

Hypertension in Children and Adolescents: 2019 Primary Care Update

Fall Update in Family Medicine

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Objectives

At the end of this session, participants will be able to:

- Define "elevated blood pressure" and "hypertension" values and identify patients at risk.
- Evaluate pediatric and adolescent patients with elevated blood pressure measurements by performing ambulatory blood pressure monitoring and completing the appropriate hypertension workup.
- Initiate hypertension treatment in adolescents as appropriate.

What is high blood pressure?

	Under 13 years	13 and up
Elevated BP	≥ 90 th percentile for age, sex, height	SBP 120-129 and DBP < 80
Hypertension	≥ 95 th percentile for age, sex, height	SBP ≥ 130 or DBP ≥ 80
<i>Stage 1 – HTN less than stage 2 criteria</i>		
<i>Stage 2</i>	≥ 95 th percentile + 12 mmHg	SBP ≥ 140 or DBP ≥ 90

- Categories
 - Primary (essential)
 - Secondary (underlying cause)

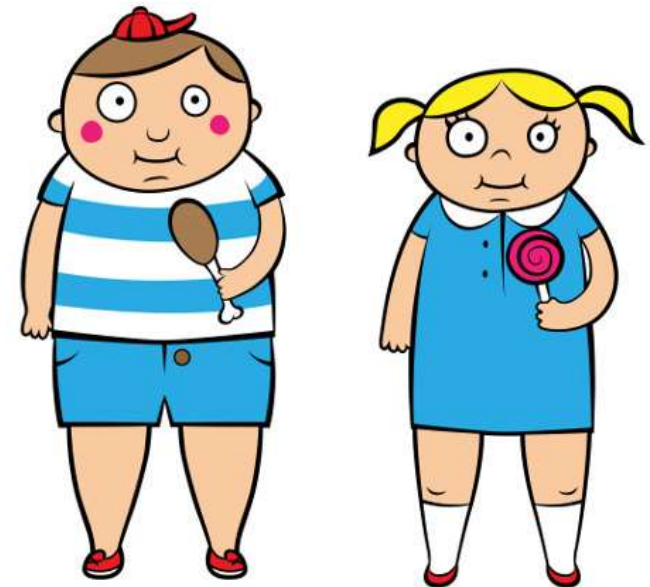
What's
different since
2017?

Epidemiology

- Where do we stand?
 - 6-7% of adolescent population with elevated blood pressure or hypertension
 - 30% of obese adolescent males; 25% of obese adolescent females
 - Males > Females
 - Ethnic minorities > Caucasian
- Why does it matter?
 - Lifelong consequences
 - Obesity epidemic

Who is at risk?

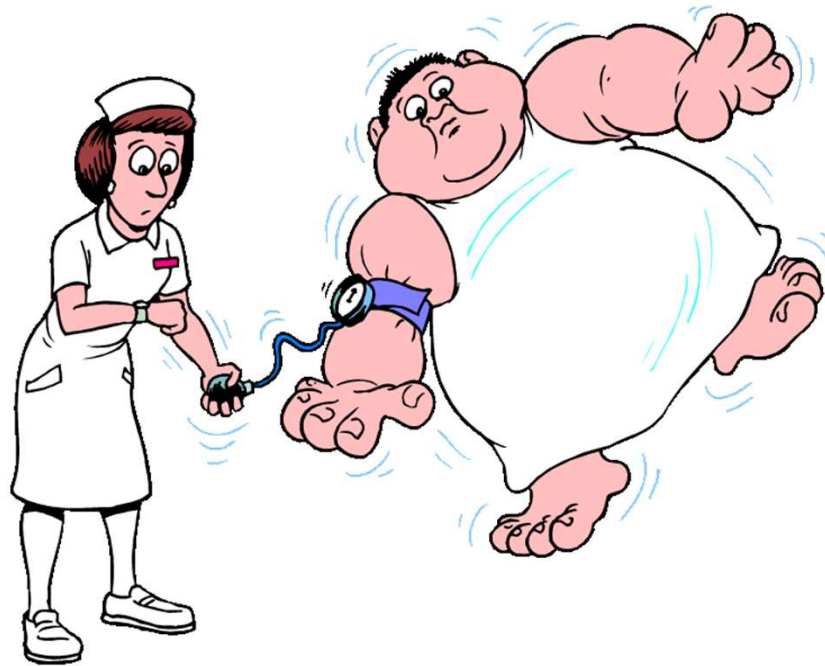
- Risk Factors
 - Adiposity
 - Sleep disordered breathing (i.e., sleep apnea)
 - Chronic kidney disease (CKD)
 - Low birth weight
 - Family history
 - Maternal smoking
- Protective Factors
 - Breastfed



