Diagnosis and Evaluation of hypertension in children

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SUMS

What is the rational for CPG 2017?

Increase in prevalence due to obesity
3.5% HTN, 10-11% elevated BP

Childhood hypertension increase the risk for adult HTN and CVD

High prevalence of MA among hypertensive children which is a significant indicator of CKD and CVD

Evidence for accelerated vascular aging in children with high BP

Obesity and HTN

- cross-sectional study was carried out on 2000 students aged 11-17 years in Shiraz during a period from 2010 to 2011
- Overall, 7% and 11.8% of the students were obese and hypertensive, respectively
- Blood pressure was associated with body mass index.

IJKD KIDNEY DISEASES

Prevalence of Childhood Obesity and Hypertension in South of Iran

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Introduction. Obesity is a growing problem worldwide and is likely a major cause of the increased prevalence of high blood pressure in children. The aim of this study was to investigate the frequency of pediatric obesity and its association with hypertension in a sample of children and adolescents in Fars province (south of Iran).

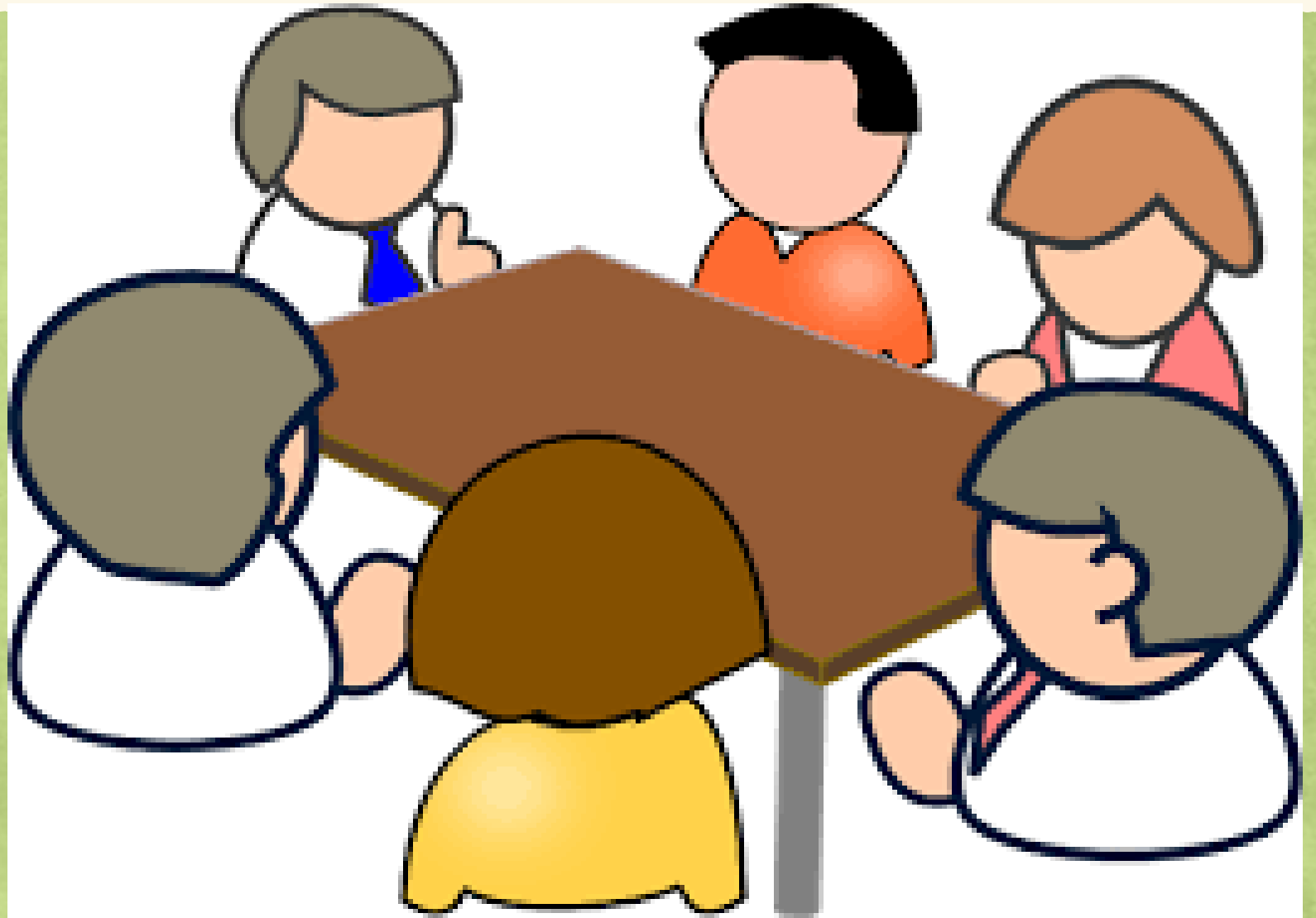
Materials and Methods. This cross-sectional study was carried out in Shiraz during a period from 2010 to 2011. A total of 2000 healthy students aged 11 to 17 years were included. Data on weight, height, systolic and diastolic blood pressure (measured 3 times with 5-minute intervals), and parental history of hypertension and educational level were obtained. The 95th percentile body mass index for age and sex was considered obesity.

