CLINICAL PRACTICE GUIDELINE Guidance for the Clinician in Rendering Pediatric Care

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN™

Clinical Practice Guideline for Screening and Management of High Blood Pressure in Children and Adolescents

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Hypertension

Treatment and Prevention

in

Children and Adolescents

Overall Goals

In both primary and secondary HTN, include achieving a BP level that:

- not only reduces the risk for target organ damage in childhood
- but also reduces the risk for HTN and related CVD in adulthood
- reverse target organ damages as much as possible

Several studies have shown that currently available treatment options can even reverse target organ damage in hypertensive youth.

The previous recommendations for HTN treatment target in children without CKD or diabetes were SBP and DBP <95th percentile.

but Longitudinal studies demonstrated:

-markers of target organ damage, such as increased LVMI, can be detected among some children with BP >90th percentile(or >120/80 mm Hg) but <95th percentile

-risk for subsequent CVD in early adulthood increases as the BP level in adolescence exceeds 120/80 mm Hg.

Therefore, an optimal BP level to be achieved with treatment of childhood HTN is <90th percentile or <130/80 mm Hg, whichever is lower

Key Action Statement 19. In children and adolescents diagnosed with HTN, the treatment goal with nonpharmacologic and pharmacologic therapy should be a reduction in SBP and DBP to <90th percentile and <130/80 mm Hg in adolescents ≥ 13 years old (grade C, moderate recommendation).

Aggregate Evidence Quality	Grade C
Benefits	Lower risk of childhood target organ damage, lower risk of adulthood HTN and CVD
Risk, harm, cost	Risk of drug adverse effects and polypharmacy
Benefit–harm assessment	Preponderance of benefit
Intentional vagueness	None
Role of patient preferences	Patient may have preference for nonpharmacologic or pharmacologic treatment
Exclusions	None
Strength	Moderate recommendation
Key references	11,66,103,104,416–418

Treatment and management options including:

Nonpharmacologic interventions

+

pharmacologic therapy

Nonpharmacologic Interventions:

-lifestyle modifications:

-diet

-physical activity

- lowering weight

-reduce stress

There is good evidence in adults that nutritional interventions lower BP, including clinical trials demonstrating that reducing dietary sodium results in lower BP and CV mortality, and a diet high in olive oil polyphenols lowers BP.

Studies of hypertensive youth suggest that the relationship between diet, physical activity, and BP in childhood is similar to that observed in adults.

Diet

the primary dietary strategy tested in the literature:

-The Dietary Approaches to Stop Hypertension (DASH) approach

specific elements of that diet include:

- high in fruits, vegetables, lowfat milk products, whole grains, fish, poultry, nuts, and lean red meats

- and limited intake of sugar and sweets along with lower sodium intake

TABLE 16 DASH Diet Recommendations

Food	Servings per Day
Fruits and vegetables	4–5
Low-fat milk products	≥2
Whole grains	6
Fish, poultry, and lean red meats	≤2
Legumes and nuts	1
Oils and fats	2–3
Added sugar and sweets (including sweetened beverages)	≤1
Dietary sodium	<2300 mg per d

Adapted from Barnes TL, Crandell JL, Bell RA, Mayer-Davis EJ, Dabelea D, Liese AD. Change in DASH diet score and cardiovascular risk factors in youth with type 1 and type 2 diabetes mellitus: the SEARCH for Diabetes in Youth study. *Nutr Diabetes*. 2013;3:e91; US Department of Health and Human Services, US Department of Agriculture. Appendix 7. Nutritional goals for age-sex groups based on dietary reference intakes and dietary guidelines recommendations. In: *2015-2020 Dietary Guidelines for Americans*. Washington, DC: US Department of Health and Human Services, US Department of Agriculture; 2015; and Expert Panel on Integrated Guidelines for Cardiovascular Health and Risk Reduction in Children and Adolescents; National Heart, Lung, and Blood Institute. Expert Panel on Integrated Guidelines for Cardiovascular Health and Risk Reduction in Children and Adolescents: Summary Report. *Pediatrics*. 2011;128 (suppl 5): S213–S256.

A high intake of fruits, vegetables, and legumes (ie, a plant-strong diet) is associated with lower BP.

A lack of fruit consumption in childhood has been linked to increases in cIMT in young adulthood in the Young Finns study.

Higher intake of low-fat dairy products has been associated with lower BP in childhood.

Physical Activity

Interntional data demonstrate increasing physical activity leads to lower BP.

A review of 9 studies: 40 minutes of moderate to vigorous, aerobic physical activity at least 3 to 5 days per week improved SBP by an average of 6.6 mm Hg and prevented vascular dysfunction.

A recent analysis of 12 randomized controlled trials including 1266 subjects found reductions of 1% and 3% for resting SBP and DBP, respectively.

Any type of exercise, whether it's aerobic training, resistance training, or combined training, appears to be beneficial

Programs that combine diet and physical activity can have a beneficial effect on SBP, prevention of childhood obesity and address cardiometabolic risk.

Key Action Statement 20. At the time of diagnosis of elevated BP or HTN in a child or adolescent, clinicians should provide advice on the DASH diet and recommend moderate to vigorous physical activity at least 3 to 5 days per week (30–60 minutes per session) to help reduce BP (grade C, weak recommendation).

Aggregate Evidence Quality	Grade C
Benefits	Potential to reduce BP
Risk, harm, cost	No or low potential for harm. Following a healthier diet may increase costs to patients and families
Benefit–harm assessment	Potential benefit outweighs lack of harm and minimal cost
Intentional vagueness	None
Role of patient preferences	Level of caregiver and patient concern may influence adoption of the DASH diet and physical activity. Patients may also have preferences around the use of a medication. These factors may influence the efficacy of lifestyle change
Exclusions	None
Strength	Weak recommendation
Key references	332,339–342,424–431

Weight Loss and Related CV Risk Factors

Motivational interviewing (MI):

may be a useful to:

-address overweight and obesity in children

-improve adherence to treatment

In addition to the standard lifestyle approaches,

intensive weight-loss therapy involving regular patient and/or family contact and at least 1 hour of moderate to vigorous physical activity on a daily basis should be offered to children and adolescents with obesity and HTN

Stress Reduction

-Breathing-awareness meditation(a component of the Mindfulness-Based Stress Reduction Program), led to a reduction in daytime, nighttime, and 24-hour SBP (3–4 mm Hg) and DPB (1 mm Hg) in both normotensive and with elevated BP adolescents

-Transcendental meditation showed no significant BP effect but did lead to a decrease in LVM in African American adolescents with elevated BP.

