

No Pressure

Understanding the 2017 AAP Hypertension Guidelines

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Disclosures

Consulting editor for DynaMed Plus

I do not intend to discuss this product in the course of the presentation.



Objectives

- Review major recommendations of the 2017 AAP Guidelines on Hypertension
- Highlight the key differences and changes between the 2004 and 2017 guidelines
- Highlight practical and logistical issues for primary care practitioners as it relates to new recommendations



Case

- Kara is an adorable and energetic 8 year old who presents with her mom for evaluation of nasal congestion and ear pain. After doing a cartwheel into the triage room to get her vitals per office protocol her BP is documented as 115/75. She is 134 cm (75th %ile) for height and weight is 27.7 kg (50th %ile) with BMI 15.3 (25th %ile).
- You masterfully manage her URI symptoms and otalgia. As you are doing a final review before sending her on her way, your eye catches the BP and your gut thinks this seems high and warrants a little more thought.



Clinical Questions

- Is her blood pressure “high?”
- Should she have had her BP checked at this acute care visit?
- Was her BP taken appropriately?
- What are the next steps in follow up?



Blood Pressure Categories

2004

BP Category	Blood Pressure percentile (Children)
Stage I Hypertension	$\geq 95^{\text{th}}$ to $< 99^{\text{th}} + 5$ mmHg
BP Category	Blood Pressure percentile (Adolescents)
Stage I Hypertension	$\geq 95^{\text{th}}$ to $< 99^{\text{th}} + 5$ mmHg (regardless if $< 90^{\text{th}}$)

2017

BP Category	Blood Pressure percentile/value mmHG (Age 1-13 years)
Normal	$< 90^{\text{th}}$
BP Category	Blood Pressure mmHG (Age ≥ 13 years)
Normal	$< 120 / < 80$
Stage I Hypertension	130-139/80-89

*Whichever is lower



Blood Pressure Categories

2017

2004

BP Category	Blood Pressure percentile (Age 1-13 years)
Normal	< 90 th
Prehypertension	90 th to < 95 th
Stage I Hypertension	≥ 95 th to 99 th +5 mmHg
Stage II Hypertension	> 99 th + 5 mmHG
BP Category	Blood Pressure percentile (Adolescents)
Normal	< 90 th
Prehypertension	90 th to < 95 th or >120/80 (regardless if < 90 th)
Stage I Hypertension	≥ 95 th to < 99 th +5 mmHg
Stage II Hypertension	> 99 th + 5 mmHG

BP Category	Blood Pressure percentile/value mmHG (Age 1-13 years)
Normal	< 90 th
Elevated	90 th or 120/80* to < 95 th
Stage I Hypertension	≥ 95 th to < 99 th +12 mmHg OR 130-139/80-89*
Stage II Hypertension	> 99 th + 12 mmHG OR ≥140/90*
BP Category	Blood Pressure mmHG (Age ≥ 13 years)
Normal	< 120/<80
Elevated	120-129/<80
Stage I Hypertension	130-139/80-89
Stage II Hypertension	≥ 140/90

*Whichever is lower



New Normative BP Tables

- New tables do not include data from overweight and obese children (BMI \geq 85th %ile)
- Result is a lowering of BP table values of several millimeters from 2004 report
- Actual heights in addition to height percentiles on charts
- 95th %ile + 12 mmHG added as category with removal of 99th %ile



Comparisons for a 12 yo boy

Age, y	BP Percentile	SBP, mm Hg							DBP, mm Hg						
		Percentile of Height							Percentile of Height						
		5th	10th	25th	50th	75th	90th	95th	5th	10th	25th	50th	75th	90th	95th
12	50th	101	102	104	106	108	109	110	59	60	61	62	63	63	64
	90th	115	116	118	120	121	123	123	74	75	75	76	77	78	79
	95th	119	120	122	123	125	127	127	78	79	80	81	82	82	83
	99th	126	127	129	131	133	134	135	86	87	88	89	90	90	91

