

# CT Children's CLASP Guideline

## Hypertension

### INTRODUCTION

High blood pressure is a significant problem in pediatric populations. Hypertension is prevalent in as high as 4% of children and adolescents. Children at increased risk of hypertension include those with: obesity/overweight, history of prematurity or low birth weight, kidney disease, heart disease, diabetes, and sleep apnea, amongst others. Of concern, damage from childhood hypertension starts in childhood with premature vascular aging, left ventricular hypertrophy, impaired cognition, and risk of both renal disease and early onset heart disease.

New clinical practice guidelines published by the American Academy of Pediatrics in 2017 updated normative values and workup and treatment guidelines for hypertension in children and adolescents. The full guideline can be accessed at:

<http://pediatrics.aappublications.org/content/early/2017/08/21/peds.2017-1904>

### INITIAL EVALUATION AND MANAGEMENT

#### INITIAL EVALUATION:

- Blood pressure should be measured at all well child checks starting at 3 years, unless more frequent monitoring is recommended (see **Appendix A: Patient Populations that Require Increased Blood Pressure Monitoring**)
- Blood pressures should be obtained by:
  - Using an appropriate cuff size (cuff bladder length should cover 80-100% of the arm circumference but not overlap itself, and the cuff bladder width should cover at least 40% of the arm length from olecranon to acromion (see **Appendix B: Appropriate Cuff Size**)
  - **Using manual measurement (i.e., not with a machine) in the right upper extremity (including infants), with the patient seated in a chair and feet flat on the floor or a stool or exam table shelf (feet MUST be on a flat surface to avoid falsely elevated blood pressure)**
  - It is NOT appropriate to obtain blood pressure on a leg at any age.
- Normal blood pressure measurements by age are listed in **Appendix C: Blood Pressure Screening Table**
  - If the patient's blood pressure is above the normal limits, refer to the American Academy of Pediatrics blood pressure chart to obtain the blood pressure percentile:  
<http://pediatrics.aappublications.org/content/early/2017/08/21/peds.2017-1904>
    - **Appendix G: Blood Pressure Levels for males by age and height percentile (see separate attachment)**
    - **Appendix H: Blood Pressure Levels for females by age and height percentile (see separate attachment)**

- Blood pressures should be repeated based on blood pressure category and stage (see [Appendix D: Blood Pressure Categories and Stages](#) and [Appendix F: Evaluation of Hypertension for Children and Adolescents](#))
  - Evaluate for concerning symptoms if the patient has Stage 2 hypertension to determine if urgent or emergent referral is necessary (i.e. acute onset of headaches, visual changes, mental status changes)
  - Evaluate for possibility of cardiac abnormality (i.e. decreased femoral pulses)
- Consider medications that may be associated with elevated blood pressure (see [Appendix E: Common Pharmacologic Agents Associated with Elevated Blood Pressure in Children](#))

**INITIAL MANAGEMENT:** See [Appendix F: Evaluation of Hypertension for Children and Adolescents](#)

- **Elevated Blood Pressure Category:** (greater than 90% but less than 95%; see [Appendix D: Blood Pressure Categories and Stages](#))
  - Trial lifestyle changes for 6 months:
    - Low sodium diet/DASH diet, please refer to <https://www.nhlbi.nih.gov/health-topics/dash-eating-plan>
    - Weight loss (for those overweight)
    - Physical activity: 30-60 minutes of moderate-to- vigorous activity 3-5x/week
  - Consider stopping or changing medications that may be associated with elevated blood pressure (see [Appendix E: Common Pharmacologic Agents Associated with Elevated Blood Pressure in Children](#))
  - Reassess blood pressure in 6 months after lifestyle changes implemented
  - If blood pressure remains elevated x3 readings in at least 2 separate office visits, obtain a urinalysis or dipstick and 4 extremity blood pressure (if able) and place a routine referral to Nephrology (please ensure patient is not menstruating).
  - It is NOT recommended to obtain an ultrasound or bloodwork prior to placing the Nephrology referral.
- **Stage 1 Hypertension Category:** (see [Appendix D: Blood Pressure Categories and Stages](#))
  - Reassess blood pressures in 1-2 weeks
  - If blood pressure remains elevated x3 readings in at least 2 separate office visits, obtain a urinalysis or dipstick and 4 extremity blood pressure (if able) and place a routine referral to Nephrology (please ensure patient is not menstruating). It is not recommended to obtain an ultrasound prior to placing the Nephrology referral.
- **Stage 2 Hypertension Category:** (see [Appendix D: Blood Pressure Categories and Stages](#))
  - Obtain a urinalysis or dipstick and 4 extremity blood pressure (if able)
    - Please ensure patient not menstruating
  - Send the patient to the Emergency Department if symptomatic (i.e. acute onset of headaches, visual changes or mental status changes)
  - Place an urgent referral to Nephrology if the patient is not symptomatic.
  - Management will be directed by Nephrology