-Data suggest yoga may also be helpful

Pharmacologic Treatment

indication:

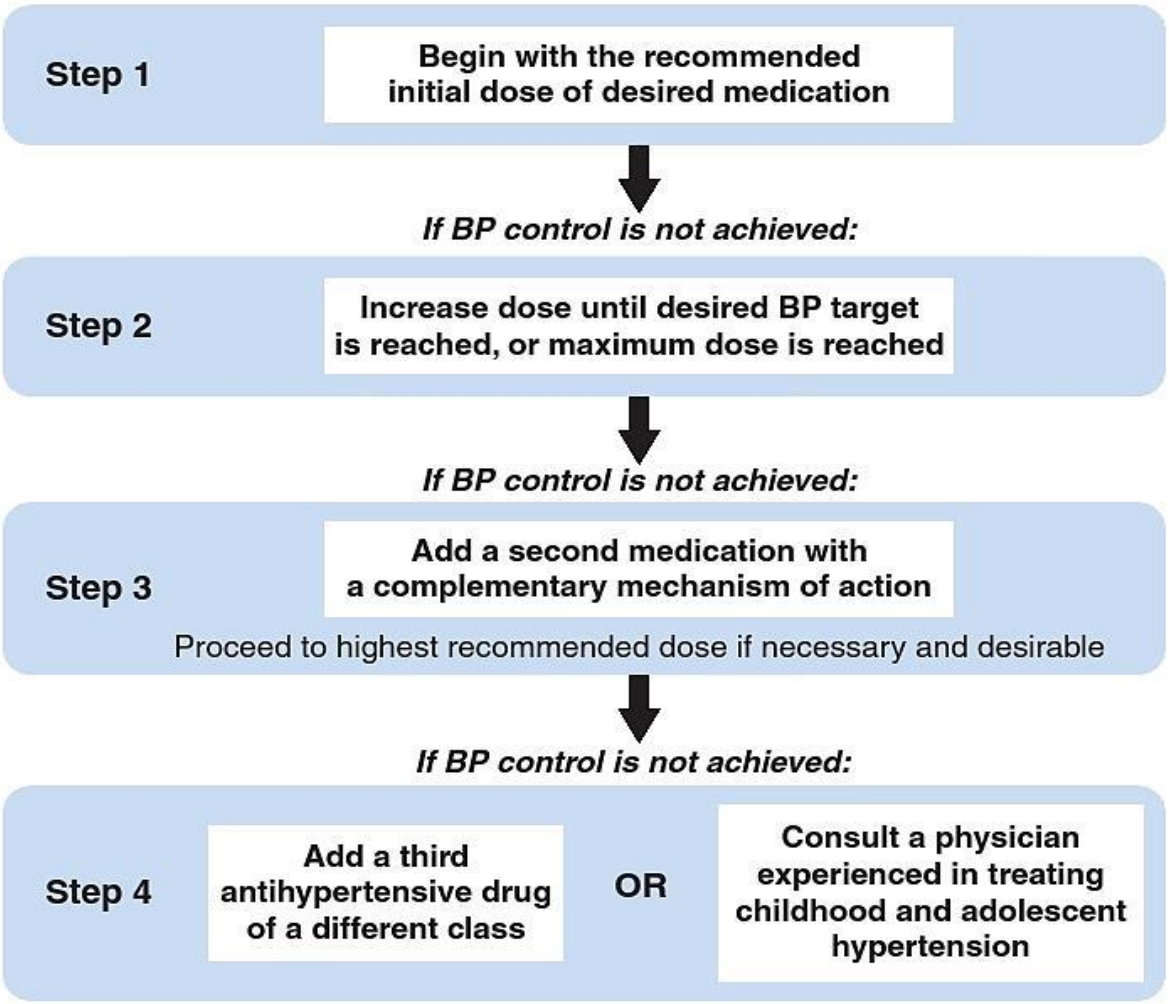
1- Children who remain hypertensive despite a trial of lifestyle modifications or

2- who have symptomatic HTN,

3- stage 2 HTN without a clearly modifiable factor (eg, obesity),

4- or any stage of HTN associated with CKD or diabetes mellitus

therapy should be initiated with a single medication at the low end of the dosing range


Step 1
Begin with the recommended initial dose of desired medication
If BP control is not achieved:
Step 2
Increase dose until desired BP target is reached, or maximum dose is reached
If BP control is not achieved:
Step 3
Add a second medication with a complementary mechanism of action
Proceed to highest recommended dose if necessary and desirable
If BP control is not achieved:
Step 4
Add a third antihypertensive drug of a different class
OR
Consult a physician experienced in treating childhood and adolescent hypertension

Depending on repeated BP measurements, the dose of the initial medication can be increased every 2 to 4 weeks until:

- BP is controlled (eg, <90th percentile),
- the maximal dose is reached,
- or adverse effects occur

Although the dose can be titrated every 2 to 4 weeks using home BP measurements, the patient should be seen every 4 to 6 weeks until BP has normalized.

If BP is not controlled with a single agent, a second agent can be added to the regimen and titrated as with the initial drug.

Because of the salt and water retention that occurs with many antihypertensive medications, a thiazide diuretic is often the preferred second agent.

Lifestyle modifications should be continued in children requiring pharmacologic therapy.

An ongoing emphasis on a healthy, plant-strong diet rich in fruits and vegetables; reduced sodium intake; and

increased exercise can improve the effectiveness of antihypertensive medications.

The use of a combination product as initial treatment has been studied only for bisoprolol and hydrochlorothiazide, so the routine use of combination products to initiate treatment in children cannot be recommended.

Once BP control has been achieved, a combination product can be considered as a means to improve adherence and reduce cost if the dose and formulation are appropriate.

TABLE 17 Dosing Recommendations for the Initial Prescription of Antihypertensive Drugs for Outpatient Management of Chronic HTN

Drug	Age	Initial Dose	Maximal Dose	Dosing Interval	Formulations
ACE inhibitors					
Contraindications: pregnancy, angioedema					
Common adverse effects: cough, headache, dizziness, asthenia					
Severe adverse effects: hyperkalemia, acute kidney injury, angioedema, fetal toxicity					
Benazepril	≥6 y[a]	0.2 mg/kg per d (up to 10 mg per d)	0.6 mg/kg per d (up to 40 mg per d)	Daily	Tablet: 5, 10, 20, 40 mg (generic) Extemporaneous liquid: 2 mg/mL
Captopril	Infants	0.05 mg/kg per dose	6 mg/kg per d	Daily to 4 times a day	Tablet: 12.5, 25, 50, 100 mg (generic)
	Children	0.5 mg/kg per dose	6 mg/kg per d	Three times a day	Extemporaneous liquid: 1 mg/mL
Enalapril	≥1 mo[a]	0.08 mg/kg per d (up to 5 mg per d)	0.6 mg/kg per d (up to 40 mg per d)	Daily to twice a day	Tablet: 2.5, 5, 10, 20 mg (generic) Solution: 1 mg/mL
Fosinopril	≥6 y <50 kg	0.1 mg/kg per d (up to 5 mg per d)	40 mg per d	Daily	Tablet: 10, 20, 40 mg (generic)
	≥50 kg[a]	5 mg per d	40 mg per d		
Lisinopril	≥6 y[a]	0.07 mg/kg per d (up to 5 mg per d)	0.6 mg/kg per d (up to 40 mg per d)	Daily	Tablet: 2.5, 5, 10, 20, 30, 40 mg (generic) Solution: 1 mg/mL
Ramipril	—	1.6 mg/m^2 per d	6 mg/m^2 per d	Daily	Capsule: 1.25, 2.5, 5 10 mg (generic)
Quinapril	—	5 mg per d	80 mg per d	Daily	Tablet: 5, 10, 20, 40 mg (generic)
ARBs					
Contraindications: pregnancy					
Common adverse effects: headache, dizziness					
Severe adverse effects: hyperkalemia, acute kidney injury, fetal toxicity					
Candesartan	1–5 y[a]	0.02 mg/kg per d (up to 4 mg per d)	0.4 mg/kg per d (up to 16 mg per d)	Daily to twice a day	Tablet: 4, 8, 16, 32 mg
	≥6 y[a]				Extemporaneous liquid: 1 mg/mL
	<50 kg	4 mg per d	16 mg per d		
	≥50 kg	8 mg per d	32 mg per d		
Irbesartan	6–12 y	75 mg per d	150 mg per d	Daily	Tablet: 75, 150, 300 mg (generic)
	≥13	150 mg per d	300 mg per d		
Losartan	≥6 y[a]	0.7 mg/kg (up to 50 mg)	1.4 mg/kg (up to 100 mg)	Daily	Tablet: 25, 50 100 (generic) Extemporaneous liquid: 2.5 mg/mL
Olmesartan	≥6 y[a]	—	—	Daily	Tablet: 5, 20, 40 mg
	<35 kg	10 mg	20 mg		Extemporaneous liquid: 2 mg/mL
	≥35 kg	20 mg	40 mg		
Valsartan	≥6 y[a]	1.3 mg/kg (up to 40 mg)	2.7 mg/kg (up to 160 mg)	Daily	Tablet: 40, 80, 160, 320 mg (generic) Extemporaneous liquid: 4 mg/mL