2004

Normotensive

Prehypertension

Stage I HTN

25th % ile height: 117/74

50th % ile height: 121/79

75th % ile height: 137/89

2017

Elevated BP

Stage I HTN

Stage II HTN

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%
12	Height (in)	55.2	56.3	58.1	60.1	62.2	64	65.2	55.2	56.3	58.1	60.1	62.2	64	65.2
	Height (cm)	140.3	143	147.5	152.7	157.9	162.6	165.5	140.3	143	147.5	152.7	157.9	162.6	165.5
	50th	101	101	102	104	106	108	109	61	62	62	62	62	63	63
	90th	113	114	115	117	119	121	122	75	75	75	75	75	76	76
	95th	116	117	118	121	124	126	128	78	78	78	78	78	79	79
	95th + 12 mm Hg	128	129	130	133	136	138	140	90	90	90	90	90	91	91



Back to our Case

Kara 8 yo 75th % ile height with BP 115/75

2004

Blood Pressure Levels for Girls by Age and Height Percentile*

Age (Year)	BP Percentile ↓	Systolic BP (mmHg)							Diastolic BP (mmHg)						
		← Percentile of Height →							← Percentile of Height →						
		5th	10th	25th	50th	75th	90th	95th	5th	10th	25th	50th	75th	90th	95th
8	50th	95	95	96	98	99	100	101	57	57	57	58	59	60	60
	90th	108	109	110	111	113	114	114	71	71	71	72	73	74	74
	95th	112	112	114	115	116	118	118	75	75	75	76	77	78	78
	99th	119	120	121	122	123	125	125	82	82	83	83	84	85	86

2017

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%
8	Height (in)	47.6	48.4	49.8	51.4	53	54.5	55.5	47.6	48.4	49.8	51.4	53	54.5	55.5
	Height (cm)	121	123	126.5	130.6	134.7	138.5	140.9	121	123	126.5	130.6	134.7	138.5	140.9
	50th	93	94	95	97	98	99	100	56	56	57	59	60	61	61
	90th	107	107	108	110	111	112	113	69	70	71	72	72	73	73
	95th	110	111	112	113	115	116	117	72	73	74	74	75	75	75
	95th + 12 mm Hg	122	123	124	125	127	128	129	84	85	86	86	87	87	87

Case Continued

Kara *appears* to have a BP in the Stage I HTN range. Before your blood pressure elevates trying to remember the next steps, you think about her savvy and enthusiastic entrance and wonder about the validity and appropriateness of the initial reading.



Blood Pressure Screening and Measurement

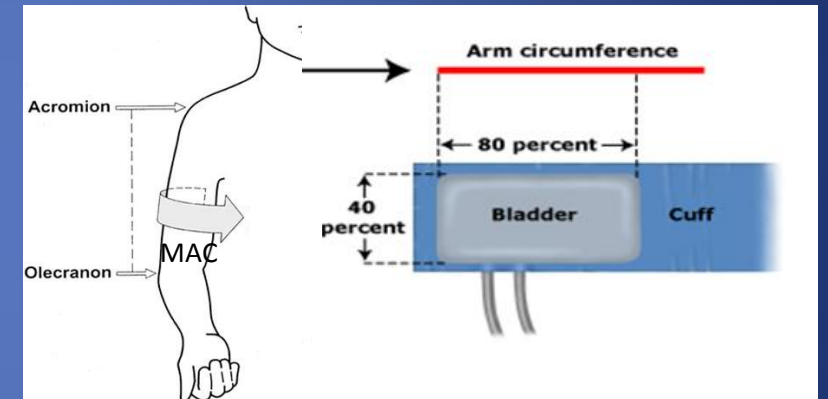
- 2004 Guidelines recommended screening BP be performed in all healthy children ≥ 3 years old at every medical encounter
- 2017 Guidelines recommend BP screening in all healthy children ≥ 3 years old annually
- Children with obesity, diabetes, chronic kidney disease, and aortic arch obstruction/coarctation, or on medication which can raise BP should have BP performed at every encounter



Measuring BP

Cuff Size and Placement

- Take BP in the right arm
- Measure mid-arm circumference (MAC)
- Bladder length should be 80%-100% of MAC
- Cuff width should be 40% of the MAC
- Lower end of cuff should be 2-3 cm above antecubital fossa



Measuring BP

- Oscillometric Readings may be used for screening but need to be confirmed by auscultation if abnormal
- Patient should be seated and quiet for 2-3 minutes
- Arm passively resting at heart level
- For auscultation cuff inflated to 20-40 mmHg above loss of radial pulse and then deflated at 2-3 mmHg/second
- Readings taken at onset and disappearance of Korotkoff sounds while auscultating with the bell of the stethoscope