<https://www.consumeraffairs.com/high-blood-pressure>

Diagnosis

- Straightforward cutoffs \neq easy to establish diagnosis



<http://www.laughinggif.com/view/f1w1lqskoq/51.html>

Diagnosis

- Who should be screened?
 - Annually at age 3
 - Any patient with risk factors- at every visit.

Diagnosis

- Measurement of accurate blood pressure
 - Appropriate cuff size
 - Position Correctly
 - If first measurement high with oscillometric device, repeat manually at least twice and average.
 - Awareness of factors that may influence blood pressure reading.
 - Caffeine intake, medications, anxiety, etc

Diagnosis

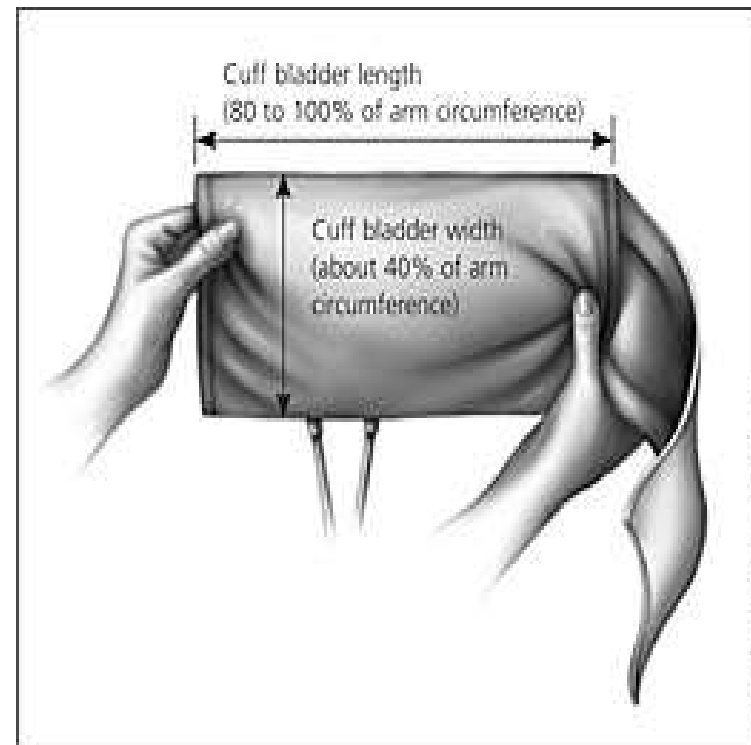
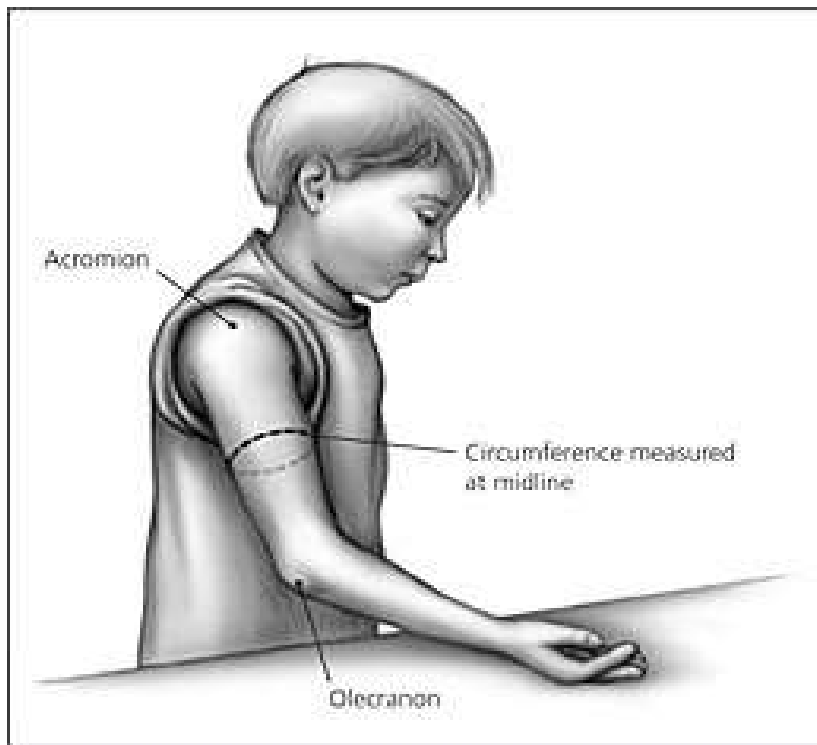
A appropriate sized blood pressure cuff is one with an inflatable bladder width at least ___ percent of the arm circumference with a bladder length that is ___ percent of the arm circumference.

