



Assessment and management of pediatric obesity and hypertension

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Disclaimer

- ▶ I have had no relevant disclosures.

Objectives

- Define **obesity**, understanding factors contributing to obesity, work up and management
- Define **Hypertension** in the pediatric population
- Elaborate changes in the new recommendation for hypertension as per AAP guidelines 2017
- Elaborate on pertinent nuances on adequate screening of at risk populations, making an accurate diagnosis and pertinent pediatric examination in these conditions.
- Elaborate on appropriate referral to specialist (cardiology) for hypertension.
- Basic treatment guidelines for hypertension

Obesity diagnosis

Measurement

- BMI is not used until 2 years of age
- To assess weight status in an infant, use weight for length

Use WHO chart

Body Mass Index Percentile Ages 2 to 20 Years

Underweight
< 5th percentile

Healthy Weight
5-84th percentile

Overweight
85-94th percentile

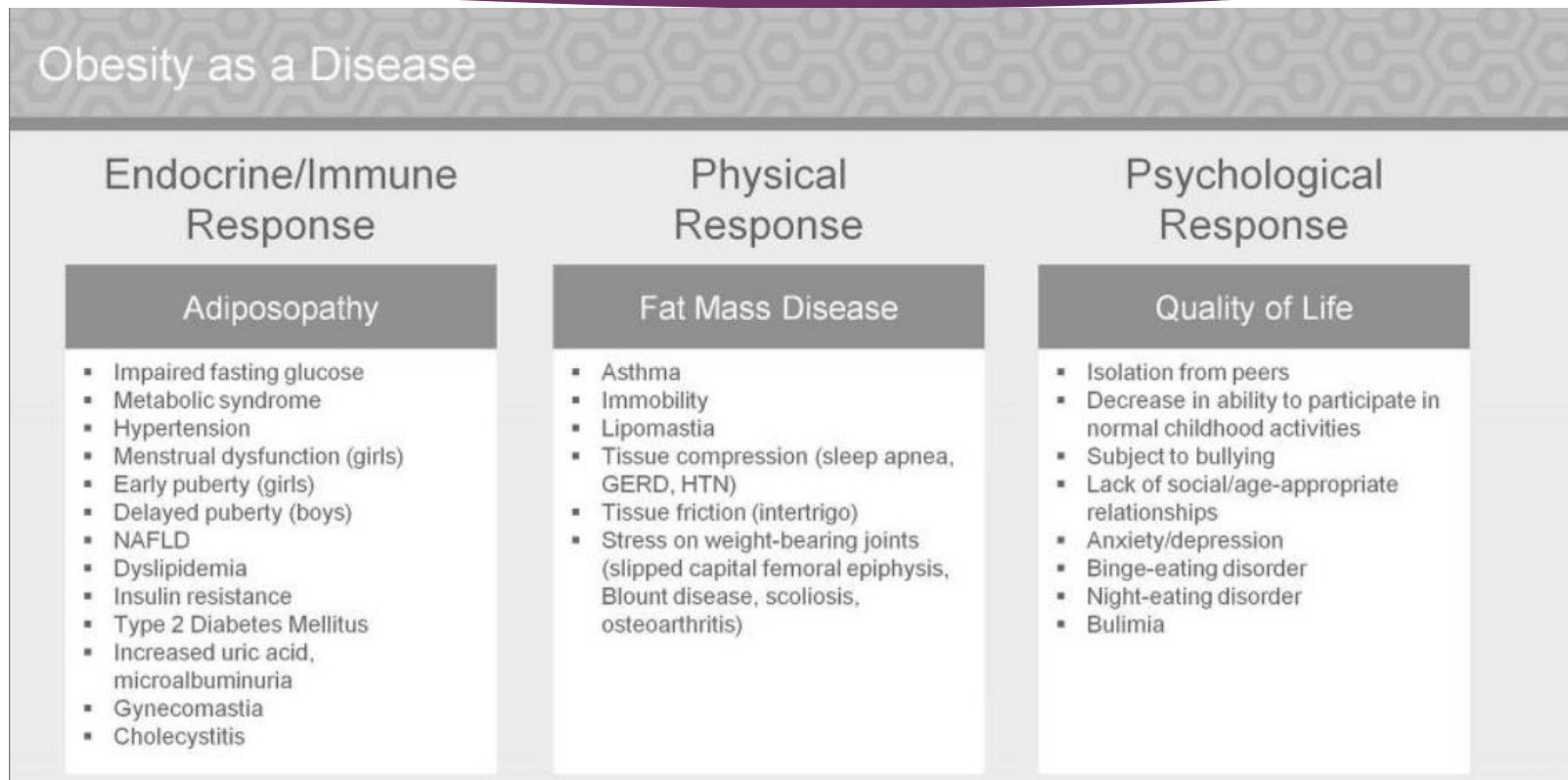
Obesity
95-99th percentile or BMI > 30

Severe Obesity
BMI ≥ 120% of the 95th percentile or BMI ≥ 35 kg/m²

Caveat: Not all patients with BMI 85% or above have excess adiposity, and many children and adolescents with BMI < 5% are healthy and do not need treatment.

- Expanded definition of severe obesity includes Class I, II, and III obesity
- Class I obesity (≥95th percentile to <120% of the 95th percentile)
- Class II obesity (≥120% to <140% of the 95th percentile) or a BMI ≥ 35 to ≤ 39, whichever lower
- Class III obesity (≥140% of the 95th percentile) or BMI ≥ 40, whichever lower.
- Class I obesity = 95th-99th percentile or Obesity
- Class II & III = > 99th percentile or Severe Obesity

OBESITY- as a disease



Focused Review of Systems

Symptoms	Related Co-morbidity
Nervousness, school avoidance, social inhibitions	Depression, anxiety, bullying
Fatigue, muscle aches	Vitamin D deficiency
Polyuria, polydipsia, fatigue, nocturia	Type 2 Diabetes (T2DM)
Headaches, facial numbness	Pseudotumor cerebri
Skin pigmentation, skin tags	Insulin resistance (IR)
Daytime somnolence, loud snoring, witnessed apnea	Obstructive sleep apnea (OSA)
Abdominal pain, indigestion	Gastroesophageal reflux disease (GERD), gall bladder disease, constipation
Hip or knee pain	Slipped capital femoral epiphysis (SCFE), early osteoarthritis
In-toeing, leg bowing, mild knee pain	Blount's disease
Hirsutism, acne, irregular menses	Polycystic Ovarian Syndrome (PCOS)

[103]

Figure 2: Focused Review of Systems.
From Cuda SE, Censani M, Scinta W, Joseph M, Green R. Pediatric Obesity Algorithm, 2016-17.
www.pediatricobesityalgorithm.org