Simplified BP Screening Table

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

Recording BP

- An elevated initial reading should be followed by 2 additional measurements and averaged
- If still elevated and the BP was measured by auscultation, the measurement can be used to classify the degree of elevation
- If initial elevated measurements were by oscillometry, 2 additional measurements should be performed by auscultation and averaged to derive the BP used to classify the degree of elevation



Case Resolution

You re-check Kara's BP twice at the end of the visit after she is calm, using the right size cuff and technique and, thankfully, her BP is normal. As she and her mom depart after taking the last sticker, you make a note to ask your nurse manager to

1. Change the intake protocol to screen BP in children without chronic conditions only at annual Well Checks
2. Perform an in-service on appropriate BP measurement with the clinical staff
3. Use the screening BP table until IT has the bandwidth to get the new normative BP values into the EMR.
4. Buy more *COOL* stickers, not the *LAME* ones like last time!



Next Case

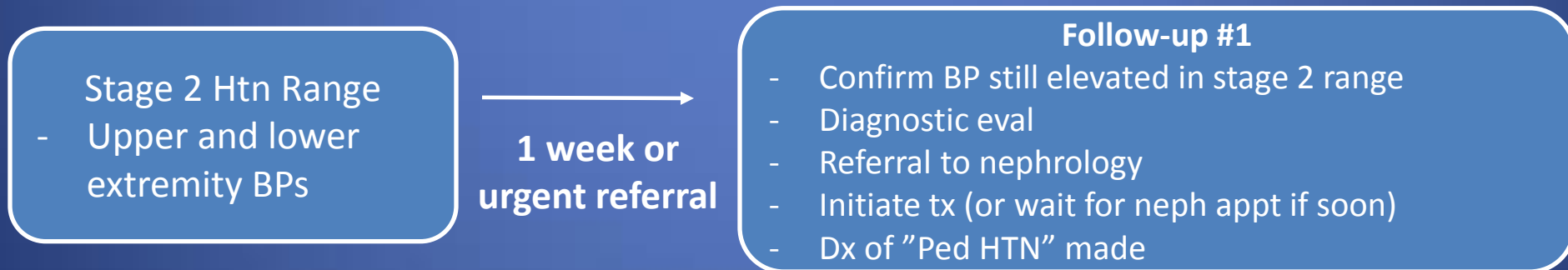
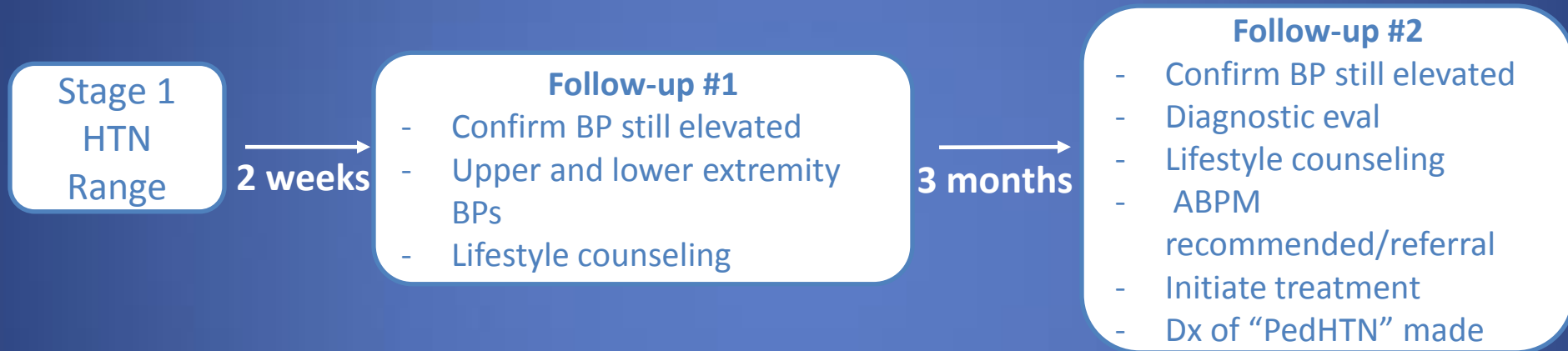
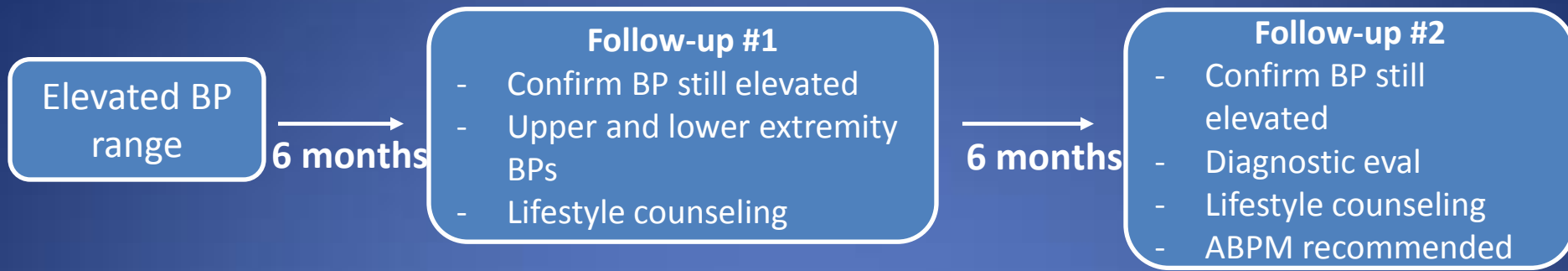
Sam is an 11 YO precocious young man presenting for his Well Child Check. He's great other than failing his hearing and vision – no doubt from his self-reported on-line gaming addiction. As you counsel him on cutting back screen time to less than 2 hours/day, you note his BP (taken appropriately multiple times by auscultation in triage) to be 119/78. You identify this as being in the Stage I HTN range by percentile. He has a normal BMI and benign history and physical.