Results. Overall, 7% and 11.8% of the students were obese and respectively. Blood pressure was associated with dex. Maternal education level was not associated sion in the child.

In this study, obesity was an important risk factor for Our data showed that prevalence of obesity has not in the recent 5 years in Iran, but that of hypertension ificantly. The high prevalence of hypertension in d obese children emphasizes the need for prevention childhood obesity and hypertension in early stages.

DIAGNOSIS

Repeat high BP at a visit and multiple measurements over time before diagnosing HTN



KAS 3

- Trained health care professionals in the office setting should make a diagnosis of HTN if a child or adolescent has auscultatory confirmed BP readings ≥95th percentile on 3 different visits

KAS 4

- Organizations with EHRs used in an office setting should consider including flags for abnormal BP values both when the values are being entered and when they are being viewed

Oscillometric Vs Auscultatory

Oscillometry

- MAP is determined ,SBP and DBP are calculated
- Calculation formula ae different for different machines
- Easy to use
- Overestimate

Auscultatory

- SBP and DBP are measured
- Inter observer variation
- Better predictor of TOD
- Normative data based on it

KAS 5

- *Oscillometric devices may be used for BP screening in children and adolescents. When doing so, providers should use a device that has been validated in the pediatric age group. If elevated BP is suspected on the basis of oscillometric readings, confirmatory measurements should be obtained by auscultation*

At home measurement

Home BP measurement

- Pediatric studies do not show that BP measured in setting other than the office or ABPM sufficiently reliable for diagnosis of HTN

KAS 10

- Home BP monitoring should not be used to diagnose HTN, MH, or WCH but may be a useful adjunct to office and ambulatory BP measurement after HTN has been diagnosed

Evaluation

- Evaluation
  - Determine the underlying cause
  - Assess comorbidities

Evaluation

Evaluation include

- Patient and FHX
- P/E
- Lab and imaging

HISTORY

PERINATAL HX	NUTRITIONAL HX	Physical activity HX
• Maternal HTN • LBW • GA • Pregnancy complication	• Na intake • Fatty food • Sugary beverages	• Inactivity • Direct lifestyle modification

