Algorithm for Hypertension in the Pediatric Population

Children's National

Elevated blood pressure
≥90th percentile to <95th percentile **OR** 120/80 mmHg to <95th percentile (whichever is lower)

Recheck in 6 months → Remains elevated → Lifestyle interventions
Decrease salt intake

Check upper and lower extremity BP

- equal → Recheck in 6 months → BP remains elevated → **Refer to Nephrology***
- Upper > 20 mmHg than lower → **Refer to Cardiology** for structural concerns

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Stage 1 Hypertension
- Ages 1 to <13 years with BP ≥ 95th percentile to <95th percentile + 12 mmHg
- Age 13 and older with BP between 130/80 to 139/89 mmHg

Lifestyle interventions
Decrease salt intake

Recheck in 1–2 weeks
Check upper and lower extremity BP

- Upper > 20 mmHg than lower → **Refer to Cardiology** for structural concerns
- Recheck in 3 months → BP remains elevated → **Refer to Nephrology***

Children <6 years screen for renal disease:
- Urinalysis
- BMP
- Refer to Nephrology for renal ultrasound

Stage 2 Hypertension
- Ages 1 to <13 years with BP ≥ 95th percentile + 12 mmHg
- Age 13 and older with BP ≥ 140/90 mmHg

Lifestyle interventions
Decrease salt intake

Recheck in 1–2 weeks
Check upper and lower extremity BP

- Upper > 20 mmHg than lower → **Refer to Cardiology** for structural concerns
- BP remains elevated → **Refer to Nephrology***
- If not elevated → Recheck in 6 mo.

****If patient is symptomatic OR BP > 30 mmHg above the 95th percentile (or >180/120 in adolescents) refer for emergency care immediately.****

Algorithm for Hypertension in the Pediatric Population *(Continued)*

Children with certain high risk conditions are at greater risk of hypertension. Be sure to consider the following **high risk conditions:**
- Obesity
- Diabetes
- Renal disease (i.e. Chronic kidney disease)
- Premature infants
- Heart defects (i.e. aortic arch obstruction or coarctation)
- Medications known to increase BP

These children should have BP carefully monitored and have BP measured at every health encounter (in addition to every well child visit), including those before age 3.

- Seat child correctly.
- Ensure appropriate cuff size*
- Measure BP manually by auscultation.

If ≥ 90th percentile, remeasure twice and average measurements.

Determine BP percentile according to BP charts.

*Diagnosis of hypertension may be made in an office setting if a child or adolescent has **auscultatory confirmed BP readings ≥ 95th percentile** (≥ 130/80 in adolescents ≥ 13 years) **at 3 different visits.***

*Cuff size:
- Cuff width ≥ 40% of midarm circumference
- Bladder to cover ≥ 80% of the arm circumference

Exclude secondary causes of hypertension (HTN)

Perform complete past:
- Medical history
- Family history
- Sleep history

Review of systems

Physical exam

*Screening Tests (prior to referral to Nephrology)

Patient Population	Screening Tests
All patients	• Urinalysis • BMP • Lipid profile (fasting or non-fasting to include HDL and total cholesterol) • Renal ultrasonography in those <6 years or those with abnormal urinalysis or renal function
In children or adolescents with obesity (BMI >95th percentile), in addition to the above	• Hemoglobin A1c (accepted diabetes screen) • Alanine transaminase (fatty liver screen) • Fasting lipid panel (dyslipidemia screen)
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 • Thyroid-Stimulating hormone • Drug screen • Sleep study (if loud snoring, daytime sleepiness, or reported history of apnea) • CBC, especially in those with growth delay or abnormal renal function

Hypertensive Urgency

Severe elevation in BP without symptoms or evidence of acute target-organ damage ▶ *warrants immediate evaluation*

- Verify by auscultatory BP measurement, if possible
- Repeat 2-3 times

Hypertensive Emergency

Severe elevation in BP with symptoms or evidence of acute target-organ damage

- 30 mmHg > 95th percentile for children less than 13 years
- >180/120 in adolescents

Clinical judgement must be used to gauge severity of hypertension in order to determine the timing and intensity of management due to concern for acute hypertensive end-organ damage that can be life threatening.

Pediatric patients should be referred to an immediate source of care (i.e. emergency department) if BP is at the stage 2 level or > 30 mmHg above the 95th percentile for children < 13 years of age or > 180/120 in an adolescent

Hypertension and Competitive Sports Participation

Hypertension Stage	Participation Level
Any athlete with hypertension should be evaluated by Nephrology to look for signs of end organ damage (specifically LVH on echocardiogram) ▶ **immediate urgent referral if symptomatic**	
Elevated BP	No limitations
Stage 1 HTN	• No limitations in children with no LVH, heart disease • Limit competitive athletics in children with LVH until BP is normalized by appropriate pharmacologic therapy
Stage 2 HTN	Restrict high static activities (gymnastics, martial arts, sailing, sport climbing, water skiing, weight lifting, windsurfing, body building, downhill skiing, skateboarding, snowboarding, wrestling, boxing, kayaking, cycling, decathlon, rowing, speed skating, triathlon) until BP is controlled with lifestyle modification or pharmacologic therapy

Normal BP SBP/DBP at < 90th percentile for age, sex, and height

Simplified Blood Pressure Table for Initial Screening, Blood Pressure Values Requiring Further Evaluation

Age (years)	BP, mmHg			
	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
	120	80	120	80

BP measurements are based on the 90th percentile BP for age and sex for children at the 5th percentile of height

Sources:

- *Approach to hypertensive emergencies and urgencies in children, Uspal et al., UpToDate*
- *Children's Hospital Association Consensus Statements for Comorbidities of Childhood Obesity, Estrada et al., Childhood Obesity, doi: 10.1089/chi.2013.0120*
- *Clinical Overview of hypertensive crisis in children, Wen-Chieh et al., World Journal of Clinical Cases, doi: 10.12998/wjcc.v3.i6.510*
- *Clinical Practice Guideline for Screening and Management of High Blood Pressure in Children and Adolescents, Flynn et al., American Academy of Pediatrics Clinical Practice Guidelines, https://doi.org/10.1542/peds.2017-1904*
- *Department of Nephrology, Children's National Hospital*
- *Evaluation of Hypertension in children and adolescents, Mattoo, UpToDate*