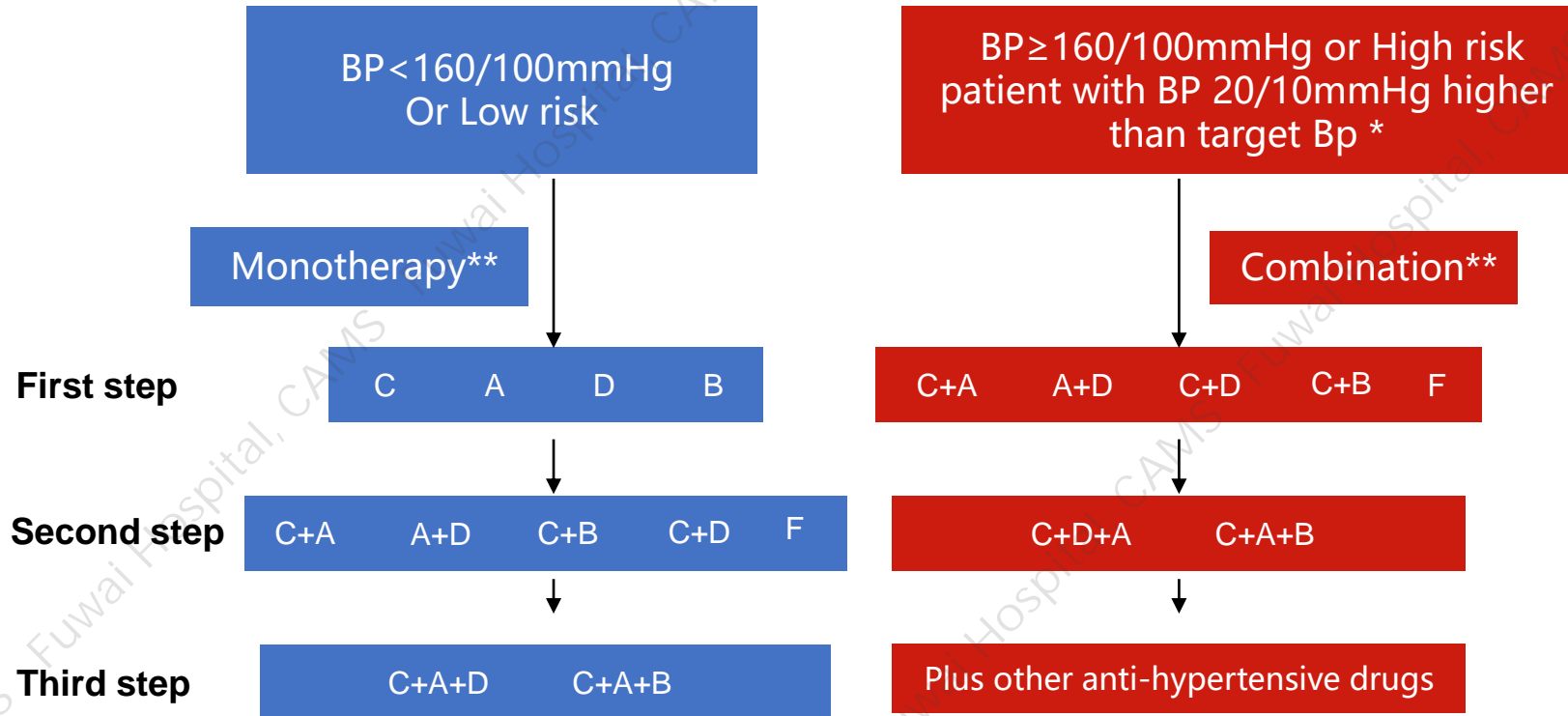
血管紧张素转换酶
抑制剂 (ACEI)

血管紧张素受体
阻滞剂 (ARB)

利尿剂

β 受体阻滞剂

Recommendations for Treatment



F: Low dose FDC

*Patients whose BP ≥ 140/90 mmHg low dose combination can be considered

**include increasing to full dose

Goal of hypertension treatment

- BP targets mainly depends on the patients' tolerance and the complexity of the treatment.
- It is no need to change the regimen to get the BP returned to a higher level if a patient can reduce BP to lower level without carrying out a complex treatment and can tolerate the current BP.
- BP targets in general population $< 140/90\text{mmHg}$ (I , A) ;
if tolerated, BP targets $< 130/80\text{mmHg}$ (I, A) .

BP treatment targets in special population

Population	BP targets
Elderly	65 ~ 79 yrs: initial target bp < 150/90mmHg; if tolerated < 140/90mmHg (Ⅱa, B) ; ≥80 yrs : target bp < 150/90mmHg (Ⅱa, B) ;
Pregnant	< 150 / 100 mmHg (Ⅱb, C) ;
Post-stroke	Chronic phase: Bp < 140 / 90 mmHg (Ⅱa, B) ; Acute stroke < 180/110mmHg;
CHD	Bp < 140/90mmHg (Ⅰ, A) , if tolerated < 130/80mmHg (Ⅱa, B) , DBP not < 60mmHg (Ⅱb, C) ;
Diabetes	Bp < 130/80mmHg (Ⅱa, B) ; elderly and /or CHD patients < 140 / < 90 mmHg;
CKD	Without proteinuria < 140/90mmHg (Ⅰ, A) , With proteinuria < 130/80mmHg (Ⅱa, B) ;
Heart failure	BP < 130/80mmHg (Ⅰ, C) ;

Hierarchical follow-up for hypertension management

Items	Management level I	Management level II
Management object	Patients with controlled hypertension	Patients with uncontrolled hypertension
Non-drug therapy	Long-term adherence	Strengthen lifestyle interventions for a long time
Follow-up frequency	Once every three months	Once every 2–4 weeks
Drug therapy	Maintenance drug therapy Keep BP up to standard	Adjust treatment regimen according to guidelines

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Summary

- Hypertension is defined as systolic pressure at least 140 mmHg or diastolic pressure at least 90 mmHg
- The diagnosis of hypertension requires integration of home or ambulatory blood pressure monitoring (ABPM) in addition to measurements made in the clinical setting
- Proper technique and interpretation of the blood pressure is essential in the diagnosis and management of hypertension
- An evaluation should be performed to determine the extent of target-organ damage, the presence of established cardiovascular or kidney disease, and other cardiovascular risk factors
- Lifestyle modification should be prescribed to all patients
- BP targets in general population < 140/90mmHg
- BP targets mainly depends on the patients' tolerance and the complexity of the treatment.

Thank you!