- A: 60, 75
- B: 40, 80-100
- C: 50, 75
- D: 50, 80-100



Pop Quiz!

Diagnosis



Diagnosis

- Measurement of accurate blood pressure
 - Appropriate cuff size
 - Position Correctly
 - If first measurement high with oscillometric device, repeat manually at least twice and average.
 - Awareness of factors that may influence blood pressure reading.
 - Caffeine intake, medications, anxiety, etc

Diagnosis

- Position Correctly
 - Patient with feet flat on the floor
 - Measure with right arm supported at the level of the heart
 - Why? Because coarctation of the aorta may lead to falsely low readings in the left arm

Diagnosis

- Appropriate cuff size
- Position Correctly
- If first measurement high with oscillometric device, repeat manually at least twice and average.
- Awareness of factors that may influence blood pressure reading.
 - Caffeine intake, medications, anxiety, etc

Diagnosis

- Factors that can increase blood pressure:

Diagnosis

Pop Quiz!

What happens after a child or adolescent has a high reading in the office?

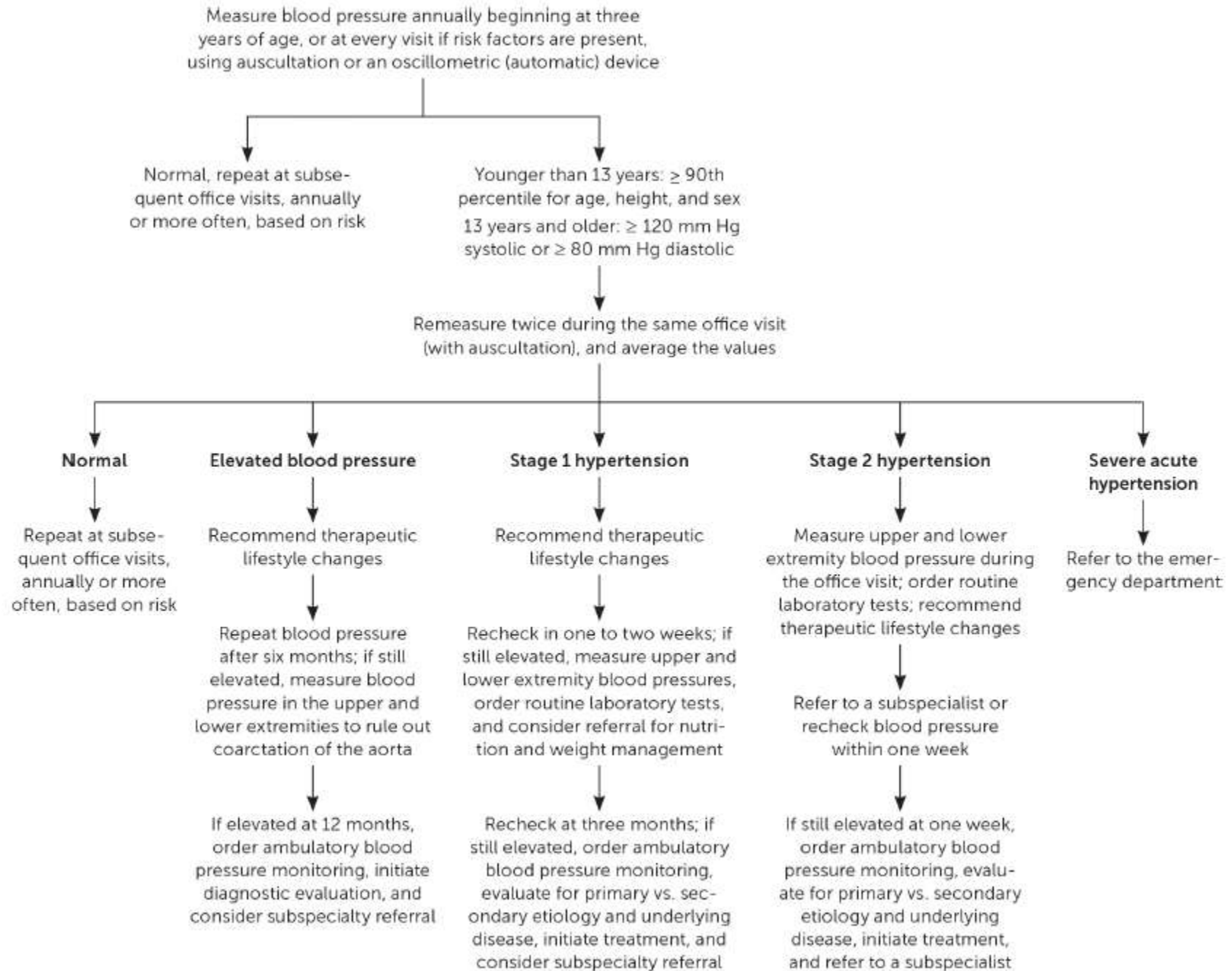
A: You schedule the patient for follow up for the blood pressure at a separate visit