Diagnostic Work-up: Labs and Studies

Infancy (0-24 months)	Toddler (Ages 2-4 years)	Early Childhood (Ages 5-9 years)	Puberty (Ages 10-14 years)	Adolescent (Ages 15-18 years)
Weight > Length	BMI \geq 95 th percentile <u>or</u> \geq 85 th percentile with two or more risk factors (24-48 months)	BMI \geq 95 th percentile <u>or</u> \geq 85 th percentile with two or more risk factors	BMI \geq 95 th percentile <u>or</u> \geq 85 th percentile with two or more risk factors	BMI \geq 95 th percentile <u>or</u> \geq 85 th percentile with two or more risk factors
	<ul style="list-style-type: none"> ▪ Fasting blood glucose and/or HgA1c ▪ Fasting lipid panel/Non-fasting if fasting not feasible ▪ ALT, AST, consider GGT ▪ Consider 25 OH Vitamin D 			
	<ul style="list-style-type: none"> ▪ Consider sleep study ▪ Consider liver ultrasound ▪ Consider uric acid ▪ Consider fasting serum insulin 			
	<ul style="list-style-type: none"> ▪ Consider urine microalbumin/creatinine ratio ▪ Consider C-peptide, hs-CRP 			

[20] [21] Figure 3: Diagnostic work up: Labs and Studies.
From Cuda SE, Censani M, Scinta W, Joseph M, Green R. Pediatric Obesity Algorithm, 2016-17.
www.pediatricobesityalgorithm.org

Management of the Infant with Obesity: 0 to 24 months

- No screen time
- No TV in bedroom
- Allow infant to feed themselves
- Do not force/finish foods when infant indicating refusal
- 12-18 Hours of sleep



- Exclusive breastfeeding for 6-12 months
- Appropriate formula feeding ingestion for age
- Delay complementary foods until 6 months
- No juice/sugar sweetened beverages
- No fast food
- No desserts

- Keep active in playpen/floor
- Encourage direct interaction with parents as much as possible
- No media

Management of the Toddler with Obesity: 2 to 4 years

- Routine sleep pattern
- No TV in bedroom
- 11-14 hours of sleep
- All meals at the table/highchair
- Parents as role models
- Food not used as reward
- Parents should not be over controlling
- Family Based Therapy



- Active play almost constantly
- Minimal sedentary time
- No screen time < 2 years, < 1 hour/day 2-4 years

- Three meals plus snack(s)
- 3 servings of protein (1-3oz)/day
- 2-2.5 cups dairy/day
- 3 servings non-starchy vegetables (3/4 cup to 1 1/2 cups)/day
- Fruit 1 cup /day
- Dessert only on special occasion
- No sugar sweetened beverages
- No fast food
- Age appropriate portion sizes
- Praise for trying new foods

Management of the Young Child with Obesity: 5 to 9 years

- Minimize obesogenic medications especially SGAs*
- Treat asthma with controller meds to minimize systemic steroid use
- Consider ACE inhibitor for persistent hypertension

- Screen time <1-2 hours
- Routine sleep pattern
- No TV in bedroom
- 11-14 hours of sleep
- All meals at the table
- Parents as role models
- Parenting style should not be overly controlling
- Sleep study if severe obesity and/or symptoms
- Tonsillectomy and adenoidectomy if indicated



- Three meals; 1-2 snacks
- 3 servings of protein/day
- 2-3 servings of dairy/day
- 4-5 servings non-starchy vegetables
- Dessert only on special occasion
- No sugar sweetened beverages
- No fast food
- Age appropriate portion sizes
- Praise for trying new foods
- Consider low glycemic index/reduced carbohydrate diet
- Moderate - vigorous activity for 60 minutes or greater each day; Can be organized or not

*Second generation antipsychotics

Management of the Pubertal Child with Obesity: 10-14 years

- Orlistat (Xenical) FDA approved for \geq age 12
- Minimize obesogenic medications especially SGAs
- Treat asthma with controller meds to minimize systemic steroid use
- Consider ACE inhibitor for persistent hypertension
- Metformin FDA approved for T2DM \geq age 10

- Screen time less than 1-2 hours/day
- 10-12 hours of sleep
- Routine sleep pattern
- No TV in bedroom
- Parenting style should not be overly controlling
- Peer groups become increasingly important
- All meals at table with family and encourage socialization
- Recommend meal and exercising tracking



- 3 meals; 1-2 nutritious snacks
- 3 servings of protein/day
- 3 servings of dairy/day
- 4-5 servings of non-starchy vegetables
- Dessert only on special occasion
- No sugar sweetened beverages
- No fast food
- Age-appropriate portion sizes
- Allow child to leave food on plate

- Vigorous activity for 60 minutes or more daily. Can be organized or not
- Monitor for changes in decreased activity level
- Decrease non academic sedentary time as much as possible

Management of the Adolescent with Obesity: 15-18 years

- Orlistat (Xenical) \geq age 12,
- Phentermine approved for \geq age 16
- Minimize obesogenic medications especially SGAs*
- Treat asthma with controller meds to minimize systemic steroid use
- Consider ACE inhibitor for persistent hypertension
- Metformin FDA approved for T2DM \geq age 10

- Screen time less than one hour/day
- 10-12 hours of sleep
- Routine sleep pattern
- No TV in bedroom
- Parenting style should not be overly controlling
- Friends and relationships are important
- Recommend meal/exercising tracking or monitoring



- 3 meals; nutritious snacks
- 3 servings of protein/day
- 3 servings of dairy/day
- 4-5 servings of non-starchy vegetables
- Dessert only on special occasion
- No sugar sweetened beverages
- No fast food
- Age-appropriate portion sizes
- Allow adolescent to leave food on plate
- Vigorous activity for 60-90 minutes or more daily
- Planned intervention with structured physical activity
- Decrease non academic sedentary time as much as possible

*Second generation antipsychotics

Activity Recommendations (Normal Weight): 5-12 Years

- Children should accumulate at least 60 minutes (and up to several hours) of age-appropriate physical activity on all or most days of the week. This daily accumulation should include moderate and vigorous physical activity with the majority of the time being spent in activity that is intermittent in nature.
- Children should participate in several bouts of physical activity lasting 15 minutes or more each day.
- Children should participate in a variety of age-appropriate physical activities designed to achieve optimal health, wellness, fitness, and performance benefits.
- Extended periods (periods of two hours or more) of inactivity are discouraged for children, especially during the daytime hours.