HISTORY

Psychosocial HX

- Adverse experiences during prenatally
- Anxiety
- depression

Family HX

- Primary HTN
- Monogenic disease for HTN
- Update F HX

KAS 13

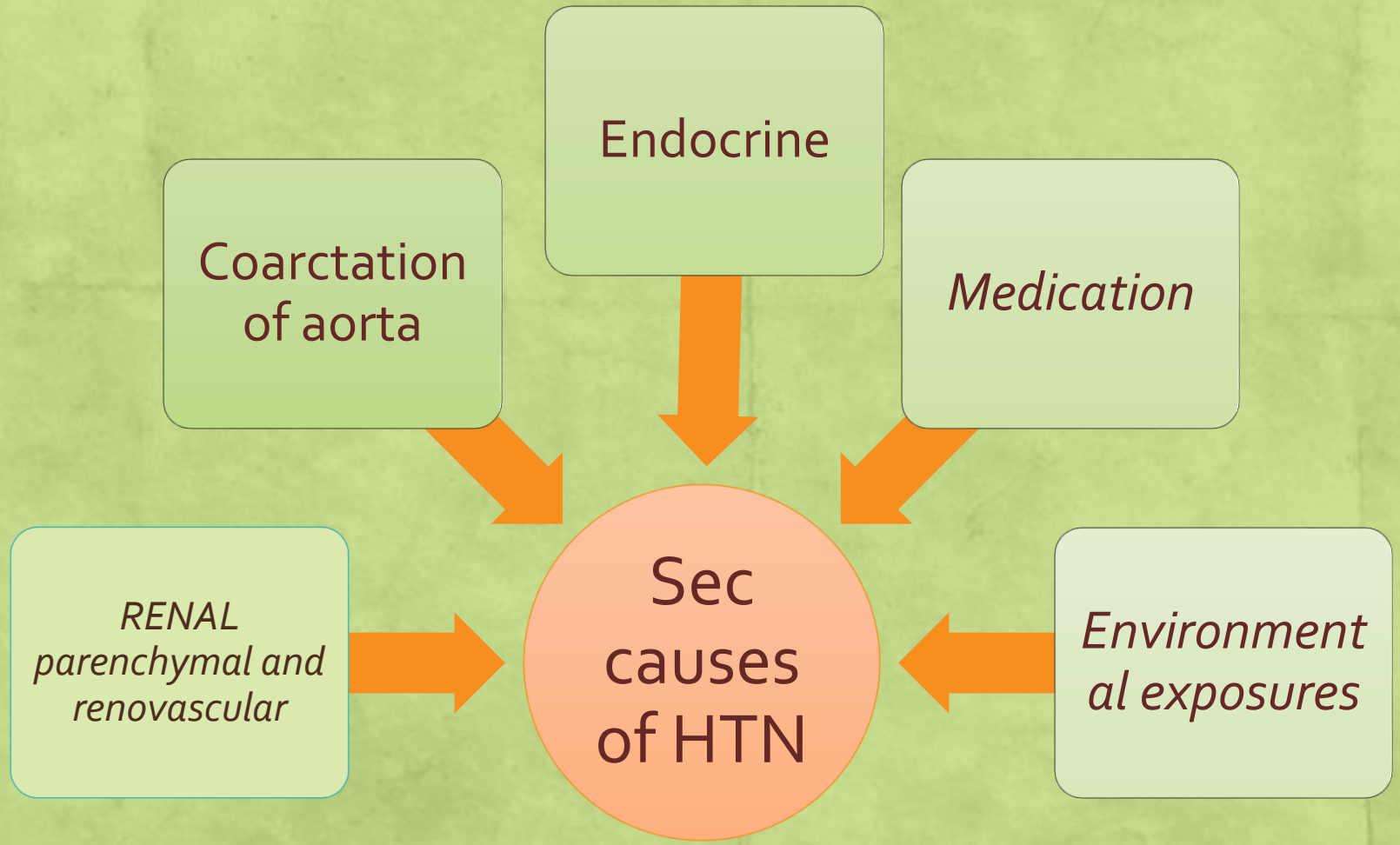
- In children and adolescents being evaluated for high BP, the provider should obtain a perinatal history, appropriate nutritional history, physical activity history, psychosocial history, and family history and perform a physical examination to identify findings suggestive of secondary causes of HTN

Physical exam

PHYSICAL EXAM

To identify sec cause of HTN or TOD effect of HTN

Secondary causes



Secondary causes

- Renal parenchymal disease or renal structural abnormalities account for 34-76%
- Renovascular disease account for 12-13%
- Renal cause especially among children < 6 years old
- Coarctation of Aorta with various syndromes such as Williams sx, Alagille sx, neurofibromatosis, and Takayasu arteritis
- Prevalence of HTN in children with repaired aortic coarctation is 17-77% , even without evidence of recoarctation

KAS 11

- *Children and adolescents ≥6 years of age do not require an extensive evaluation for secondary causes of HTN if they have a positive family history of HTN, are overweight or obese, and/or do not have history or physical examination findings suggestive of a secondary cause of HTN*

Primary Vs Secondary hypertension

Primary (predominant cause of HTN in US children)

- Age ≥ 6 years
- Positive family HX of HTN
- Obesity/ overweight
- Severity of BP similar between primary and secondary HTN but systolic HTN predictive of primary HTN
- Usually asymptomatic