B: You refer to a pediatric nephrologist

C: They are here for an STI and are probably just nervous- we'll see what it is next time.

D: You didn't notice the blood pressure value until after they left.

DEPARTMENT OF FAMILY MEDICINE



Diagnosis

- Ambulatory blood pressure monitoring
 - Does not mean that child or adolescent checks blood pressure at home or pharmacies
 - Does not mean a wrist cuff or other device that can be purchased at a pharmacy
 - Refers to a validated device that checks blood pressure every 20-30 min around the clock.
 - Specialist consultation typically needed

Diagnosis

- History
 - Birth history, previous urologic, renal, cardiac, endocrine disease, obesity
 - Drugs: stimulants, caffeine, OTC medications, illicit substances.
 - Sleep history
 - Family history
 - Mental health history
 - Dietary and exercise history

Diagnosis

- Physical Exam Findings
 - Usually normal
 - BMI vs poor growth
 - Screen for coarctation: measure in right and left arm, one leg
 - BP normally 10-20 mmHg higher in legs, equal in arms
 - Abdominal bruit
 - Ambiguous genitalia

Diagnosis

- Diagnostic Testing
 - No extensive evaluation needed in children ages 6+ who are overweight or obese, have a family history, and/or normal history and physical.
 - If secondary HTN suspected- targeted work up indicated.

Diagnosis

- Diagnostic testing
 - All children or adolescents with persistent elevation of blood pressure
 - BMP, urinalysis to assess for renal disease
 - Lipid profile to assess for additional CVD risk factor
 - Obese children or adolescents
 - Fasting glucose or A1c and AST/ALT: assess for fatty liver and diabetes as additional CVD risk factors
 - Children or adolescents with abnormal UA
 - Renal ultrasound and CBC to evaluate for underlying renal disease

Diagnosis

- Diagnostic Testing Continued
 - Children or adolescents with history suggestive of sleep disorder
 - Sleep study to rule out obstructive sleep apnea
 - Children or adolescents with history suggestive of substance abuse
 - Drug screen - if positive, appropriate referrals
 - Children or adolescents in whom pharmacotherapy is being consider (usually stage 2)
 - Echocardiography - to assess for cardiac target organ damage

Who should be followed or treated?