Thiazide diuretics					
Contraindications: anuria					
Common adverse effects: dizziness, hypokalemia					
Severe adverse effects: cardiac dysrhythmias, cholestatic jaundice, new onset diabetes mellitus, pancreatitis					
Chlorthalidone	Child	0.3 mg/kg	2 mg/k per d (50 mg)	Daily	Tablet: 25, 50, 100 mg (generic)
Chlorothiazide	Child[a]	10 mg/kg per d	20 mg/kg per d (up to 375 mg per d)	Daily to twice a day	Tablet: 250, 500 mg (generic) Suspension: 250/5 mL Extemporaneous liquid: 1 mg/mL
Hydrochlorothiazide	Child[a]	1 mg/kg per d	2 mg/kg per d (up to 37.5 mg per d)	Daily to twice a day	Tablet: 12.5, 25, 50 mg

TABLE 17 Continued

Drug	Age	Initial Dose	Maximal Dose	Dosing Interval	Formulations
Calcium channel blockers					
Contraindications: hypersensitivity to CCBs					
Common adverse effects: flushing, peripheral edema, dizziness					
Severe adverse effects: angioedema					
Amlodipine	1–5 y	0.1 mg/kg	0.6 mg/kg (up to 5 mg per d)	Daily	Tablet: 2.5, 5,10 mg
	≥6 y[a]	2.5 mg	10 mg		Extemporaneous liquid: 1 mg/mL
Felodipine	≥6 y	2.5 mg	10 mg	Daily	Tablet (extended release): 2.5,5,10 mg (generic)
Isradipine	Child	0.05–0.1 mg/kg	0.6 mg/kg (up to 10 mg per d)	Capsule: twice daily to 3 times a day; extended-release tablet: daily	Capsule: 2.5, 5 mg Extended-release tablet: 5, 10 mg
Nifedipine extended release	Child	0.2–0.5 mg/kg per d	3 mg/kg/d (up to 120 mg per d)	Daily to twice a day	Tablet (extended-release): 30, 60, 90 mg (generic)

—, not applicable.

[a] FDA pediatric labeling.

Pharmacologic therapies for hypertension in children[1,6]

Drug class	Medications	Adverse reactions	Contraindications	Comments
ACE inhibitors	Benazepril Fosinopril Enalapril Lisinopril	Dry cough, headache, dizziness (most common) Hyperkalemia and elevation in creatinine (usually in patients with bilateral renal artery stenosis) Angioedema (rare)	Pregnancy, should be avoided in sexually active young females History of angioedema	Drug of choice for patients with CKD and diabetic nephropathy
ARBs	Candesartan Losartan Olmesartan Valsartan	Headache, dizziness (most common) Hyperkalemia and elevation in creatinine (usually in patients with bilateral renal artery stenosis)	Pregnancy, should be avoided in sexually active young females	Drug of choice for patients with CKD and diabetic nephropathy
Thiazide diuretics	Hydrochlorothiazide	Hypokalemia, hyponatremia, hypomagnesemia, hyperuricemia, hypercalcemia, glucose intolerance	Sulfa allergy, anuria	"Off label" drug (doses, safety, and efficacy are extrapolated from adult studies)
CCBs	Amlodipine Felodipine	Peripheral edema, gingival hyperplasia, flushing	Sinus node dysfunction	Drug of choice for patients with renal artery disease

Abbreviations: CKD, chronic kidney disease; ACE inhibitors, angiotensin-converting enzyme inhibitors; ARBs, angiotensin receptor blockers; CCBs, calcium channel blockers

Recommended Doses for Selected Antihypertensive Agents for Use in Hypertensive Children and Adolescents