Clinical Questions

- What are the next steps in evaluating abnormally elevated blood pressure?
- What is required to make the diagnosis of Hypertension?
- What is the work up of persistent elevated BP and Hypertension?
- How do overweight/obesity and other chronic illnesses alter workup?



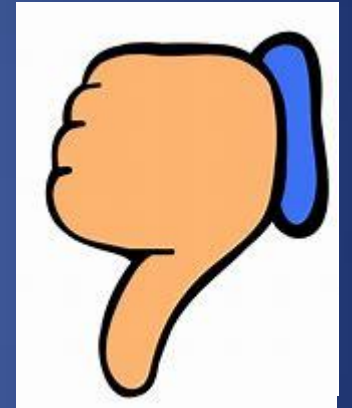


BP Category (see Table 3)	BP Screening Schedule	Lifestyle Counseling (Weight, Nutrition)	Check Upper and Lower Extremity BP	ABPM ¹	Diagnostic Evaluation ²	Initiate Treatment ³	Consider Subspecialty Referral
Normal	Annual	X					
	Initial measurement	X					
Elevated BP	Second measurement: Repeat in 6 months	X	X				
	Third measurement: Repeat in 6 months	X		X	X		X
	Initial measurement	X					
Stage 1 HTN	Second measurement: Repeat in 1-2 weeks	X	X				
	Third measurement: Repeat in 3 months	X		X	X	X	X
	Initial measurement	X	X				
Stage 2 HTN ⁴	Second measurement: Repeat/refer to specialty care within 1 week	X		X	X	X	X
	Initial measurement	X	X				



Ambulatory Blood Pressure Monitoring (ABPM)

- ~~Now officially recommended~~ (if available) for all patients with office diagnosed elevated BP or HTN
- ~~Not readily available~~
- Limited to children ≥ 5 years at least 120 cm tall due
 - More accurate for diagnosis than office
 - More predictive of future BP
- Limited to children who can tolerate the procedure
 - Can assist in detection of secondary hypertension
- ~~No data for hard CV outcomes in children~~
 - Can avoid unnecessary evaluation and treatment of patients with white coat hypertension



Diagnostic Evaluation

- Focuses on determining causes and assessing for comorbidities of HTN
- Comprehensive History and Physical assessing for secondary causes and risk factors
- Extent of testing directed by results of H&P



Characteristics Suggestive of Primary HTN

- Age \geq 6 years
- Overweight/Obesity
- Family history in first or second degree relative
- Severity of HTN does NOT reliably distinguish between primary and secondary in most studies

An extensive evaluation is not required for children \geq 6 years with overweight/obesity, a positive family history, and a normal exam