- “Elevated BP” or worse

	Under 13 years	13 and up
Elevated BP	≥ 90 th ile for age, sex, height	SBP 120-129 and DBP < 80
Hypertension	≥ 95 th ile for age, sex, height	SBP ≥ 130 or DBP ≥ 80
<i>Stage 1 – HTN less than stage 2 criteria</i>		
Stage 2	≥ 95 th ile + 12 mmHg	SBP ≥ 140 or DBP ≥ 90

- ≥ 90thile for age, sex, height (<13yo)
- SBP ≥ 120 (13yo+) &/or DBP ≥ 80 (13yo+)

Lifestyle Modifications

- Weight loss, intensive family-oriented behavioral weight loss program if obese
- Regular physical activity
 - 150 min moderate intensity per week
- Dietary changes
 - low salt and fat, high in fresh fruit/veggies and fiber
- Stress reduction techniques (meditation, yoga)
- Avoid caffeine, tobacco, alcohol

Lifestyle Modifications

- Typically trial 3-12 months, may stop here if BP decreases
- What about sports?
 - Athletes can play if:
 - Only “elevated blood pressure”
 - Stage 1 HTN without end organ damage
 - controlled Stage 2 HTN

Pharmacologic Therapy

- Indicated if symptomatic, evidence of end-organ damage, or Stage 2 values
 - $\geq 95^{\text{th}}$ ile + 12 mmHg or $\geq 140/\geq 90$
- No clinical trials or evidence of a “best” first choice, but use clinical judgement
- Medication initiation tips:
 - Start with lowest recommended dose
 - Lexicomp for FDA- approved weight based dosing recommendations
 - Titrate up every 2-4wk
 - May need to add a 2nd agent

Pharmacologic Therapy

- ACEI [Angiotensin converting enzyme inhibitor]
(benazepril, enalapril, fosinopril, lisinopril)
 - Best choice for chronic kidney disease, proteinuria, diabetes
 - Example: Lisinopril 5-40mg once daily
- ARB [Angiotensin receptor blocker]
(candesartan, losartan, olmesartan, valsartan)
 - May be better choice for African American children
 - Example: Losartan 25-100mg once daily
- CCB [Calcium channel blockers] (amlodipine, nifedipine)
 - Safe in pregnancy
 - Example: 30-90mg once daily
- Thiazide diuretic (chlorothiazide, hydrochlorothiazide)
 - Example: Hydrochlorothiazide 12.5-37.5mg once daily

Pharmacologic Therapy

- 2nd line medications
 - beta-blockers (metoprolol, propranolol)
 - May also help anxiety/palpitations
 - Central alpha agonist (clonidine)
 - May help with ADHD symptoms
 - Vasodilators (hydralazine, minoxidil)
 - More likely to cause headaches

**Beta blockers
are no longer
1st line!**

Case 1: 12yo AAM with BP 124/80

- CC: sports physical
 - HPI: no complaints
 - PMH: lupus – has seen peds dermatology and nephrology
 - PSH: none
 - SocialHx: unremarkable
 - FamHx: mom with lupus, MGF h/o dialysis
 - Allergies: NKDA
 - Current meds: none
 - Last 3 visit BPs: 110/70, 118/76, 126/84
 - Height/Weight: 5'2"; 111lb
 - PE: non-revealing
-
- Nephrologist hasn't seen him in 3 years
 - What else would you like to know? What will you do next?