Secondary HTN

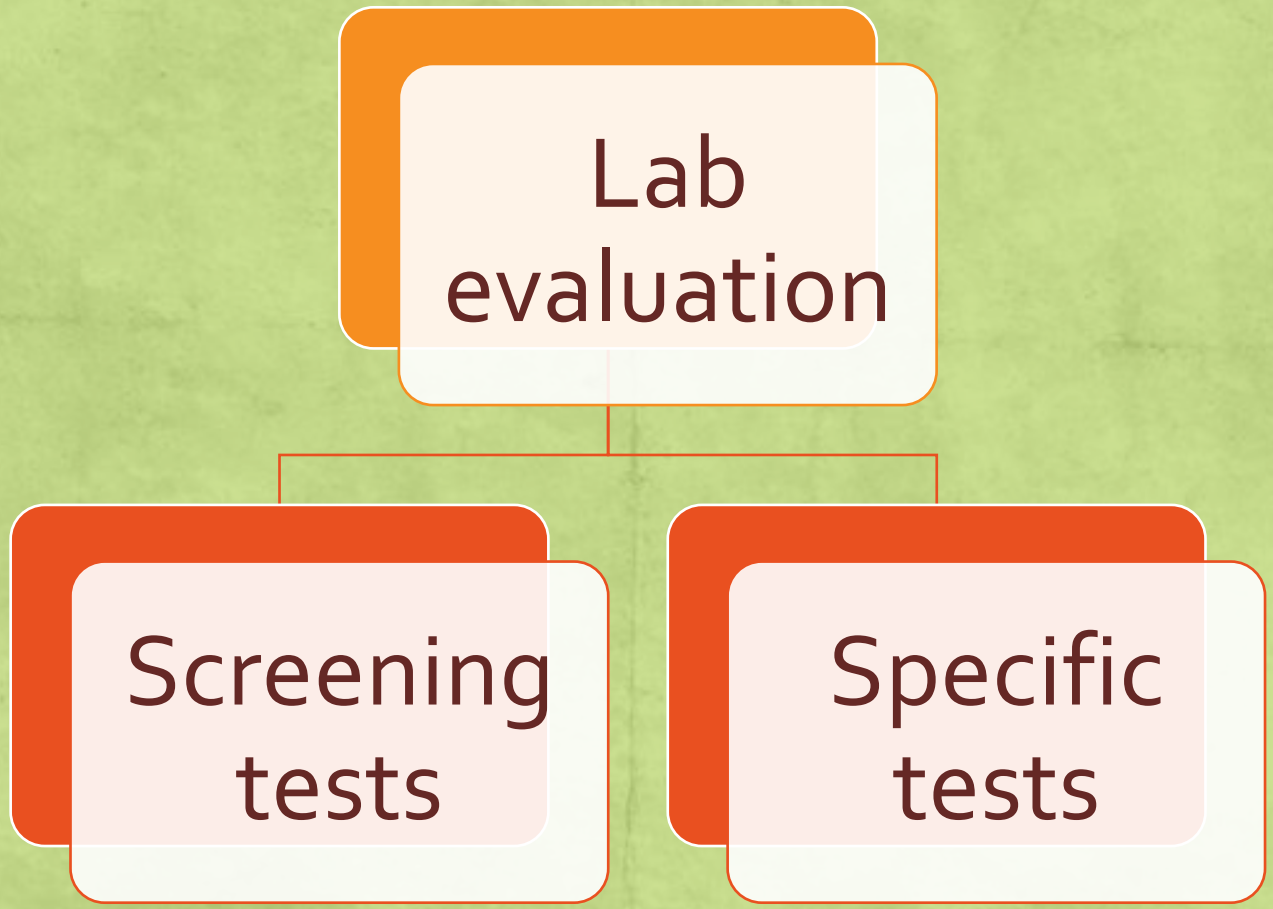
- Diastolic/nocturnal
- May be positive family HX
- Symptoms of underlying disorder
- Younger in age

TABLE 14 Examples of Physical Examination Findings and History Suggestive of Secondary HTN or Related to End Organ Damage Secondary to HTN