Class	Drug	Starting Dose	Interval	Maximum Dose[a]
Aldosterone receptor antagonists	Eplerenone	25 mg/d	QD–BID	100 mg/d
	Spironolactone[b]	1 mg/kg/d	QD–BID	3.3 mg/kg/d up to 100 mg/d
ACE inhibitors	Benazepril[b]	0.2 mg/kg/d up to 10 mg/d	QD	0.6 mg/kg/d up to 40 mg/d
	Captopril[b]	0.3–0.5 mg/kg/dose	BID–TID	6 mg/kg/d up to 450 mg/d
	Enalapril[b]	0.08 mg/kg/d	QD	0.6 mg/kg/d up to 40 mg/d
	Fosinopril	0.1 mg/kg/d up to 10 mg/d	QD	0.6 mg/kg/d up to 40 mg/d
	Lisinopril[b]	0.07 mg/kg/d up to 5 mg/d	QD	0.6 mg/kg/d up to 40 mg/d
	Quinapril	5–10 mg/d	QD	80 mg/d
Angiotensin receptor blockers	Candesartan	4 mg/d	QD	32 mg/d
	Losartan[b]	0.75 mg/kg/d up to 50 mg/d	QD	1.4 mg/kg/d up to 100 mg/d
	Olmesartan	20–35 kg: 10 mg/d ≥35 kg: 20 mg/d	QD	20–35 kg: 20 mg/d ≥35 kg: 40 mg/d
	Valsartan[b]	1.3 mg/kg/d up to 40 mg/d <6 y: 5–10 mg/d	QD	2.7 mg/kg/d up to 160 mg/d <6 y: 80 mg/d
α- and β-adrenergic antagonists	Labetalol[b]	2–3 mg/kg/d	BID	10–12 mg/kg/d up to 1.2 g/d
	Carvedilol	0.1 mg/kg/dose up to 6.25 mg BID	BID	0.5 mg/kg/dose up to 25 mg BID
β-adrenergic antagonists	Atenolol[b]	0.5–1 mg/kg/d	QD-BID	2 mg/kg/d up to 100 mg/d
	Bisoprolol/HCTZ	0.04 mg/kg/d up to 2.5/6.25 mg/d	QD	10/6.25 mg/d
	Metoprolol	1–2 mg/kg/d	BID	6 mg/kg/d up to 200 mg/d
	Propranolol	1 mg/kg/d	BID–TID	8 mg/kg/d up to 640 mg/d
Calcium channel blockers	Amlodipine[b]	0.1 mg/kg/d	QD	0.6 mg/kg/d up to 10 mg/d
	Felodipine	2.5 mg/d	QD	10 mg/d
	Isradipine[b]	0.05–0.15 mg/kg/dose	TID–QID	0.8 mg/kg/d up to 20 mg/d
	Extended-release nifedipine	0.25–0.5 mg/kg/d	QD–BID	3 mg/kg/d up to 120 mg/d
Central α agonist	Clonidine[b]	5–10 mcg/kg/d	BID–TID	25 mcg/kg/d up to 0.9 mg/d
Diuretics	Amiloride	5–10 mg/d	QD	20 mg/d
	Chlorthalidone	0.3 mg/kg/d	QD	2 mg/kg/d up to 50 mg/d
	Furosemide	0.5–2.0 mg/kg/dose	QD–BID	6 mg/kg/d
	HCTZ	0.5–1 mg/kg/d	QD	3 mg/kg/d up to 50 mg/d
Vasodilators	Hydralazine	0.25 mg/kg/dose	TID–QID	7.5 mg/kg/d up to 200 mg/d
	Minoxidil	0.1–0.2 mg/kg/d	BID–TID	1 mg/kg/d up to 50 mg/d

[a]The maximum recommended adult dose should never be exceeded.

[b]Information on preparation of a stable extemporaneous suspension is available for these agents.

BID, twice daily; HCTZ, hydrochlorothiazide; QD, once daily; QID, four times daily; TID, three times daily; ACE, angiotensin-converting enzyme.

Pharmacologic Treatment and Pediatric Exclusivity Studies

Studies completed in hypertensive children show that antihypertensive drugs decrease BP with few adverse effects.

There are few studies in children in which researchers compare different antihypertensive agents.

These studies do not show clinically significant differences in the degree of BP lowering between agents.

There are limited clinical trials and Long-term studies in children that have CV end points as outcomes.

Pharmacologic Treatment: Choice of Agent

Pharmacologic treatment of HTN in children and adolescents should be initiated with an ACE inhibitor, ARB, long-acting calcium channel blocker, or a thiazide diuretic.

Because African American children may not have as robust a response to ACE inhibitors, a higher initial dose for the ACE inhibitor may be considered; alternatively, therapy may be initiated with a thiazide diuretic or long-acting calcium channel blocker.

β-blockers are not recommended as initial treatment in children. because compared with other agents:

-the expanded adverse effect profile and

-lack of association in adults with improved outcomes

ACE inhibitors and ARBs are contraindicated in pregnancy, because these agents can cause injury and death to the developing fetus.

Adolescents of childbearing potential should be informed of the potential risks of these agents on the developing fetus; alternative medications (eg,calcium channel blocker, β-blocker) can be considered when appropriate.

In children with HTN and CKD, proteinuria, or diabetes mellitus, an ACE inhibitor or ARB is recommended as the initial antihypertensive agent unless there is an absolute contraindication.

Other antihypertensive medications (eg, α-blockers, β-blockers, combination α-and β-blockers, centrally acting agents, potassium-sparing diuretics, and direct vasodilators) should be reserved for children who are not responsive to 2 or more of the preferred agents

Key Action Statement 21. In hypertensive children and adolescents who have failed lifestyle modifications (particularly those who have LV hypertrophy on echocardiography, symptomatic HTN, or stage 2 HTN without a clearly modifiable factor [eg, obesity]), clinicians should initiate pharmacologic treatment with an ACE inhibitor, ARB, long-acting calcium channel blocker, or thiazide diuretic (grade B, moderate recommendation).

Aggregate Evidence Quality	Grade B
Benefits	Potential prevention of progressive CVD; regression or avoidance of target organ damage; resolution of hypertensive symptoms; improved cognition; avoidance of worsening HTN; potential avoidance of stroke, heart failure, coronary artery disease, kidney failure
Risks, harm, cost	Potential for hypotension, financial cost, chronic medication treatment, adverse medication effects, impact on insurability (health and life)
Benefit–harm assessment	Preponderance of benefits over harms
Intentional vagueness	None
Role of patient preferences	The choice of which antihypertensive medication to use should be made in close discussion with the patient and parent regarding risk, benefits, and adverse effects
Exclusions	None
Strength	Moderate recommendation
Key references	452,455,467

Treatment: Follow-Up and Monitoring

Treatment of a child or adolescent with HTN requires ongoing monitoring because goal BP can be difficult to achieve.

If the decision has been made to initiate treatment with medication, the patient should be seen frequently (every 4–6 weeks) for dose adjustments and/or addition of a second or third agent until goal BP has been achieved.

After that, the frequency of visits can be extended to every 3 to 4 months.

If the decision has been made to proceed with lifestyle changes only, then follow-up visits can occur at longer intervals (every 3–6 months) so that adherence to lifestyle change can be reinforced and the need for initiation of medication can be reassessed.

In patients treated with antihypertensive medications, home BP measurement is frequently used to get a better assessment of BP control

Repeat ABPM may also be used to assess BP control and is especially important in patients with CKD .

At each follow-up visit, the patient should be assessed:

- for adherence to prescribed therapy and
- for any adverse effects of the prescribed medication such as:
  - -laboratory testing depending on the medication:
    - -for example, electrolyte monitoring if the patient is on a diuretic
  - -Imaging Evaluation by Echocardiography special:
    - -in known hypertensive target organ damage (such as LVH)
    - -high probably for Coarctation of the Aorta

It is also important to continually reinforce adherence to lifestyle changes because effective treatment will depend on the combination of effects from both medication and lifestyle measures.

Treatment results assnss:

Use of ABPM to Assess Treatment

ABPM can be an objective method to evaluate treatment effect during antihypertensive drug therapy.

A report from a single center found that among hypertensive children receiving antihypertensive drugs, BP data from ABPM resulted in medication changes in 63% of patients.

Another study of 38 hypertensive children used ABPM to evaluate thee ffectiveness of antihypertensive therapy (nonpharmacologic and pharmacologic).

After 1 year of treatment, ABPM results indicated that treatment-goal BP was achieved in only one-third of children with HTN.

Key Action Statement 22. 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 (grade B, moderate recommendation).