Aerobic/ endurance	Bone-building	Muscle strengthening	Active play
Running Jumping	Hopping Jumping Running	Push-ups Tree climbing Sit-ups	Competitive sports: Soccer Baseball Free Play: Walking Dancing Jump roping

Sleep hygiene

Things to Follow	Things to Avoid
<ul style="list-style-type: none">• Keep bedtimes and wake times consistent every day of the week. Late weekend nights or sleeping-in can throw off a sleep schedule for days.• Bedtime should follow a predictable sequence of events, such as brushing teeth and reading a story.• Having physical exercise early in the day can help with sleep time.• Worry time should not be at bedtime. Children with this problem can try having a “worry time” scheduled earlier to think about and discuss their worries with a parent.• Security objects at bedtime are often helpful for children who need a transition to feel safe.• When checking on a child at night, checks should be “brief and boring.”	<ul style="list-style-type: none">• High stimulation activities just before bed, such as watching TV, or playing video games• Spending lots of non-sleep time in bed. This also includes if a child is awake in bed tossing and turning: get out of bed to do a low stimulation activity (e.g., reading), then return to bed later.• Intake of caffeine (sodas, chocolate, tea, coffee) in the afternoons/evenings.• For the best night’s sleep, most people should avoid strenuous workouts close to bedtime.

Special caution- Artificial sweeteners

Background

- Be cautious! NNS are 180-20,000 times sweeter than sucrose
- Most evidence shows that those who use NNS do not lose weight
- Evidence suggests that if NNS are used in combination with food, insulin and GLP-1 levels actually are higher
- Sweetness without calories can result in a disturbance in appetite regulation and a higher preference for sweet taste
- However, some studies in adults report success if used in a weight management program in the context of intentional weight loss
- Most studies suggest unfavorable metabolic and health outcomes

Health Impact

- NNS have been approved by the FDA as "generally regarded as safe," meaning that data is insufficient to ensure the long term safety
- No associations between NNS and cancer, ADHD or ADD, birth defects, diabetes or lupus
- Over 50% of parents in one study stated that they seek products that have reduced sugar but did not know they contain NNS
- Studies point to a preference for sweet vs salty or savory foods after NNS

Common Nonnutritive Sweeteners

- Sucralose
- Aspartame
- Acesulfame potassium
- Neotame
- Advantame
- Saccharin
- Stevia

Adolescent Metabolic & Bariatric Surgery

Indications

Indications for adolescents mirror the NIH recommendations for adults:

BMI ≥ 40 kg/m²

or

BMI ≥ 35 kg/m² with significant current comorbidities including severe OSA, T2D, hypertension.

In adolescents, use of percentile BMI values are used along with existing severe medical conditions and/or debilitating quality of life.

MBS considered for youth with severe obesity: BMI $\geq 120\%$ of the 95th percentile.

Outcomes

(5 year Teen Labs Study)

MBS Outcomes (5 year Teen Labs Study)

- 96% follow up at 5 years
- Mean percent weight loss=26%
- 68% normalized blood pressure
- 81% normalized triglycerides
- 86% with T2DM in remission
- 48% low ferritin levels

Mental Health Outcomes (5 year AMOS Study)

- At 5 years: Self- esteem improved, mood down slightly
- Mental health problems persist after surgery necessitating ongoing MH treatment

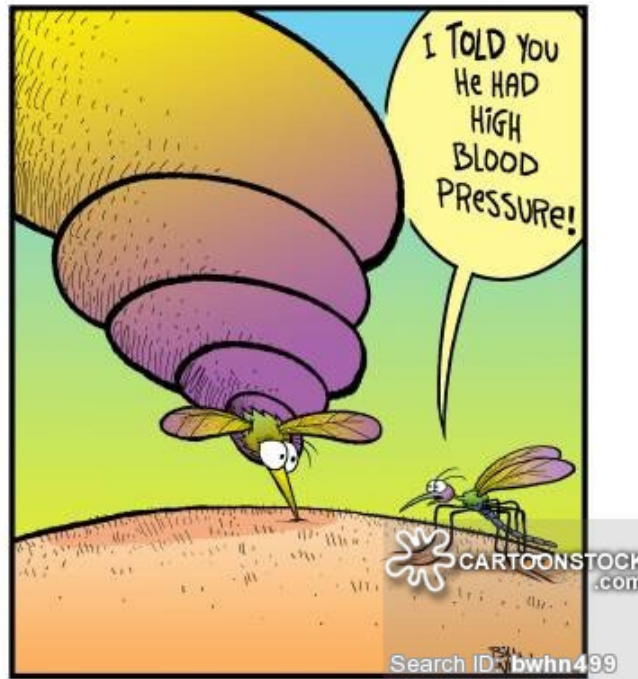
Recommendations

- Adolescents undergoing MBS need to be followed in weight management clinic pre and postoperatively; preferably American College of Surgeons MBSAQIP recommendations including sensitivity training.
- Vertical sleeve gastrectomy (VSG) most common operation with adolescents; both Roux-en-Y Gastric Bypass and VSG similar risk/benefit
- Screen for micronutrient deficiencies at baseline and ongoing after MBS.
- Obesity is a chronic disease requiring multimodal therapies and treatment by a multidisciplinary weight management team which can provide surgical, pharmacologic, behavioral, nutritional interventions and activity recommendations.
- Counsel females about increased fertility with weight loss
- All adolescents counseled on risk/benefit and provided informed consent along with family/guardian
- For more information, review the 2018 ASMBS Pediatric Metabolic and Bariatric Surgery Guidelines. [353]

Online Viewing Code

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HYPERTENSION



Definition

- ▶ Childhood HTN is defined according to BP distribution in healthy children

TABLE 3 Updated Definitions of BP Categories and Stages

For Children Aged 1–13 y	For Children Aged ≥ 13 y
Normal BP: <90th percentile	Normal BP: <120/ \leq 80 mm Hg
Elevated BP: \geq 90th percentile to <95th percentile or 120/80 mm Hg to <95th percentile (whichever is lower)	Elevated BP: 120/ \leq 80 to 129/ \leq 80 mm Hg
Stage 1 HTN: \geq 95th percentile to <95th percentile + 12 mmHg, or 130/80 to 139/89 mm Hg (whichever is lower)	Stage 1 HTN: 130/80 to 139/89 mm Hg
Stage 2 HTN: \geq 95th percentile + 12 mm Hg, or \geq 140/90 mm Hg (whichever is lower)	Stage 2 HTN: \geq 140/90 mm Hg

Flynn JT, Kaelber DC, Baker-Smith CM, et al., and AAP Subcommittee on Screening and Management of High Blood Pressure in Children. Clinical practice guideline for screening and management of high blood pressure in children and adolescents. *Pediatrics*. 2017;140(3):e20171904