<p><b>WHEN TO REFER</b></p>	<p><b>URGENT EMERGENCY DEPARTMENT REFERRAL:</b></p> <ul style="list-style-type: none"> <li>Patients who are symptomatic with acute onset of headaches, visual changes, or mental status changes in the setting of stage 2 hypertension (see <i>Appendix D: Blood Pressure Categories and Stages</i>)</li> </ul> <p><b>URGENT REFERRAL TO CONNECTICUT CHILDREN’S NEPHROLOGY (call provider line to discuss):</b></p> <ul style="list-style-type: none"> <li>Children with evidence of nephritis (hematuria, proteinuria, elevated creatinine)</li> <li>Patients with stage 2 hypertension who are asymptomatic</li> </ul> <p><b>ROUTINE REFERRAL TO CONNECTICUT CHILDREN’S NEPHROLOGY (within 4 weeks):</b></p> <ul style="list-style-type: none"> <li>Patients with stage 1 hypertension x 3 readings</li> <li>Patients with consistent BP readings &gt;90 percentile after trial of lifestyle changes</li> </ul> <p><b>REFERRAL TO CONNECTICUT CHILDREN’S CARDIOLOGY:</b></p> <ul style="list-style-type: none"> <li>Clinical evidence of a cardiac abnormality (i.e. decreased femoral pulses, pathologic murmur, evidence of coarctation of the aorta)</li> </ul>
<p><b>HOW TO REFER</b></p>	<p><b>Referral to Nephrology via CT Children’s One Call Access Center</b>  <a href="http://connecticutchildrens.org">Make a Referral - Connecticut Children's (connecticutchildrens.org)</a>  <b>Phone:</b> 833.733.7669 <b>Fax:</b> 833.226.2329</p> <p><b>Information to be included with the referral:</b></p> <ul style="list-style-type: none"> <li>Blood pressure measurements, most recent progress notes</li> <li>All blood work, urine studies and any imaging studies if already obtained</li> </ul>
<p><b>WHAT TO EXPECT</b></p>	<p><b>What to expect from Connecticut Children’s Visit:</b></p> <ul style="list-style-type: none"> <li>History and physical exam (including a manual blood pressure taken)</li> <li>Evaluation of prior laboratory testing</li> <li>Additional labs and imaging studies, if appropriate</li> <li>24-hour ambulatory blood pressure monitoring, if appropriate</li> <li>Counseling on dietary and lifestyle modification, if appropriate</li> <li>Initiation of treatment with anti-hypertensive agent, if appropriate</li> <li>Ascertain need for further cardiac evaluation or ophthalmologic evaluation</li> </ul>