Aggregate Evidence Quality	Grade B
Benefits	ABPM results can guide adjustment in medication. ABPM can facilitate achieving treatment-goal BP levels
Risks, harm, cost	Inconvenience and patient annoyance in wearing an ABPM monitor. Cost of ABPM monitors
Benefit–harm assessment	Overall benefit
Intentional vagueness	None
Role of patient preferences	Patients may choose not to wear the ambulatory BP monitor repeatedly, which may necessitate alternative approaches to evaluate treatment efficacy
Exclusions	Uncomplicated HTN with satisfactory BP control
Strength	Moderate recommendation
Key references	17,474,475

Treatment-Resistant HTN

Resistant HTN in adults is defined as persistently elevated BP despite treatment with 3 or more antihypertensive agents of different classes.

All of these drugs should be prescribed at maximally effective doses, and at least 1 should be a diuretic.

Key to the identification of patients with true resistant HTN is correct office BP measurement, confirmation of adherence to current therapy, and confirmation of treatment resistance by ABPM.

At present, there are no data on whether true treatment-resistant HTN exists in pediatric patients.

Evaluation and management strategies similar to those proven effective in adults with resistant HTN would be reasonable in children and adolescents who present with apparent treatment resistance.

The treatment of patients with resistant HTN includes:

- dietary sodium restriction,
- the elimination of substances known to elevate BP,
- the identification of previously undiagnosed secondary causes of HTN,
- the optimization of current therapy,
- and the addition of additional agents as needed.

Recent clinical trial data suggest that an aldosterone receptor antagonist (such as spironolactone) is the optimal additional agent in adults with resistant HTN;

it helps address volume excess as well as untreated hyper aldosteronism, which is common in adult patients with true resistant HTN.

Treatment in Special Populations

Treatment in Patients With CKD and Proteinuria

1- CKD

Children and adolescents with CKD often present with or develop HTN. HTN is a known risk factor for the progression of kidney disease in adults and children.

Evidence suggests that the treatment of HTN in children with CKD might slow the progression of or reverse end organ damage.

When evaluated by 24-hour ABPM, children and adolescents with CKD often have poor BP control even if BP measured in the clinic appears to be normal.

MH(Masked HTN) is associated with end organ damage, such as LVH.

Threshold values that define HTN are not different in children with CKD, although there is some evidence that lower treatment goals might improve outcomes.

- researchers randomly assigned children with CKD to standard antihypertensive therapy (with a treatment goal of 24-hour MAP <90th percentile by ABPM) or to intensive BP control (24-hour MAP <50th percentile by ABPM).

- The study demonstrated fewer composite CKD outcomes in children with the lower BP target.

- Recent adult data from the Systolic Blood Pressure Intervention Trial suggest lower BP targets may be beneficial in preventing other, adverse CV outcomes as well.

Key Action Statement 23

1- Children and adolescents with CKD should be evaluated for HTN at each medical encounter;

2- Children or adolescents with both CKD and HTN should be treated to lower 24-hour MAP to <50th percentile by ABPM;

3- and 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 (grade B; strong recommendation).

Key Action Statement 23. Children and adolescents with CKD should be evaluated for HTN at each medical encounter;

Children or adolescents with both CKD and HTN should be treated to lower 24-hour MAP to <50th percentile by ABPM; and

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 (grade B; strong recommendation).

Aggregate Evidence Quality	Grade B
Benefits	Control of BP in children and adolescents with CKD has been shown to decrease CKD progression and lead to resolution of LVH
Risks, harm, cost	Cost of ABPM and BP control, both financial and nonfinancial
Benefit–harm assessment	Benefits of BP control in patients with CKD outweigh treatment risks
Intentional vagueness	Threshold
Role of patient preferences	Patients may not want to wear the ambulatory BP monitor repeatedly, which should lead to detailed counseling regarding the benefits of this procedure in CKD
Exclusions	None
Strength	Strong recommendation
Key references	47,173,203,415,480–483

2-Proteinuria

Proteinuric renal disease is often associated with HTN and a rapid decline in glomerular filtration.

Studies in both adults and children have indicated that both BP control and a reduction in proteinuria are beneficial for preserving renal function.

Researchers in multiple studies have evaluated the utility of RAAS blockade therapy in patients with CKD and HTN.

These medications have been shown to benefit both BP and proteinuria.

- The benefit of such therapies may not be sustained, however.

- The Effect of Strict Blood Pressure Control and ACE-Inhibition on Progression of Chronic Renal Failure in Pediatric Patients study demonstrated an initial 50% reduction in proteinuria in children with CKD after treatment with ramipril but with a rebound effect after 36 months.

- This study also showed that BP reduction with a ramipril-based antihypertensive regimen improved renal outcomes.

- In children with HTN related to underlying CKD, the assessment of proteinuria and institution of RAAS blockade therapy appears to have important prognostic implications.

Key Action Statement 24. Children and adolescents with CKD and HTN should be evaluated for proteinuria (grade B, strong recommendation).

Aggregate Evidence Quality	Grade B
Benefits	Detection of proteinuria among children with CKD and HTN may foster early detection and treatment of children at risk for more advanced renal disease
Risks, harm, cost	Additional testing
Benefit–harm assessment	Benefit of detection of a higher-risk group exceeds the risk of testing
Intentional vagueness	Whether to screen children with HTN without CKD for proteinuria
Role of patient preferences	None
Exclusions	Children without CKD
Strength	Strong recommendation
Key references	47,484

Key Action Statement 25. Children and adolescents with CKD, HTN, and proteinuria should be treated with an ACE inhibitor or ARB (grade B, strong recommendation).

Aggregate Evidence Quality	Grade B
Benefits	ACE inhibitor and ARB therapy has been shown in the short-term to be effective in reducing urine proteinuria
Risks, harm, cost	Positive effect on urine protein concentrations after the receipt of an ACE inhibitor may not be sustained over time
Benefit–harm assessment	Treatment with an ACE inhibitor or ARB may lower the rate of progression of renal disease even if the effect is not sustained in the long-term
Intentional vagueness	Whether to aggressively treat the BP so that it is <90th percentile
Role of patient preferences	Patients may have concerns about the choice of medication, which should be addressed
Exclusions	Children without CKD
Strength	Strong recommendation
Key references	173,464,465,485,487,488

Treatment in Patients With Diabetes

Based on the Fourth Report criteria for the diagnosis of HTN, between 4% and 16% of children and adolescents with T1DM are found to have HTN.

In the SEARCH study of 3691 youth between the ages of 3 and 17 years, elevated BP was documented in 6% of children with T1DM, with the higher prevalence in those with higher glycosylated hemoglobin A1c levels

An office-based study in Australia found much higher rates(16%) and a positive correlation with BMI.

BP >130/90 mm Hg has been associated with a morethan-fourfold increase in the relative risk of coronary artery disease and mortality at 10-year follow-up of individuals with T1DM.

The prevalence of HTN is higher in youth with T2DM compared with T1DM(12%-31% vs 4%-6%)

BP and arterial stiffness in cohort studies have correlated with BMI, male sex, African American race, and age of onset of diabetes.

Unlike T1DM, HTN in T2DM is not correlated with glycosylated hemoglobin A1c levels or glycemic failure, and it develops early in the course of the disease.

It is also associated with rapid onset of adverse cardiac changes111, and may not respond to diet changes.

The concurrence of obesity and T2DM compounds the risks for target end organ damage.