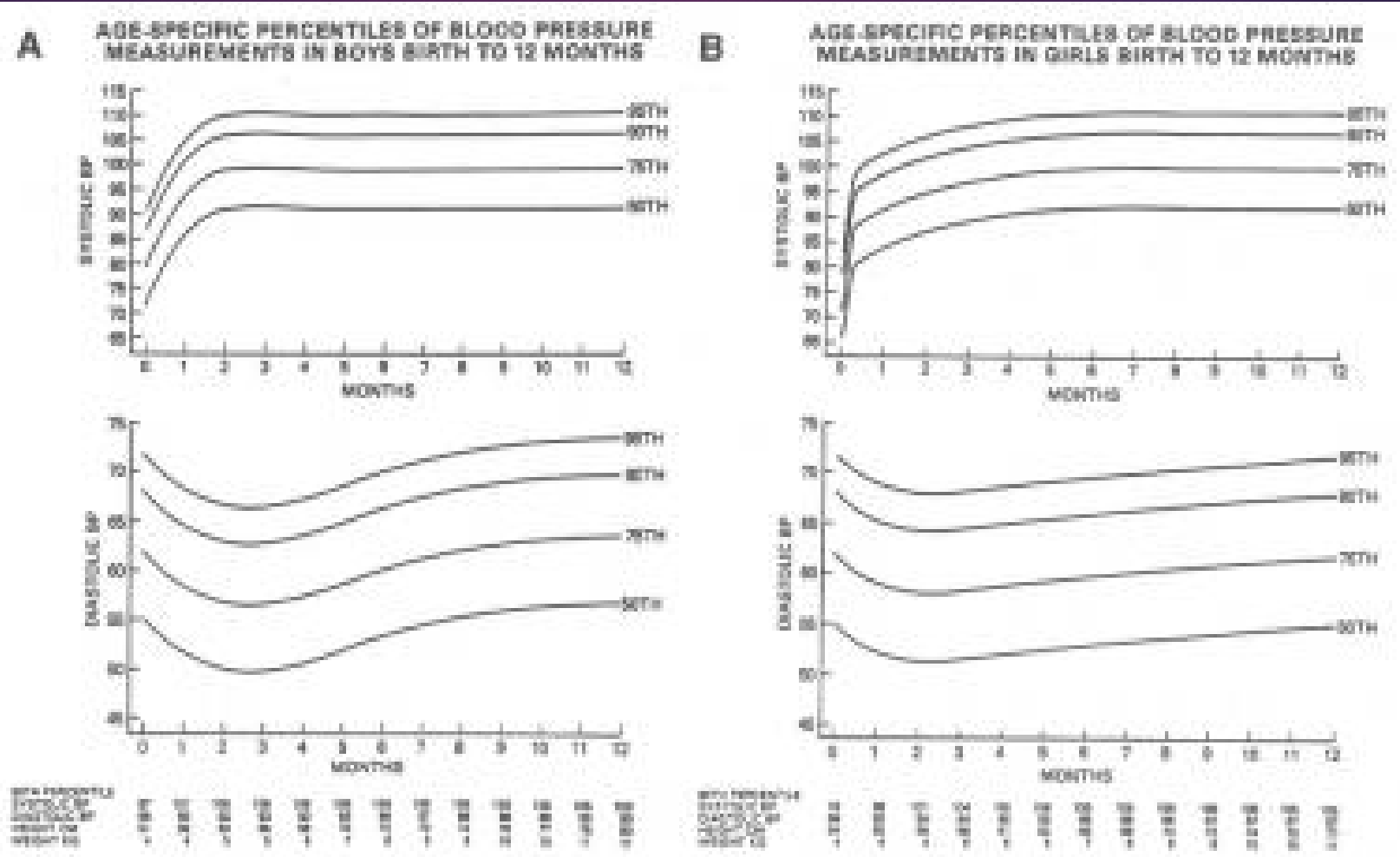
Definition in neonates (26 weeks to 44 weeks of PMA) and infants (1- 12 mths of age)

- ▶ BP values for neonates 26–44 weeks post-menstrual age have been compiled* and may be used to identify neonates with high BP
- ▶ 2nd Task Force Report BP curves should still be used for infants 1–12 months of age.

Neonatal BP chart

Postconceptional age	50th percentile	95th percentile	99th percentile
44 Weeks			
SBP	88	105	110
DBP	50	68	73
MAP	63	80	85
42 Weeks			
SBP	85	98	102
DBP	50	65	70
MAP	62	76	81
40 Weeks			
SBP	80	95	100
DBP	50	65	70
MAP	60	75	80
38 Weeks			
SBP	77	92	97
DBP	50	65	70
MAP	59	74	79
36 Weeks			
SBP	72	87	92
DBP	50	65	70
MAP	57	72	71
34 Weeks			
SBP	70	85	90
DBP	40	55	60
MAP	50	65	70
32 Weeks			
SBP	68	83	88
DBP	40	55	60
MAP	48	62	69
30 Weeks			
SBP	65	80	85
DBP	40	55	60
MAP	48	65	68
28 Weeks			
SBP	60	75	80
DBP	38	50	54
MAP	45	58	63
26 Weeks			
SBP	55	72	77
DBP	30	50	56
MAP	38	57	63

Infant BP chart



New Blood Pressure Tables

TABLE 4 BP Levels for Boys by Age and Height Percentile

Age (y)	BP Percentile	SBP (mm Hg)								DBP (mm Hg)							
		Height Percentile or Measured Height								Height Percentile or Measured Height							
		5%	10%	25%	50%	75%	90%	95%	5%	10%	25%	50%	75%	90%	95%		
1	Height (in)	30.4	30.8	31.6	32.4	33.3	34.1	34.6	30.4	30.8	31.6	32.4	33.3	34.1	34.6		
	Height (cm)	77.2	78.3	80.2	82.4	84.6	86.7	87.9	77.2	78.3	80.2	82.4	84.6	86.7	87.9		
	50th	85	85	86	86	87	88	88	40	40	40	41	41	42	42		
	90th	98	99	99	100	100	101	101	52	52	53	53	54	54	54		
	95th	102	102	103	103	104	105	105	54	54	55	55	56	57	57		
	95th + 12 mm Hg	114	114	115	115	116	117	117	66	66	67	67	68	69	69		
2	Height (in)	33.9	34.4	35.3	36.3	37.3	38.2	38.8	33.9	34.4	35.3	36.3	37.3	38.2	38.8		
	Height (cm)	86.1	87.4	89.6	92.1	94.7	97.1	98.5	86.1	87.4	89.6	92.1	94.7	97.1	98.5		
	50th	87	87	88	89	89	90	91	43	43	44	44	45	46	46		
	90th	100	100	101	102	103	103	104	55	55	56	56	57	58	58		
	95th	104	105	105	106	107	107	108	57	58	58	59	60	61	61		
	95th + 12 mm Hg	116	117	117	118	119	119	120	69	70	70	71	72	73	73		
3	Height (in)	36.4	37	37.9	39	40.1	41.1	41.7	36.4	37	37.9	39	40.1	41.1	41.7		
	Height (cm)	92.5	93.9	96.3	99	101.8	104.3	105.8	92.5	93.9	96.3	99	101.8	104.3	105.8		
	50th	88	89	89	90	91	92	92	45	46	46	47	48	49	49		
	90th	101	102	102	103	104	105	105	58	58	59	59	60	61	61		
	95th	106	106	107	107	108	109	109	60	61	61	62	63	64	64		
	95th + 12 mm Hg	118	118	119	119	120	121	121	72	73	73	74	75	76	76		