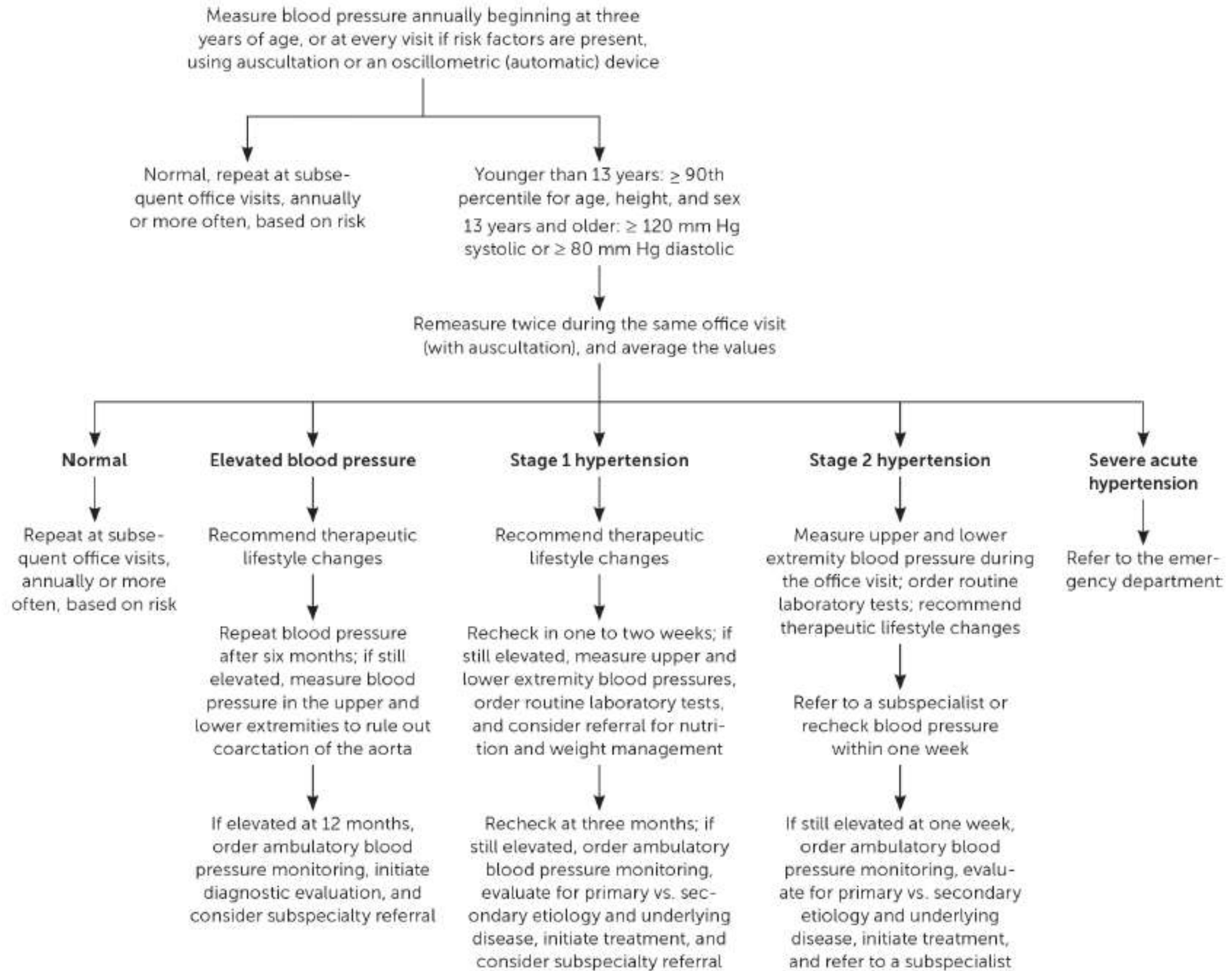
Practice with BP Tables...

- 12yo M who is 5' 2"

BP Levels for Boys by Age and Height Percentile

Age (y)	BP Percentile	SBP (mm Hg)							DBP (mm Hg)						
		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

DEPARTMENT OF FAMILY MEDICINE



Case 1: 12yo AAM with BP 124/80

- Diagnosis?
- Workup?
- Treatment plan?