Body System	Finding, History	Possible Etiology
Vital signs	Tachycardia	Hyperthyroidism
		PCC
		Neuroblastoma
	Decreased lower extremity pulses; drop in BP from upper to lower extremities	Coarctation of the aorta
Eyes	Proptosis	Hyperthyroidism
	Retinal changes[a]	Severe HTN, more likely to be associated with secondary HTN
Ear, nose, throat	Adenotonsillar hypertrophy	SDB
	History of snoring	Sleep apnea
Height, weight	Growth retardation	Chronic renal failure
	Obesity (high BMI)	Cushing syndrome
	Truncal obesity	Insulin resistance syndrome
Head, neck	Elfin facies	Williams syndrome
	Moon facies	Cushing syndrome
	Thyromegaly, goiter	Hyperthyroidism
	Webbed neck	Turner syndrome
Skin	Pallor, flushing, diaphoresis	PCC
	Acne, hirsutism, striae	Cushing syndrome
		Anabolic steroid abuse
	Café-au-lait spots	Neurofibromatosis
	Adenoma sebaceum	Tuberous sclerosis
	Malar rash	Systemic lupus
	Acanthosis nigricans	T2DM

Hematologic	Pallor	Renal disease
	Sickle cell anemia	
Chest, cardiac	Chest pain	Heart disease
	Palpitations	
	Exertional dyspnea	
	Widely spaced nipples	Turner syndrome
	Heart murmur	Coarctation of the aorta
	Friction rub	Systemic lupus (pericarditis)
		Collagen vascular disease
	Apical heave[a]	LVH
Abdomen	Abdominal mass	Wilms tumor
		Neuroblastoma
		PCC
	Epigastric, flank bruit	RAS
	Palpable kidneys	Polycystic kidney disease
		Hydronephrosis
		Multicystic dysplastic kidney
Genitourinary	Ambiguous or virilized genitalia	Congenital adrenal hyperplasia
	Urinary tract infection	Renal disease
	Vesicoureteral reflux	
	Hematuria, edema, fatigue	
	Abdominal trauma	
Extremities	Joint swelling	Systemic lupus
		Collagen vascular disease
	Muscle weakness	Hyperaldosteronism
		Liddle syndrome
Neurologic, metabolic	Hypokalemia, headache, dizziness, polyuria, nocturia	Reninoma
	Muscle weakness, hypokalemia	Monogenic HTN (Liddle syndrome, GRA, AME)