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Simplified BP table created for use in initial screening of BP values

- ▶ Based on 90th percentile BP values for children at 5th height percentile

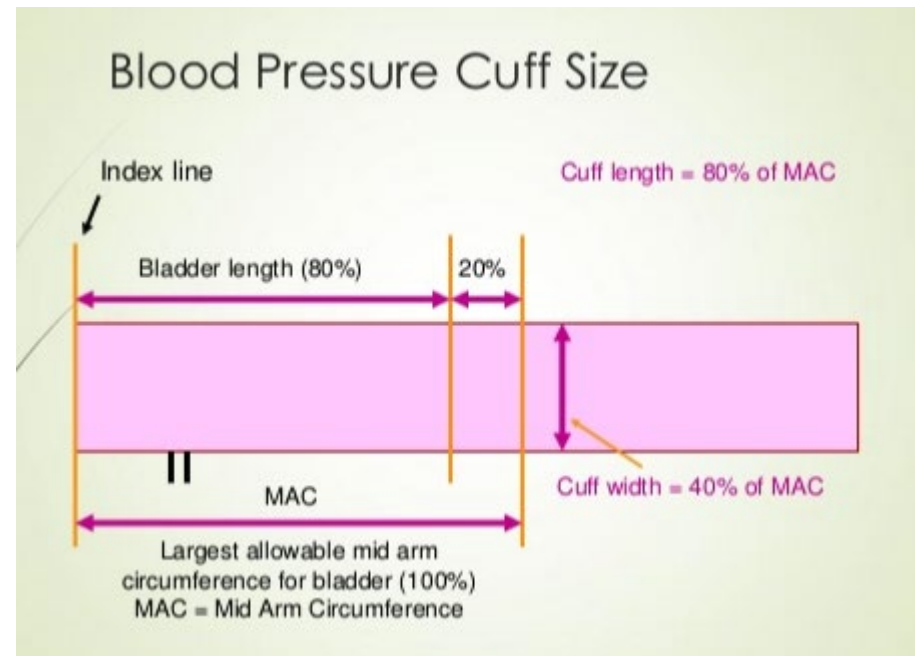
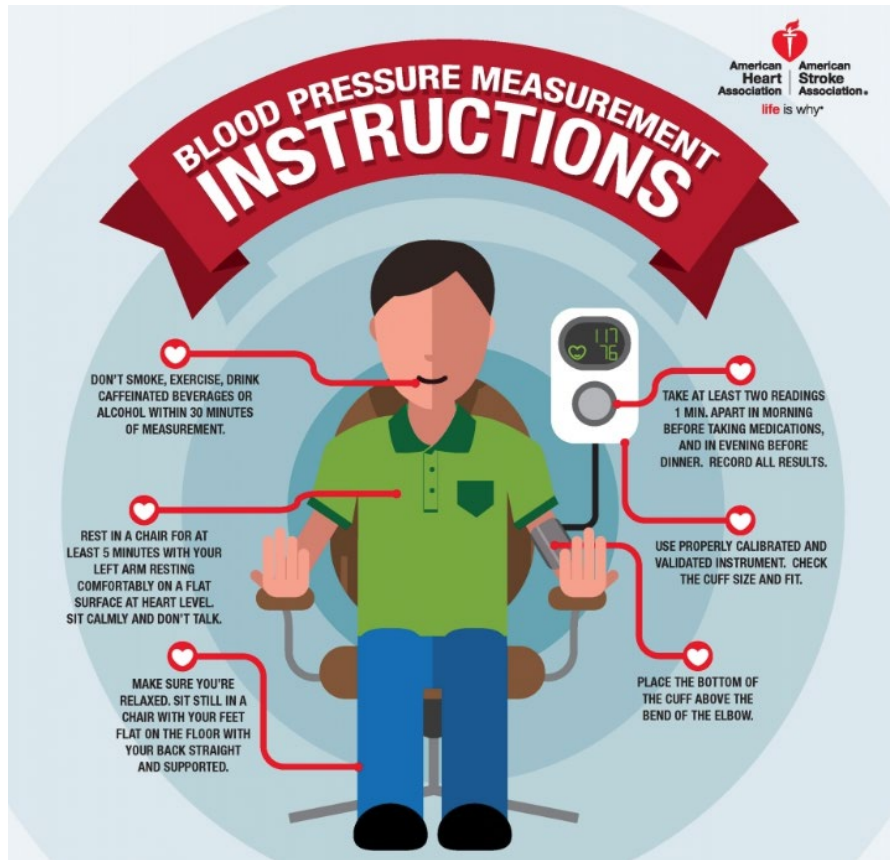
TABLE 6 Screening BP Values Requiring Further Evaluation