Empirical evidence shows a poor awareness of HTN in youth with T1DM and T2DM.

Additionally, only a fraction of children with HTN and diabetes were found to be on pharmacologic therapy

Key Action Statement 26. Children and adolescents with T1DM or T2DM should be evaluated for HTN at each medical encounter and treated if BP is ≥95th percentile or >130/80 mm Hg in adolescents ≥13 years of age (grade C, moderate recommendation).

Aggregate Evidence Quality	Grade C
Benefits	Early detection and treatment of HTN in children with T1DM and T2DM may reduce future CV and kidney disease
Risks, harm, cost	Risk of drug adverse effects and polypharmacy
Benefit–harm assessment	Preponderance of benefit
Intentional vagueness	None
Role of patient preferences	Family concerns about additional testing and/or medication may need to be addressed
Exclusions	None
Strength	Weak to moderate recommendation
Key references	14,110,111,494

Comorbidities

Dyslipidemia

Children and adolescents with HTN are at increased risk for lipid disorders attributable to the "common soil" phenomenon, in which poor diet, inactivity, and obesity contribute to both disorders.

Furthermore, both HTN and dyslipidemias are associated with subclinical atherosclerosis and are risk factors for future CVD.

Screening is recommended to identify those at increased risk for early atherosclerosis.

Treatment of lipid disorders identified in the setting of HTN should follow existing pediatric lipid guidelines with lifestyle advice, including weight loss and pharmacotherapy, as necessary.

OSAS(obstructive sleep apnea syndrome)

Children with snoring, daytime sleepiness (in adolescents), or hyperactivity (in younger children) may have OSAS and consequent HTN.

The more severe the OSAS, the more likely a child is to have elevated BP(see Table 18 in leter slide).

Children with moderate to severe OSAS are at increased risk for HTN.

However, it is not known whether OSAS treatment with continuous positive airway pressure results in improved BP in all children.

TABLE 18 OSAS Symptoms and Signs

History of frequent snoring (≥3 nights per week)
Labored breathing during sleep
Gasps, snorting noises, observed episodes of apnea
Sleep enuresis (especially secondary enuresis)
Sleeping in a seated position or with the neck hyperextended
Cyanosis
Headaches on awakening
Daytime sleepiness
Attention-deficit/hyperactivity disorder
Learning problems
Physical examination
Underweight or overweight
Tonsillar hypertrophy
Adenoidal facies
Micrognathia, retrognathia
High-arched palate
Failure to thrive
HTN

Adapted from Marcus CL, Brooks LJ, Draper KA, et al; American Academy of Pediatrics. Diagnosis and management of childhood obstructive sleep apnea syndrome. *Pediatrics*. 2012;130(3). Available at: www.pediatrics.org/cgi/content/full/130/3/e714.

Furthermore, adenotonsillectomy may not result in BP improvement in all children with OSAS; In particular, children who have obesity and OSAS.

Therefore, children with signs of OSAS (eg, daytime fatigue, snoring, hyperactivity, etc) should undergo evaluation for elevated BP regardless of treatment status.

Given that both nighttime and daytime BP is affected by OSAS, the use of ABPM is the recommended method for assessing the BP of children with suspected OSAS

Cognitive Impairment

The central nervous system is a target organ that can be affected by HTN.

Hypertensive children score lower on tests of neurocognition and on parental reports of executive function compared with normotensive controls.

Adams et al found an increased prevalence of learning disabilities in children with primary HTN compared with normotensive controls.

The postulated mechanism for these findings is impaired cerebrovascular reactivity.

At the present time, these findings demonsterate importance of early detection and treatment of HTN.

Sex, Racial, and Ethnic Differences in BP and Medication Choice

BP differences between various ethnic groups are well described in the adult population. minority ethnic groups have both a higher prevalence of HTN and more significant end organ damage and outcomes.

Although a growing body of evidence indicates that racial and ethnic differences in BP appear during adolescence, the cause of these differences and when they develop in childhood are yet to be fully determined.

The risk of HTN correlates more with obesity status than with ethnicity or race, although there may be some interaction.

At this time, although limited data suggest that there may be a racial difference in response to ACE inhibitors in the pediatric age group, the strength of available evidence is insufficient to recommend using racial, sex, or ethnic factors to inform the evaluation or management of HTN in children.

Special Populations and Situations

Acute Severe HTN

There is a lack of robust evidence to guide the evaluation and management of children and adolescents with acute presentations of severe HTN. Thus, much of what is known is derived from studies conducted in adults, including medication choice.

The evidence base has been enhanced somewhat over the past decade by the publication of several pediatric clinical trials and case series of antihypertensive agents that can be used to treat such patients

Although children and adolescents can become symptomatic from HTN at lesser degrees of BP elevation, in general, patients who present with acute severe HTN will have BP elevation well above the stage 2 HTN threshold.

The major clinical issue in such children is that this level of BP elevation may produce acute target organ effects, including encephalopathy, acute kidney injury, and congestive heart failure.

Clinicians should be concerned about the development of these complications when a child's BP increases 30 mm Hg or more above the 95th percentile

Although a few children with primary HTN may present with features of acute severe HTN, the vast majority will have an underlying secondary cause of HTN.

Thus, for patients who present with acute severe HTN, an evaluation for secondary causes is appropriate and should be conducted expediently.

Additionally, target organ effects should be assessed with renal function, echocardiography, and central nervous system imaging, among others.

Children and adolescents who present with acute severe HTN require immediate treatment with short-acting anti hypertensive medications that may abort potentially life threatening complications and sequelae.

Treatment may be initiated with oral agents if the patient is able to tolerate oral therapy and if life-threatening complications have not yet developed.

Intravenous agents are indicated when oral therapy is not possible because of the patient's clinical status or when a severe complication has developed (such as congestive heart failure) that warrants a more controlled BP reduction.

In such situations, the BP should be reduced by no more than 25% of the planned reduction over the first 8 hours, with the remainder of the planned reduction over the next 12 to 24 hours.

The ultimate short-term BP goal in such patients should generally be around the 95th percentile.

Table 19(later slide) lists suggested doses for oral and intravenous antihypertensive medications that may be used to treat patients with acute severe HTN.