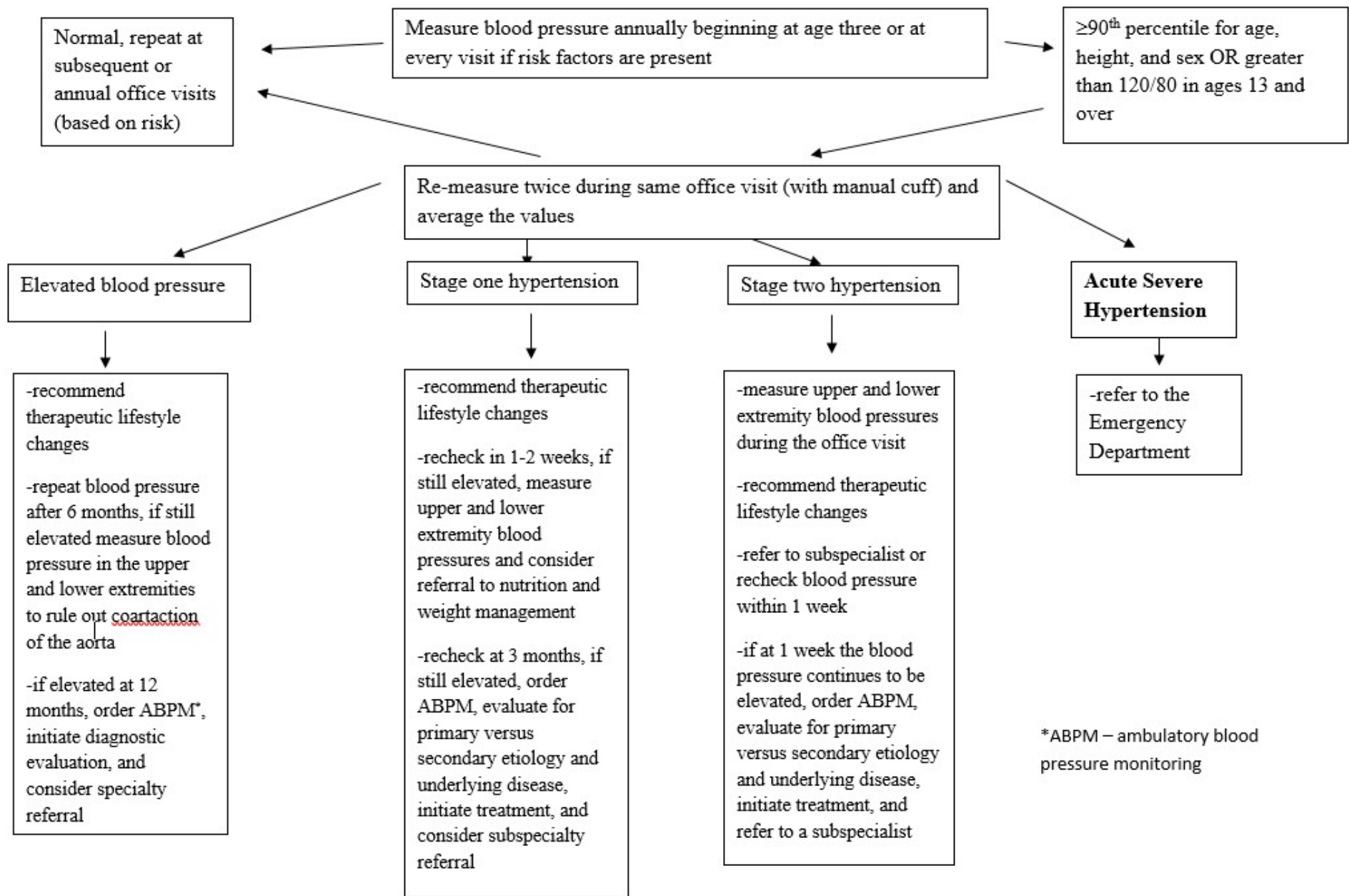
Case 2: 17yo HF with BP 142/96

- CC: wants birth control, interested in STD testing
- HPI: no complaints
- PMH: headaches, irreg menses, LMP 4/5/18
- PSH: none
- SocialHx: unremarkable
- FamHx: M-HTN; F-HTN/HLD/DM; MGF – HTN/stroke; PGF – HTN/HLD/CAD
- Allergies: NKDA
- Current meds: none
- Last 3 visit BPs: 134/86, 144/92, 140/88
- Height/Weight: 5'2"; 167lb
- PE: obese but otherwise well appearing, normal CV exam

- Interested in depo shot b/c her friend has it
- What else do you want to know? What should you do next?



Algorithm for managing elevated blood pressure in children and adolescents (AAP 2017). Original.



Case 2: 17yo HF with BP 142/96

- Diagnosis?
- Workup?
- Treatment plan?

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Objectives (Review)

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- Assist pediatric and adolescent patients with elevated blood pressure measurements in performing ambulatory blood pressure monitoring and completing the appropriate hypertension workup.
 - ABPM is most accurate, likely need specialist consult to obtain
 - Minimal workup if overweight/obese, family history, and/or normal H&P.
 - Targeted workup if secondary HTN suspected
- Initiate hypertension treatment in adolescents as appropriate.
 - Goal BP <90thile or <130/80
 - Start with lifestyle changes
 - Step-up to pharmacologic agents as appropriate

Resources

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The End

- Acknowledgements
 - Thank you to our patients!
 - Dr. Maggie Riley
 - The Corner Health Center
 - UMHS Regional Alliance for Healthy Schools

- Questions?