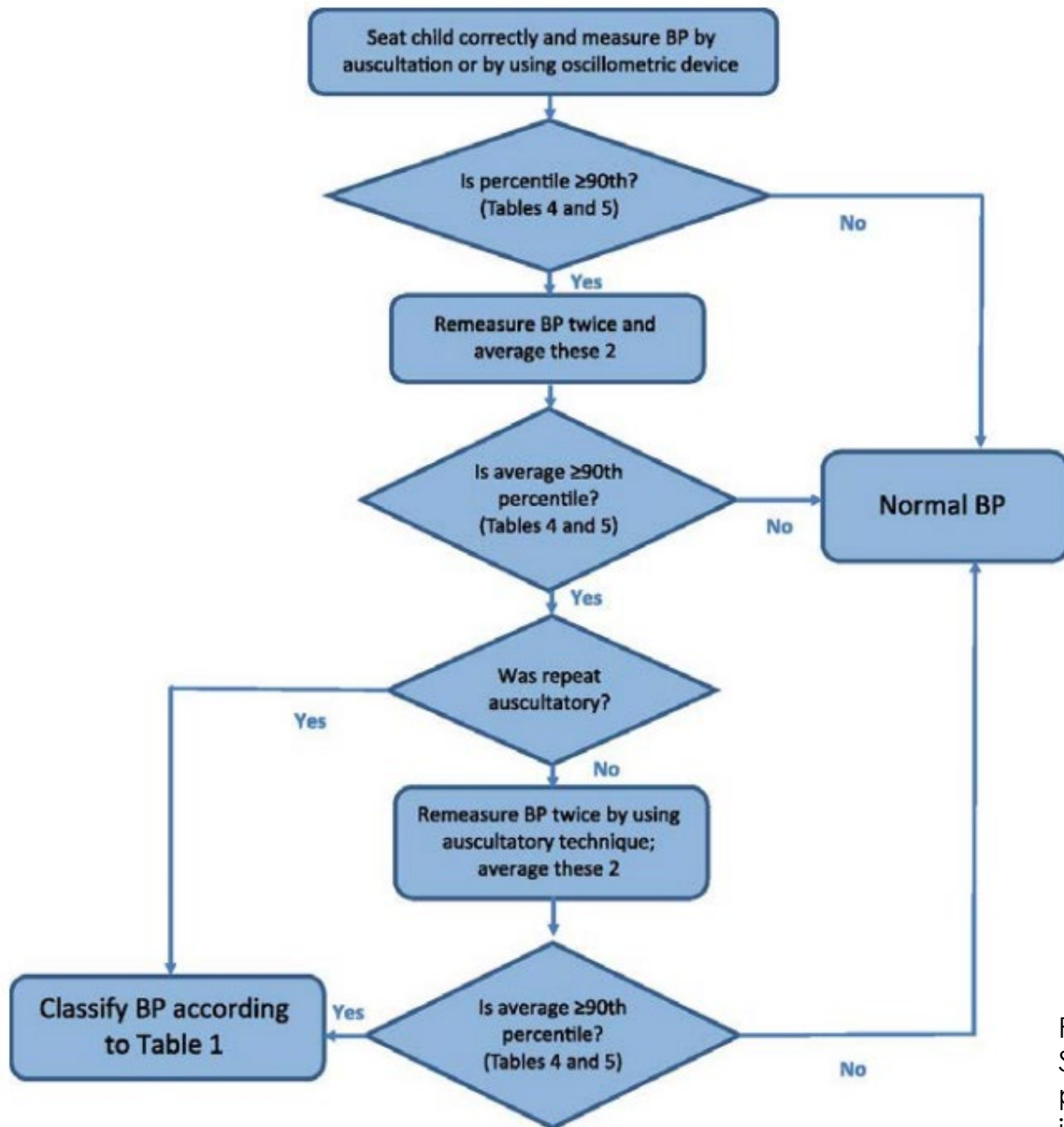
Age, y	BP, mm Hg			
	Boys		Girls	
	Systolic	DBP	Systolic	DBP
1	98	52	98	54
2	100	55	101	58
3	101	58	102	60
4	102	60	103	62
5	103	63	104	64
6	105	66	105	67
7	106	68	106	68
8	107	69	107	69
9	107	70	108	71
10	108	72	109	72
11	110	74	111	74
12	113	75	114	75
≥13	120	80	120	80

Making the diagnosis

- ▶ New guideline does not change recommendation to begin BP measurement at age 3.
- ▶ ~~Only annual measurement is recommended unless risk factors are present.~~
- ▶ BP should be checked in all children and adolescents ≥ 3 years of age at every health care encounter ~~if they have obesity, are taking medications known to increase BP, have renal disease, a history of aortic arch obstruction or coarctation, or diabetes.~~
- ▶ The clinician should repeat high BP readings at a visit and obtain multiple measurements over time before diagnosing HTN
- ▶ Trained health care professionals in the office setting should make a diagnosis of HTN if a child or adolescent has **auscultatory confirmed** BP readings ≥ 95 th percentile* ($>130/80$ mmHg after age 13) at 3 different visits.
- ▶ BP calculator- <https://www.mdcalc.com/aap-pediatric-hypertension-guidelines>

Manual BP reading





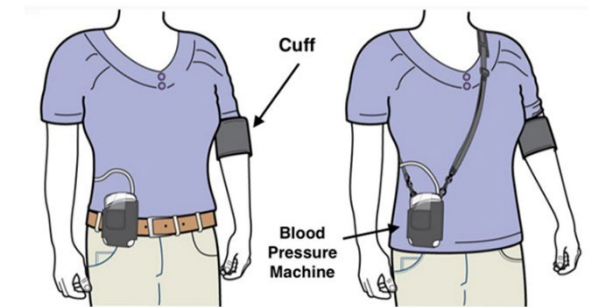
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ABPM

- ▶ Patient wears a BP cuff continually for 24 hours
- ▶ Readings q20–30 min
- ▶ Captures BP in many settings: Home, school, work and Awake, asleep

- ABPM allows for evaluation of

- Out-of-office BP
- Circadian BP patterns
- ABPM should be performed for confirmation of HTN in children and adolescents with office BP measurements in the elevated BP category for ≥ 1 year or with Stage 1 HTN over 3 clinic visits.
- Diagnosis is based on the presence of mean systolic blood pressure (SBP) and diastolic blood pressure (DBP) $< 25\%$.



BP pattern

	Ambulatory BP	Office BP
Normal BP	Normal	Normal
Sustained HTN	Elevated	Elevated
White Coat HTN	Normal	Elevated
Masked HTN	Elevated	Normal

High risk populations

TABLE 12 High-Risk Conditions for Which ABPM May Be Useful

Condition	Rationale
Secondary HTN	Severe ambulatory HTN or nocturnal HTN indicates higher likelihood of secondary HTN ^{161,167}
CKD or structural renal abnormalities	Evaluate for MH or nocturnal HTN, ^{168–172} better control delays progression of renal disease ¹⁷³
T1DM and T2DM	Evaluate for abnormal ABPM patterns, ^{174,175} better BP control delays the development of MA ^{176–178}
Solid-organ transplant	Evaluate for MH or nocturnal HTN, better control BP ^{179–188}
Obesity	Evaluate for WCH and MH ^{23,189–192}
OSAS	Evaluate for nondipping and accentuated morning BP surge ^{43,46,193,194}
Aortic coarctation (repaired)	Evaluate for sustained HTN and MH ^{58,112,113}
Genetic syndromes associated with HTN (neurofibromatosis, Turner syndrome, Williams syndrome, coarctation of the aorta)	HTN associated with increased arterial stiffness may only be manifest with activity during ABPM ^{58,195}
Treated hypertensive patients	Confirm 24-h BP control ¹⁵⁵
Patient born prematurely	Evaluate for nondipping ¹⁹⁶
Research, clinical trials	To reduce sample size ¹⁹⁷

Flynn JT, Kaelber DC, Baker-Smith CM, et al., and AAP Subcommittee on Screening and Management of High Blood Pressure in Children. Clinical practice guideline for screening and management of high blood pressure in children and adolescents. *Pediatrics*. 2017;140(3):e20171904

Patient evaluation and management

BP Category (see Table 3)	BP Screening Schedule	Lifestyle Counseling (Weight, Nutrition)	Check Upper and Lower Extremity BP	ABPM	Diagnostic Evaluation	Initiate Treatment	Consider Sub-specialty Referral
Normal	Annual	X					
Elevated BP	Initial measurement	X					
	Second measurement: Repeat in 6 months	X	X				
	Third measurement: Repeat in 6 months	X		X	X		X
Stage 1 HTN	Initial measurement	X					
	Second measurement: Repeat in 1-2 weeks	X	X				
	Third measurement: Repeat in 3 months	X		X	X	X	X
Stage 2 HTN	Initial measurement	X	X				
	Second measurement: Repeat/refer to specialty care within 1 week	X		X	X	X	X