Laboratory evaluation

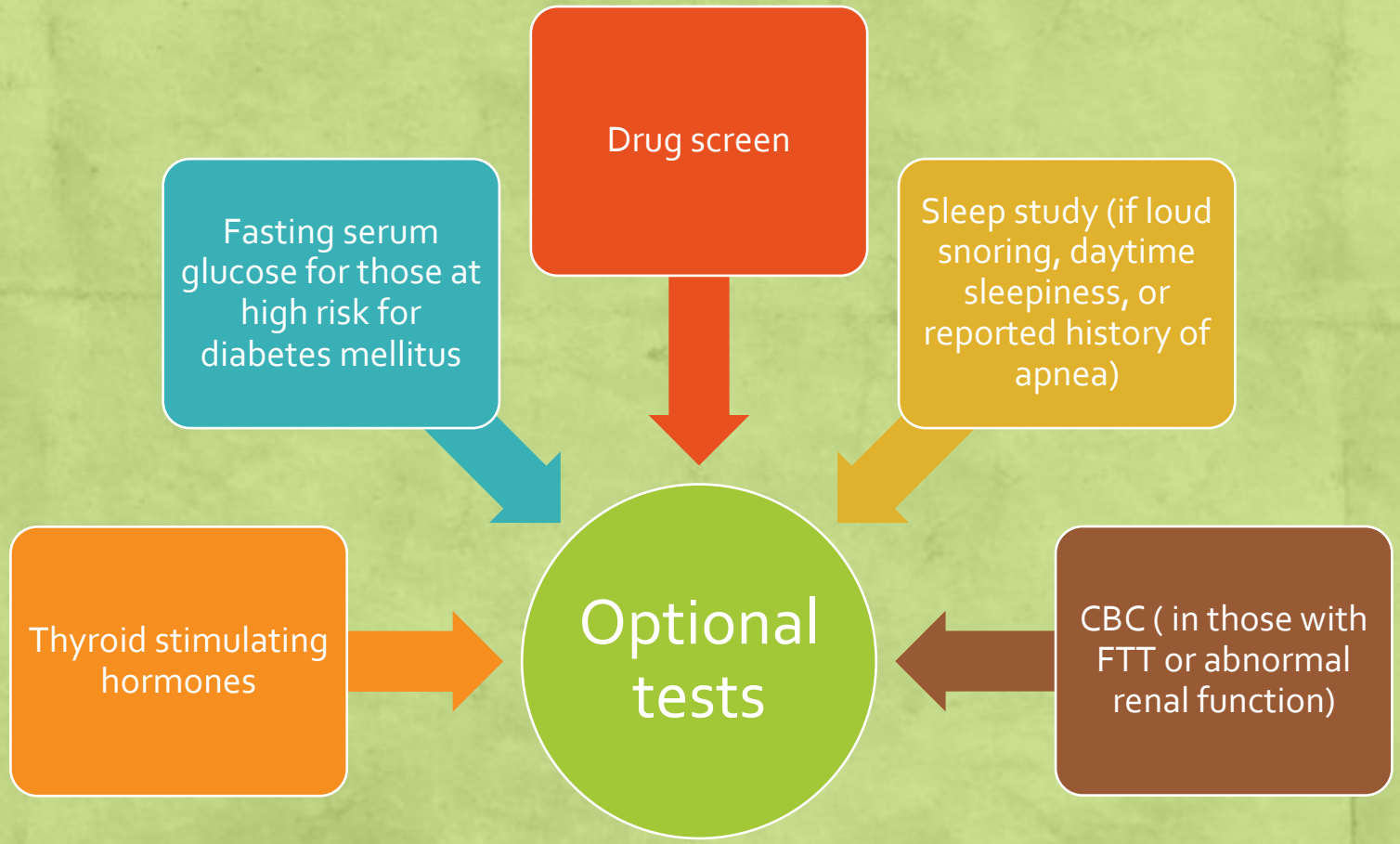


Screening for all patients

- Urinalysis
- Chemistry panel, including electrolytes, blood urea nitrogen, and creatinine
- Lipid profile (fasting or nonfasting to include high-density lipoproteina and total cholesterol)
- Renal ultrasonography in those <6 y of age or those with abnormal urinalysis or renal function

Lab evaluation

Optional tests to be obtained on the basis of history, physical examination, and initial studies



Common Pharmacologic Agents Associated With Elevated BP in Children

Over-the-counter drugs	Decongestants
	Caffeine
	Nonsteroidal anti-inflammatory drugs
	Alternative therapies, herbal and nutritional supplements
Prescription drugs	Stimulants for attention-deficit/hyperactivity disorder
	Hormonal contraception
	Steroids
	Tricyclic antidepressants
Illicit drugs	Amphetamines
	Cocaine

Electrocardiography

- Electrocardiography has high specificity but poor sensitivity for identifying children and adolescents with LVH

KAS 14

- Clinicians should not perform electrocardiography in hypertensive children and adolescents being evaluated for LVH

Imaging evaluation

Echocardiography

- Prevalence of LVH 30-40% in childhood HTN.
- If LVH present, indication to start antihypertensive treatment
- Serial echocardiography to assess treatment efficacy