Universal Tests for Confirmed HTN

- Urinalysis (UA)
- Basic Metabolic Panel (including electrolytes, BUN, Creatinine)
- Lipid Profile (fasting or non-fasting)
- Renal Ultrasound if < 6 years of age or abnormal UA or renal function
- If Obese (BMI >95th %ile) also obtain
 - HBA1C
 - AST and ALT (Screening for Fatty Liver)
 - Lipid panel should be done fasting



Tests No Longer Universally Recommended for HTN at Time of Diagnosis

- Renal Ultrasonography
- CBC
- Retinal Exam
- Echocardiography
- For young children or with stage II HTN (not mentioned in new guideline)
 - Plasma Renin
 - Plasma and urine steroid levels
 - Plasma and urine catecholamines



Directed Testing

- Based on findings from the history and/or physical additional tests may include
 - Fasting Glucose (if at high risk for DM)
 - Complete Blood Count
 - TSH
 - Drug Screen
 - Sleep Study
 - Renal US +/- Doppler
 - CTA or MRA of kidneys
- ← Consultation with a subspecialist is recommended to help decide which patients warrant further investigation



Tests Not Recommended Routinely

- ECG - Not sensitive
- Uric Acid – No clear evidence yet of causal role
- Microalbuminuria



Back to the Case

Sam returned 2 weeks later and then 3 months after that, at which time review of his workup revealed Stage I Hypertension with normal upper/lower extremity difference in BP, normal UA, chemistries, renal function, and Lipid Profile. You were unable to get ABPM. He has made lifestyle changes including active outdoor exercise even though it cuts into his computer game time!



Clinical Questions

- What are the next steps in evaluation and management?
- What are the BP treatment goals?
- What are the recommended treatments for Hypertension ?
- How often should a patient with Hypertension be followed up?



Actions Upon Diagnosis

- For patients with elevated BP or HTN lifestyle interventions should be recommended
 - DASH diet
 - Moderate to vigorous physical activity 3-5 days/week for 30-60 minutes/session
 - Consider complementary medicine such as stress reduction and yoga



Actions Upon Diagnosis

- Stage I Hypertension
 - Consider referral to a specialist
 - If has failed trial of lifestyle interventions initiate pharmacologic therapy
 - Obtain an echocardiogram to assess for LVH prior to initiating pharmacologic therapy
- Stage II Hypertension
 - Initiate treatment or refer to specialist within 1 week
 - Obtain an echocardiogram



Treatment Goal

- Reduce both SBP and DBP to $< 90^{\text{th}}$ %ile and $< 130/80$ in children ≥ 13 years



Medications

- First agent should be one of
 - ACEI/ARB (not if risk of becoming pregnant)
 - Long-acting Calcium Channel Blocker
 - Thiazide diuretic



Follow up

- See patient every 4-6 weeks for reassessment and drug titration until at goal
- Once at goal, follow-up every 3-4 months
- If a decision to proceed with lifestyle changes only, follow up in 3-6 months
- Home BP measurement can be used to help assess treatment effectiveness and adherence
- ABPM can be used as well, especially when clinic and home measurements are insufficient



Considerations for “Treatment Resistant” HTN

- Assess understanding of medications and dosing
- Assess adherence (consider reviewing pharmacy fill dates)
- Assess for use of substances or medications which may increase BP or interfere with prescribed medications
- Consider further sodium restriction
- Consider an aldosterone receptor antagonist such as Spironolactone



Take Home Points

- New Definitions of elevated BP and HTN with more detail on making the diagnosis
- New normative BP tables which will lead to more patients being classified as having elevated BP and HTN
- Emphasis on using ABPM to confirm the diagnosis
- Less extensive testing for most, with a focus on lifestyle changes, medication management, and follow up
- Refer patients with stage 2 HTN and consider referral in patients with stage 1 HTN to specialist for consideration of additional testing modalities and initial management of HTN



Questions?



References

1. 2017 AAP Guidelines for Childhood Hypertension: Highlights. https://www.youtube.com/watch?v=Yso_Ez691qw. Accessed March 26, 2018.
2. Flynn JT, Kaelber DC, Baker-Smith CM, et al; 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(6).
3. The fourth report on the diagnosis, evaluation, and treatment of high blood pressure in children and adolescents. *Pediatrics*. 2004;114(2 Suppl 4th Report):555-576.