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Normal	Annual	X					
Elevated BP	Initial measurement	X					
	Second measurement: Repeat in <u>6 months</u>	X	X				
	Third measurement: Repeat in <u>6 months</u>	X		X	X		X
Stage 1 HTN	Initial measurement	X					
	Second measurement: Repeat in 1-2 weeks	X	X				
	Third measurement: Repeat in 3 months	X		X	X	X	X
Stage 2 HTN	Initial measurement	X	X				
	Second measurement: Repeat/refer to specialty care within 1 week	X		X	X	X	X

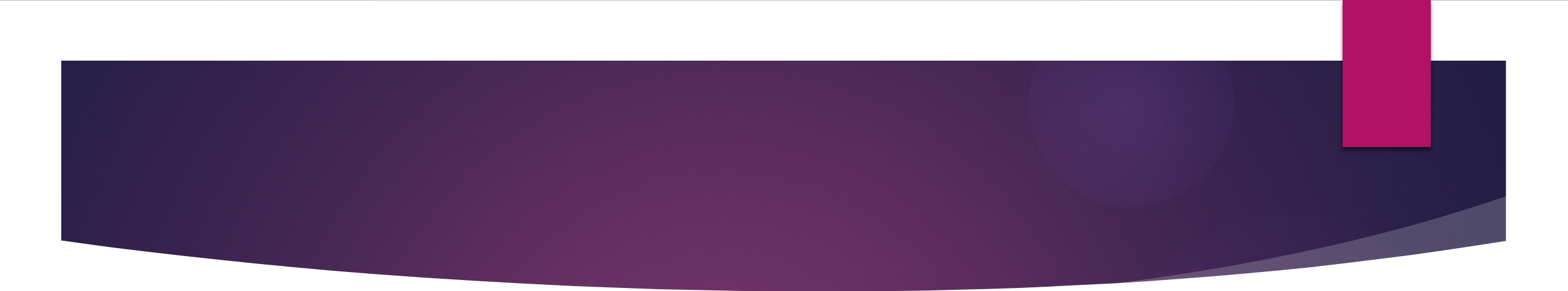
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Normal	Annual	X					
Elevated BP	Initial measurement	X					
	Second measurement: Repeat in <u>6 months</u>	X	X				
	Third measurement: Repeat in 6 months	X		X	X		X
Stage 1 HTN	Initial measurement	X					
	Second measurement: Repeat in <u>1-2 weeks</u>	X	X				
	Third measurement: Repeat in <u>3 months</u>	X		X	X	X	X
Stage 2 HTN	Initial measurement	X	X				
	Second measurement: Repeat/refer to specialty care within 1 week	X		X	X	X	X

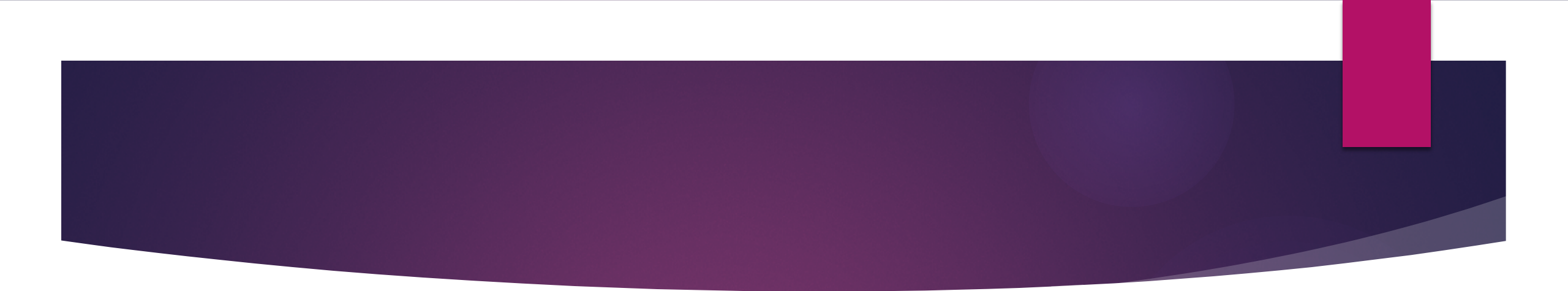
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Normal	Annual	X					
Elevated BP	Initial measurement	X					
	Second measurement: Repeat in 6 months	X	X				
	Third measurement: Repeat in 6 months	X		X	X		X
Stage 1 HTN	Initial measurement	X					
	Second measurement: Repeat in 1-2 weeks	X	X				
	Third measurement: Repeat in 3 months	X		X	X	X	X
Stage 2 HTN	Initial measurement	X	X				
	Second measurement: Repeat/refer to specialty care within <u>1 week</u>	X		X	X	X	X

Flynn JT, Kaelber DC, Baker-Smith CM, et al., and AAP Subcommittee on Screening and Management of High Blood Pressure in Children. Clinical practice guideline for screening and management of high blood pressure in children and adolescents. *Pediatrics*. 2017;140(3):e20171904



If patient is symptomatic or BP is >30 mm Hg above the 95th percentile (or >180/120 in an adolescent), refer for emergency care.

- 
- ▶ If BP normalizes at any point, return to annual screening.
 - ▶ 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 and to monitor treatment efficacy.

Types of hypertension

▶ Primary Hypertension

- Predominant cause of HTN in US children
- Characteristics include: ≥ 6 years of age; positive family history of HTN; obesity/overweight
- Severity of BP elevation is similar between primary and secondary HTN
- Systolic HTN predictive of primary HTN (Diastolic HTN predictive of secondary cause)
- 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.**

Secondary Causes

- ▶ Renal/Renovascular
 - Renal parenchymal disease or renal structural abnormalities account for 34%–76%
 - Renovascular disease accounts for 12%–13%
 - Renal causes especially likely among children (<6 years of age)
 - Children and adolescents with CKD should be evaluated for HTN at each medical encounter.

Secondary causes

▶ Coarctation of aorta

- Prevalence of HTN among children with a history of repaired aortic coarctation is 17% to 77%, even among those without evidence of recoarctation.
- Children with various syndromes, such as neurofibromatosis, Williams syndrome, Alagille syndrome, and Takayasu arteritis, are at risk for abdominal aortic obstruction.
- ABPM use is strongly encouraged to monitor for HTN.