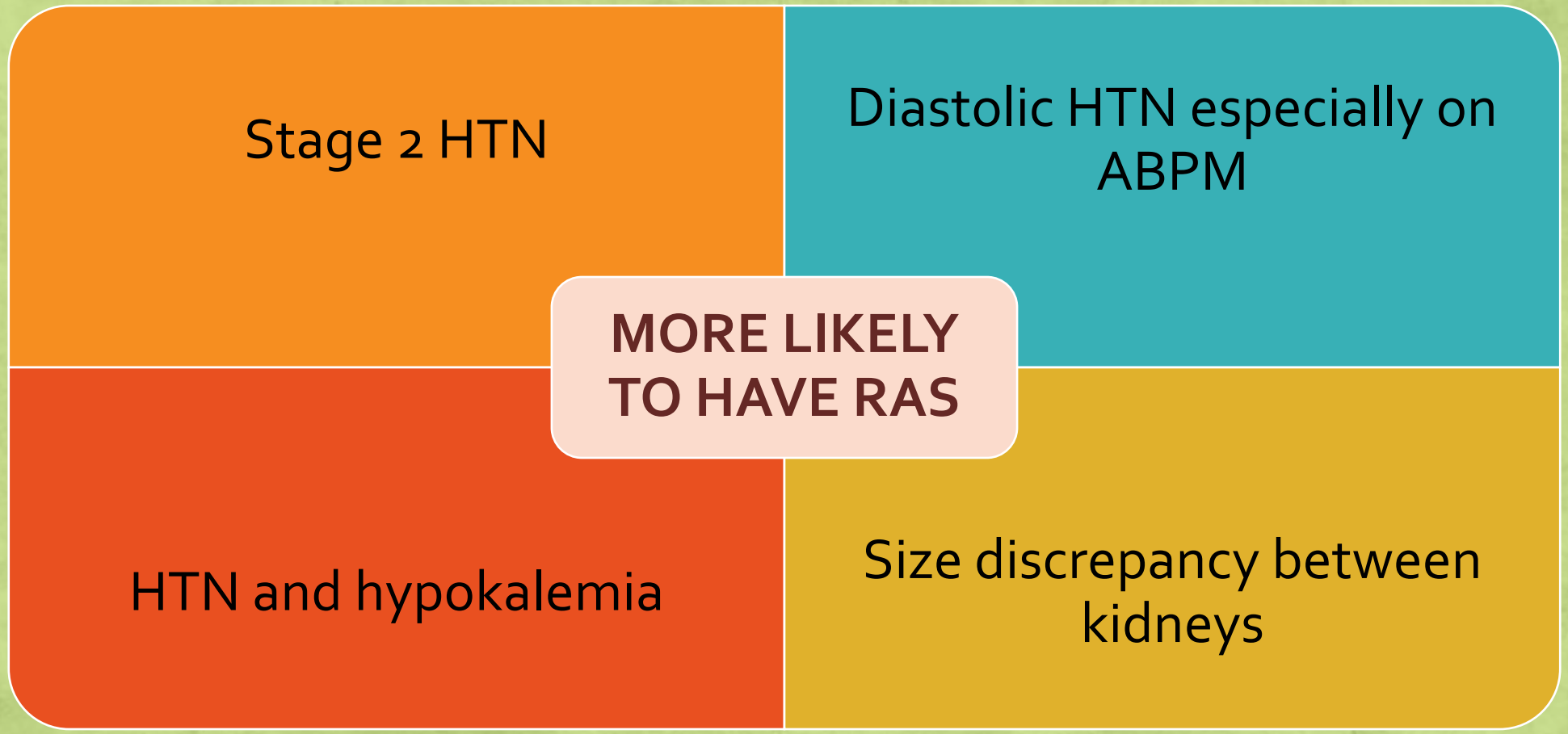
KAS 15

- *It is recommended that echocardiography be performed to assess for cardiac target organ damage (LV mass, geometry, and function) at the time of consideration of pharmacologic treatment of HTN;*
- *LVH definitions updated:*
- *LV mass >51 g/m2.7 (boys and girls) for children and adolescents older than 8 years OR LV mass >115 g/BSA for boys and LV mass >95 g/BSA for girls*
- *Repeat echocardiography may be performed to monitor improvement or progression of target organ damage at 6- to 12-month intervals. Indications to repeat echocardiography include persistent HTN despite treatment, concentric LV hypertrophy, or reduced LV ejection fraction*

ECHOCARDIOGRAPHY : KAS 15

- *In patients without LV target organ injury at initial echocardiographic assessment, repeat echocardiography at yearly intervals may be considered in those with stage 2 HTN, secondary HTN, or chronic stage 1 HTN incompletely treated (noncompliance or drug resistance) to assess for the development of worsening LV target organ injury*

Imaging for renovascular disesae



Imaging for renovascular disesae

KAS 16

- *Doppler renal ultrasonography may be used as a noninvasive screening study for the evaluation of possible RAS in normal weight children and adolescents ≥8 years of age who are suspected of having renovascular HTN and who will cooperate with the procedure*

KAS 17

- In children and adolescents suspected of having RAS, either CTA or MRA may be performed as a noninvasive imaging study. Nuclear renography is less useful in pediatrics and should generally be avoided

Microalbuminuria

- A marker of HTN-related kidney injury and a predictor of CVD in adults.
- MA appears to be a nonspecific finding in children that can occur in the absence of HTN:

1. Obesity
2. insulin resistance
3. diabetes
4. dyslipidemia
5. vigorous exercise

KAS18

- Routine testing for MA is not recommended for children and adolescents with primary HTN

FOLLOW UP AND MONITORING

Patients on medication should be seen every 4-6 wks until goal BP reached, then every 3-4 mo

Patients with lifestyle change should be seen evey 3-6 mo

TOD such as LVH should be assessed according to the recommendations