## APPENDIX A: Patient Populations that Require Increased Blood Pressure Monitoring

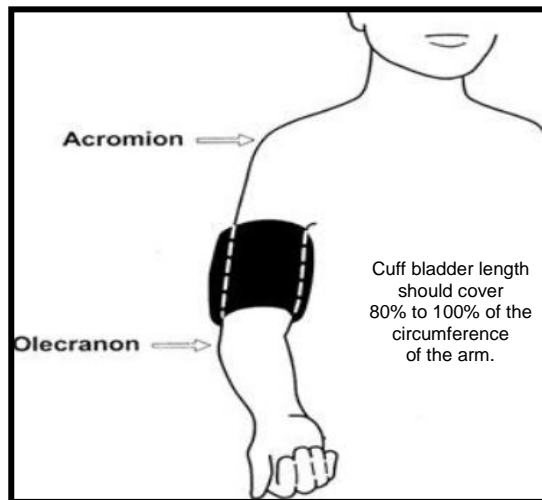
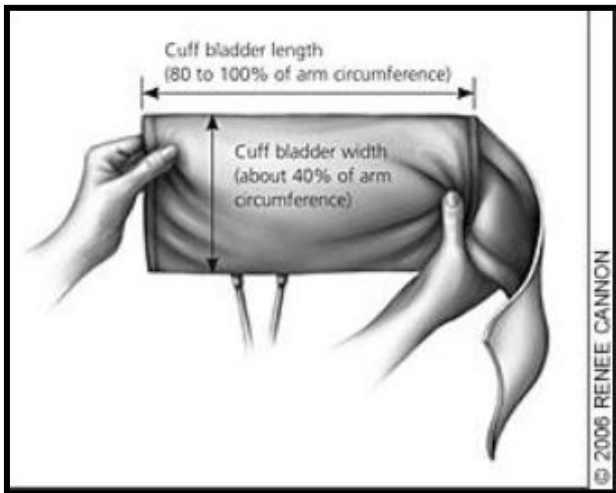
### Who Needs a BP Check Before Age 3 and/or At All Health Encounters:

- Hx of NICU stay, prematurity, SGA, VLBW
- Obesity
- Diabetes
- Treatment with drugs known to raise BP
- Congenital heart disease
- Family history of congenital renal disease
- Recurrent UTIs, hematuria, proteinuria
- Known renal disease or congenital anomalies of the kidneys or urinary tract (CAKUT)
- Solid organ transplant
- Malignancy or BMT
- Other systemic illnesses known to raise BP (NF, TS, Sickle Cell)
- Evidence of increased ICP

## APPENDIX B: Appropriate Cuff Size

- It is NOT appropriate to obtain blood pressure on a leg at any age.
- Bladder length should cover 80-100% of arm circumference but not overlap itself.
- Bladder width should cover at least 40% of arm length from acromion to olecranon.  
If patient is between 2 cuffs, use the large size cuff.

### PROPER CUFF SIZE IN CHILDREN:



## APPENDIX C: Blood Pressure Screening Table

- This table is a simplified BP screening guide for children. It is based on the 90<sup>th</sup> percentile for BP at the 5<sup>th</sup> percentile for height.
- If the patient's BP is at or below these limits, then the patient is normotensive.
- **If the patient's BP is above these limits, please consult the formal BP percentile chart located at: <http://pediatrics.aappublications.org/content/early/2017/08/21/peds.2017-1904>**

Age (year)	Blood Pressure (mm Hg)			
	BOYS		GIRLS	
	Systolic	Diastolic	Systolic	Diastolic
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

## APPENDIX D: Blood Pressure Categories and Stages

	For Children Aged 1-13 years	For Children Aged ≥13 years
Normal BP	< 90 <sup>th</sup> percentile	<120/<80 mm Hg
Elevated BP	≥90 <sup>th</sup> percentile to <95 <sup>th</sup> percentile or 120/80 mm Hg to <95 <sup>th</sup> percentile (whichever is lower)	120/<80 to 129/<80 mm Hg
Stage 1 HTN	≥95 <sup>th</sup> percentile to <95 <sup>th</sup> percentile + 12 mm Hg, or 130/80 to 139/89 mm Hg (whichever is lower)	130/80 to 139/89 mm Hg
Stage 2 HTN	≥95 <sup>th</sup> percentile + 12 mm Hg or ≥140/90 mm Hg (whichever is lower)	≥140/90 mm Hg

Flynn et al, Pediatrics, 2017

## APPENDIX E: 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

*Flynn et al, Pediatrics, 2017*

# APPENDIX F: EVALUATION OF HYPERTENSION FOR CHILDREN AND ADOLESCENTS

## EVALUATION OF HYPERTENSION FOR CHILDREN AND ADOLESCENTS