TABLE 10 Screening Tests and Relevant Populations

Patient Population	Screening Tests
All patients	<u>Urinalysis</u> <u>Chemistry panel</u> , including electrolytes, blood urea nitrogen, and creatinine <u>Lipid profile</u> (fasting or nonfasting to include high-density lipoproteina and total cholesterol) <u>Renal ultrasonography</u> in those <6 y of age or those with abnormal urinalysis or renal function
In the obese (BMI >95th percentile) child or adolescent, in addition to the above	<u>Hemoglobin A1c</u> (accepted screen for diabetes) <u>Aspartate transaminase and alanine transaminase</u> (screen for fatty liver) <u>Fasting lipid panel</u> (screen for dyslipidemia)
Optional tests to be obtained on the basis of history, physical examination, and initial studies	Fasting serum glucose for those at high risk for diabetes mellitus <u>Thyroid-stimulating hormone</u> <u>Drug screen</u> <u>Sleep study</u> (if loud snoring, daytime sleepiness, or reported history of apnea) Complete blood count, especially in those with growth delay or abnormal renal function

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Pediatrics. 2017;140(3):e20171904

To echo or not?

- ▶ It is recommended that echocardiography be performed to assess for cardiac target organ damage (left ventricular mass, geometry, and function) at the time of consideration of pharmacologic treatment of HTN.
- ▶ Repeat echocardiography to monitor patients with LVH or abnormal left ventricular function

Treatment

- ▶ To achieve an optimal BP level: (non pharmacologic and pharmacologic)
 - <90th percentile / <130/80 mm Hg in adolescents
 - Children or adolescents with both CKD and HTN should be treated to lower 24-hour mean arterial pressure
 - DM Type 1 and 2, need to be assessed for hypertension at every visit, treated if BP \geq 95th percentile or $>130/80$ mm Hg in adolescents ≥ 13 years of age.

Lifestyle modifications

- ▶ the DASH (Dietary Approaches to Stop Hypertension) diet
 - emphasizes vegetables, fruits and low-fat dairy foods — and moderate amounts of whole grains, fish, poultry and nuts. Standard diet is < 2300 mg sodium, and low sodium diet is < 1500 mg sodium.
- ▶ and recommend moderate to vigorous physical activity at least 3 to 5 days per week (30–60 min per session) to help reduce BP

Pharmacologic agents

▶ Indications

- Failed lifestyle modifications, particularly those who have LVH on echocardiography
- Symptomatic HTN
- Stage 2 HTN without a clearly modifiable factor

▶ 1st line agents may include

- Angiotensin-converting enzyme (ACE) inhibitor or angiotensin receptor blocker (ARB) – Lisinopril >6 years if age
- Long-acting calcium channel blocker (amlodipine)
- Thiazide diuretic
- In CKD or diabetes: ACE inhibitor or ARB

Follow up and monitoring

- ▶ Patients treated with lifestyle change only
 - seen every 3–6 months to assess success of BP reduction and to reassess need for pharmacologic treatment.
- ▶ Patients treated with antihypertensive medications
 - should be seen every 4–6 weeks for dose adjustments until goal BP is reached, then every 3–4 months.

ABPM may be used to assess treatment effectiveness in children and adolescents with HTN, especially when clinic and/or home BP measurements indicate insufficient BP response to treatment.

Regardless of apparent control of BP with office measures, children and adolescents with CKD and a history of HTN should have BP assessed by ABPM at least yearly to screen for MH.

Hypertension in an athlete

- ▶ There is no evidence that exercising while hypertensive increases sudden death risk.
- ▶ Physical activity and improved physical fitness are treatments for HTN.
- ▶ Children and adolescents with HTN may participate in competitive sports once hypertensive target organ effects and CV risk have been assessed.
- ▶ Children and adolescents with HTN should receive treatment to lower BP below Stage 2 thresholds before participation in competitive sports.

Have I given you high BP yet?



SIPRESS

"I'm going to take your blood pressure, so try to relax and not think about what a high reading might mean for your chances of living a long, healthy life."

Childhood Obesity: 14,000 Step Challenge:

- ▶ **GOAL:** Promote increased activity and appropriate sized food portions.
- ▶ **Who:** Recipients age 7-11 with diagnosis code for being overweight in past 12 months. Parent/recipient willing, ready, committed.
- ▶ **How:** PCP provides recipient contact information and GCTC performs outreach.
- ▶ **What:** Recipients are provided a USDA My Plate (portioned), pedometer, My Plate Refrigerator Magnet, and educational material. Recipients will use pedometer daily and track the number of steps taken. Bi-weekly reporting of steps via text
- ▶ **When:** 12 continuous weeks. Completion recipient receives an incentive.

14,000 Step Challenge: 7-11 yrs and Overweight

5-2-1-0 EVERY DAY!

Follow the 5-2-1-0 message to a

- 5 or more fruits & vegetables
- 2 hours or less recreational screen time*
- 1 hour or more of physical activity
- 0 sugary drinks, more water

Aim to eat a wide variety of brightly colored fruits and vegetables. Fill half of your plate with fruits and vegetables. Frozen and canned are just as nutritious. Try new fruits and vegetables to discover new tastes.

Keep TV and computer out of the bedroom. No screen time under the age of 2. Turn off screens during meal time. Plan ahead for your screen time instead of watching TV.

Take a family walk. Turn on the music and dance. Use the stairs. Choose activities that you enjoy!

Keep sugary drinks out of the grocery cart. Drink water when you are thirsty. It's the #1 rule. Keep a water bottle with you. Put limits on sugary drinks.

For more ideas visit [www.choosemyplate.gov](#)

Eat Smart

Get the MyPlate Habit!

The 14,000 Step CHALLENGE

Move, Play, Exercise, and Get Healthy
by Taking 14,000 Steps a Week!

14,000 STEP CHALLENGE KIT INCLUDES:

- Wrist pedometer
- Portion plate
- Tracker for recording your daily steps
- Refrigerator magnet
- Education on healthy eating and exercise

The 14,000 Step Challenge lasts 12 weeks.

Physician referral is required.

Get moving and text weekly photos to be eligible to receive fun prizes!

KIDS: ARE YOU READY TO TAKE THE PLEDGE?

- Move, play, and exercise every day.
- Ideas for outside: walk, run, jump, play ball, shoot hoops, ride a bike, skateboard, ride a scooter, and hike hoops.
- Ideas for inside: dance, do a workout video, march in place, do floor exercises, and play balloon volleyball.

Wear your wrist pedometer all day, every day.

- At bedtime, take off your wrist pedometer and write down the number of steps you moved that day.
- Don't forget to put it back on every morning.

Eat foods that make you strong.

- Use your Portion Plate to eat the right amount of food to be healthy.

PARENTS: ARE YOU READY TO TAKE THE PLEDGE, TOO?

- Complete a telephone assessment with a care coordinator.
- Encourage your child to move, play, and exercise every day.
- Text a photo of your child's tracker every week.
- Have healthy foods and snacks in your home.
- Help your child choose the right serving sizes by using the Portion Plate.

Use MyPlate for better health!

ChooseMyPlate.gov



Recipient List or Participation in QIP

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