TABLE 19 Oral and Intravenous Antihypertensive Medications for Acute Severe HTN

Drug	Class	Dose	Route	Comments
Useful for Severely Hypertensive Patients With Life-Threatening Symptoms				
Esmolol	β-adrenergic blocker	100–500 mcg/kg per min	Intravenous infusion	Short acting, constant infusion preferred. May cause profound bradycardia
Hydralazine	Direct vasodilator	0.1–0.2 mg/kg per dose up to 0.4 mg/kg per dose	Intravenous, intramuscular	Causes tachycardia Give every 4 h when given intravenous bolus
Labetalol	α- and β-adrenergic blocker	Bolus: 0.20–1.0 mg/kg per dose up to 40 mg per dose Infusion: 0.25–3.0 mg/kg per h	Intravenous bolus or infusion	Asthma and overt heart failure are relative contraindications
Nicardipine	Calcium channel blocker	Bolus: 30 mcg/kg up to 2 mg per dose Infusion: 0.5–4 mcg/kg per min	Intravenous bolus or infusion	May cause reflex tachycardia. Increases cyclosporine and tacrolimus levels
Sodium nitroprusside	Direct vasodilator	Starting: 0–3 mcg/kg per min Maximum: 10 mcg/kg per min	Intravenous infusion	Monitor cyanide levels with prolonged (>72 h) use or in renal failure; or coadminister with sodium thiosulfate
Useful for Severely Hypertensive Patients With Less Significant Symptoms				
Clonidine	Central α-agonist	2–5 mcg/kg per dose up to 10 mcg/kg per dose given every 6–8 h	Oral	Adverse effects include dry mouth and drowsiness
Fenoldopam	Dopamine receptor agonist	0.2–0.5 mcg/kg per min up to 0.8 mcg/kg per min	Intravenous infusion	Higher doses worsen tachycardia without further reducing BP
Hydralazine	Direct vasodilator	0.25 mg/kg per dose up to 25 mg per dose given every 6–8 h	Oral	Half-life varies with genetically determined acetylation rates
Isradipine	Calcium channel blocker	0.05–0.1 mg/kg per dose up to 5 mg per dose given every 6–8 h	Oral	Exaggerated decrease in BP can be seen in patients receiving azole antifungal agents
Minoxidil	Direct vasodilator	0.1–0.2 mg/kg per dose up to 10 mg per dose given Q 8–12 h	Oral	Most potent oral vasodilator, long acting

Antihypertensive Drugs for Management of Severe Hypertension in Children and Adolescents

Drug	Class	Dose	Route	Comments
Useful for Severely Hypertensive Patients with Life-Threatening Symptoms				
Esmolol	β-adrenergic blocker	100–500 mcg/kg/min	IV infusion	Very short acting—constant infusion preferred. May cause profound bradycardia
Hydralazine	Direct vasodilator	0.2–0.6 mg/kg/dose	IV, IM	Should be given q4h when given IV bolus
Labetalol	α- and β-adrenergic blockers	Bolus: 0.20–1.0 mg/kg/dose, up to 40 mg/dose Infusion: 0.25–3.0 mg/kg/h	IV bolus or infusion	Asthma and overt heart failure are relative contraindications
Nicardipine	Calcium channel blocker	Bolus: 30 mcg/kg up to 2 mg/dose Infusion: 0.5–4 μg/kg/min	IV bolus or infusion	May cause reflex tachycardia
Sodium nitroprusside	Direct vasodilator	0.5–10 mcg/kg/min	IV infusion	Monitor cyanide levels with prolonged (>72 h) use or in renal failure: or coadminister with sodium thiosulfate
Useful for Severely Hypertensive Patients with Less Significant Symptoms				
Clonidine	Central α-agonist	0.05–0.1 mg/dose, may be repeated up to 0.8 mg total dose	PO	Side effects include dry mouth and drowsiness
Enalaprilat	ACE inhibitor	0.05–0.10 mcg/kg/dose up to 1.25 mg/dose	IV bolus	May cause prolonged hypotension and acute renal failure, especially in neonates
Fenoldopam	Dopamine receptor agonist	0.2–0.8 mcg/kg/min	IV infusion	Produced modest reductions in BP in a pediatric clinical trial in patients up to 12 y
Hydralazine	Direct vasodilator	0.25 mg/kg/dose up to 25 mg/dose	PO	Extemporaneous suspension stable for only 1 wk
Isradipine	Calcium channel blocker	0.05–0.1 mg/kg/dose up to 5 mg/dose	PO	Stable suspension can be compounded
Minoxidil	Direct vasodilator	0.1–0.2 mg/kg/dose up to 10 mg/dose	PO	Most potent oral vasodilator: long acting

Key Action Statement 27. In children and adolescents with acute severe HTN and life-threatening symptoms, immediate treatment with short-acting antihypertensive medication should be initiated, and BP should be reduced by no more than 25% of the planned reduction over the first 8 hours (grade expert opinion D, weak recommendation).

Aggregate Evidence Quality	Expert Opinion, D
Benefits	Avoidance of complications caused by rapid BP reduction
Risks, harm, cost	Severe BP elevation may persist
Benefit–harm assessment	Benefit outweighs harm
Intentional vagueness	None
Role of patient preferences	None
Exclusions	Patients without acute severe HTN and life-threatening symptoms
Strength	Weak recommendation because of expert opinion
Key references	240,533,535

HTN and the Athlete

Sports participation and increased physical activity should be encouraged in children with HTN.

In adults, physical fitness is associated with lower all-cause mortality.

Although meta-analyses and randomized controlled trials consistently show lower BP after exercise training in adults, the results are less robust in children.

On the basis of this evidence, sports participation should improve BP over time.

Additionally, there is evidence that exercise itself has a beneficial effect on cardiac structure in adolescents

Although increased LV wall dimension may be a consequence of athletic training, recommendations from AHA and ACC include the following:

(1) limiting competitive athletic participation among a athletes with LVH beyond that seen with athlete's heart until BP is normalized by appropriate anti hypertensive drug therapy, and

(2) restricting athletes with stage 2 HTN (even among those without evidence of target organ injury) from participating in high-static sports(eg, weight lifting, boxing, and wrestling) until HTN is controlled with either lifestyle modification or drug therapy

The AAP policy statement "Athletic Participation by Children and Adolescents Who Have Systemic Hypertension" recommends that children with stage 2 HTN be restricted from high-static sports (classes IIIA to IIIC) in the absence of end organ damage, including LVH or concomitant heart disease, until their BP is in the normal range after lifestyle modification and/or drug therapy.

It is further recommended that athletes be promptly referred and evaluated by a qualified pediatric medical subspecialist within 1 week if they are asymptomatic or immediately if they are symptomatic.

It should be acknowledged that there are no data linking the presence of HTN to sudden death related to sports participation in children, although many cases of sudden death are of unknown etiology.

That said, athletes identified as hypertensive(eg, during preparticipation sports screening) should undergo appropriate evaluation as outlined above.

For athletes with more severe HTN (stage 2 or greater), treatment should be initiated before sports participation

Key Action Statement 28. Children and adolescents with HTN may participate in competitive sports once hypertensive target organ effects and risk have been assessed (grade C, moderate recommendation).

Aggregate Evidence Quality	Grade C
Benefits	Aerobic exercise improves CVD risk factors in children and adolescents with HTN
Risks, harm, cost	Unknown, but theoretical risk related to a rise in BP with strenuous exercise may exist
Benefit–harm assessment	The benefits of exercise likely outweigh the potential risk in the vast majority of children and adolescents with HTN
Intentional vagueness	None
Role of patient preferences	Families may have different opinions about sports participation in children with HTN
Exclusions	None
Strength	Moderate recommendation
Key references	341,360,538,540,541

Key Action Statement 29. Children and adolescents with HTN should receive treatment to lower BP below stage 2 thresholds before participating in competitive sports (grade C, weak recommendation).

Aggregate Evidence Quality	Grade C
Benefits	Aerobic exercise improves CVD risk factors in children and adolescents with HTN
Risks, harm, cost	Unknown, but theoretical risk related to a rise in BP with strenuous exercise may exist
Benefit–harm assessment	The benefits of exercise likely outweigh the potential risk in the vast majority of children and adolescents with HTN
Intentional vagueness	None
Role of patient preferences	None
Exclusions	None
Strength	Weak recommendation
Key references	341,360,538,540,541

HTN and the Post transplant Patient

HTN is common in children after solid-organ transplants, with rates ranging from 50% to 90%.

Contributing factors include the use of steroids, calcineurin inhibitors, and mTOR(mammalian target of rapamycin) inhibitors. In patients with renal transplants, the presence of native kidneys, CKD, and transplant glomerulopathy are additional risk factors for HTN.

HTN rates are higher by 24-hour ABPM compared with clinic BP measurements because these populations commonly have MH and nocturnal HTN.

Control of HTN in renal-transplant patients has been improved with the use of annual ABPM.

Therefore, ABPM should be used to identify and monitor nocturnal BP abnormalities and MH in pediatric kidney and heart-transplant recipients.

The use of home BP assessment may provide a comparable alternative to ABPM for BP assessment after transplant as well

The management of identified HTN in the pediatric transplant patient can be challenging. Rates of control of HTN in renal-transplant patients is from 33% to 55%.

antihypertensive treatment in pediatric renaltransplant recipients improved nocturnal SBP and significantly reduced proteinuria.

Children in these studies who achieved normotension had stable graft function, whereas those who remained hypertensive at 2 years had a progression of renal disease.

Antihypertensive medications have rarely been systematically studied in this population.

There is limited evidence that ACE inhibitors and ARBs may be superior to other agents in achieving BP control and improving long-term graft survival in renal transplant patients.

However, the combination of ACE inhibitors and ARBs in renal-transplant patients has been associated with acidosis and hyperkalemia and is notrecommended.

Lifetime HTN Treatment and Transition to Adulthood

For adolescents with HTN requiring ongoing treatment, the transition from pediatric care to an adult provider is essential.

HTN definition and treatment recommendations in this guideline are generally consistent with the forthcoming adult HTN treatment guideline, so diagnosis and treatment should not typically change with transition.

Key Action Statement 30. Adolescents with elevated BP or HTN (whether they are receiving antihypertensive treatment) should typically have their care transitioned to an appropriate adult care provider by 22 years of age (recognizing that there may be individual cases in which this upper age limit is exceeded, particularly in the case of youth with special health care needs). There should be a transfer of information regarding HTN etiology and past manifestations and complications of the patient's HTN (grade X, strong recommendation).

Aggregate Evidence Quality	Grade X
Benefits	Provides continuity of care for patients
Risks, harm, cost	None
Benefit–harm assessment	No risk
Intentional vagueness	None
Role of patient preferences	Patient can pick adult care provider
Exclusions	None
Strength	Strong recommendation
Key references	547

Prevention of HTN

Importance of Preventing HTN

The rate of progression to frank HTN in studies different and reach to 36.5% and was greater with higher baseline BP category.

The rate of progression may also be accelerated in African American individuals.

the risk of HTN in early adulthood is dependent on childhood BP, with greater numbers of elevated BP measurements in childhood conferring an increased risk of adult HTN.

analyses of the National Childhood BP database found 7% of adolescents with elevated BP per year progressed to true hypertensive BP levels.

Of note, initial BMI and change inm BMI were major determinants of the development of HTN.

Therefore, in both children and adults, efforts should be made to prevent progression to sustained HTN and to avoid the development of hypertensive CV diseases.

Strategies for Prevention

prevention efforts to date have focused on lifestyle modification, especially dietary intervention, exercise, and treatment of obesity.

Because family history is immutable, it is difficult to build a preventive strategy around it. However, a positive family history of HTN should suggest the need for closer BP monitoring to detect HTN if it occurs.

Appropriate energy balance with calories eaten balanced by calories expended in physical activity is important.

This is the best strategy to maintain an appropriate BMI percentile for age and sex and to avoid develo of obesity.

a DASH-type diet may be beneficial.

Avoiding high-sodium foods may prove helpful in preventing HTN, particularly for individuals who are more sensitive to dietary sodium intake

Adhering to recommendations for 60 minutes a day of moderate to vigorous physical activity can be important to maintaining an appropriate weight and may be independently helpful to maintaining a lower BP.

The achievement of normal sleep habits

avoidance of tobacco products are also reasonable strategies to reduce CV risk.

These preventive strategies can be implemented as part of routine primary health care for children and adolescents.

Patient Perspective and Pediatric HTN

Children and adolescents are not just patients; they are active participants in their health management. If children and adolescents lack a clear understanding of what is happening inside their bodies, they will not be able to make informed choices in their daily activities.

For clear judgments to be made, there needs to be open communication between physicians and families, a provision of appropriate education on optimal HTN management, and a strong partnership assembled within a multidisciplinary health care team including physicians, advanced practice providers, dietitians, nurses, and medical and clinical assistants.

It is important for physicians to be mindful that children and adolescents want, and need, to be involved in their medical care.

Pediatric HTN patients are likely to feel excluded when clinicians or other providers speak to their parents instead of including them in the conversation.

When patients are neither included in the discussion nor encouraged to ask questions, their anxiety can increase, thus worsening their HTN.

Keeping an open line of communication is important and is best done by using a team approach consisting of the patient, the family, health care support staff, and physicians.

With practical education on HTN management provided in easily understandable terms, the patients will be more likely to apply the concepts presented to them

Education is important and should be given in a way that is appropriate for young children and their families to understand.

Education should consist of suitable medication dosing, a proper diet and level of activity, the identification of symptoms, and appropriate BP monitoring (including cuff size).

Parental Perspective and Pediatric HTN

Parents play a key role in the management and care of their children's health. Parents and physicians should act as a cohesive unit to foster the best results.

It is vital for physicians to provide concise information in plain language and do so using a team approach.

This will facilitate parents having a clear understanding of the required tests, medications, follow-ups, and outcomes.

Parents of children with hypertensive issues can encounter 1 or more specialists in addition to their pediatric clinician.

This can prove to be overwhelming, frightening, and may fill the parent with anxiety.

Taking these things into account and creating unified

partners, built with the physician and family, will encourage the family to be more involved in the patient's health management.

Plain language in a team approach will yield the most positive outcomes for the patient.

Understanding the family and patient's perception of HTN and any underlying disease that may be contributing to it is important to resolve any misconceptions and encourage adherence to the physician's recommendations.

To attain therapeutic goals, proper education must be provided to the family as a whole. This education should include proper medication dosages, recommended sodium intake, any dietary changes, exercise expectations, and any other behavioral changes.

Parents with younger children will carry the ultimate burden of daily decisions as it applies to medications, food choices, and activity. Parents of older adolescents will partner with the children to encourage the right choices.

A family-based approach is important for all pediatric diseases but plays a particular role in conditions that are substantially influenced by lifestyle behaviors.

This has been shown in several pediatric populations, including those with T2DM and obesity