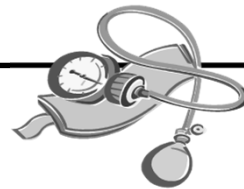


## 2017 AAP Guidelines for Childhood Hypertension: What You Need to Know

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Don Batisky, MD, FAAP  
Professor of Pediatrics  
Emory University School of Medicine  
Executive Director, PreHealth Mentoring, Emory College of Arts  
& Sciences  
Director, Pediatric Hypertension Program  
Children's Healthcare of Atlanta



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## FACULTY DISCLOSURE

In the past 12 months, I have had no relevant financial relationships with the manufacturer(s) of any commercial product(s) and/or provider(s) of commercial services discussed in this session.

I do not intend to discuss an unapproved/investigative use of a commercial product/device in this presentation.

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## Who are you?

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- [https://www.polleverywhere.com/multiple\\_choice\\_polls/w4ERr08fU96vu0rV0X2Qs](https://www.polleverywhere.com/multiple_choice_polls/w4ERr08fU96vu0rV0X2Qs)

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## What do you want to know about hypertension?

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- [https://www.polleverywhere.com/free\\_text\\_polls/ID600gYrrE0W4xZS0B3f6](https://www.polleverywhere.com/free_text_polls/ID600gYrrE0W4xZS0B3f6)

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## Learning Objectives

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By the end of this presentation, I expect that you will:

- Understand the background of the newest Clinical Practice Guidelines
- Realize the importance of BP measurement techniques
- Be able to define hypertension and 'elevated BP' in children and adolescents (not neonates/infants)

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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

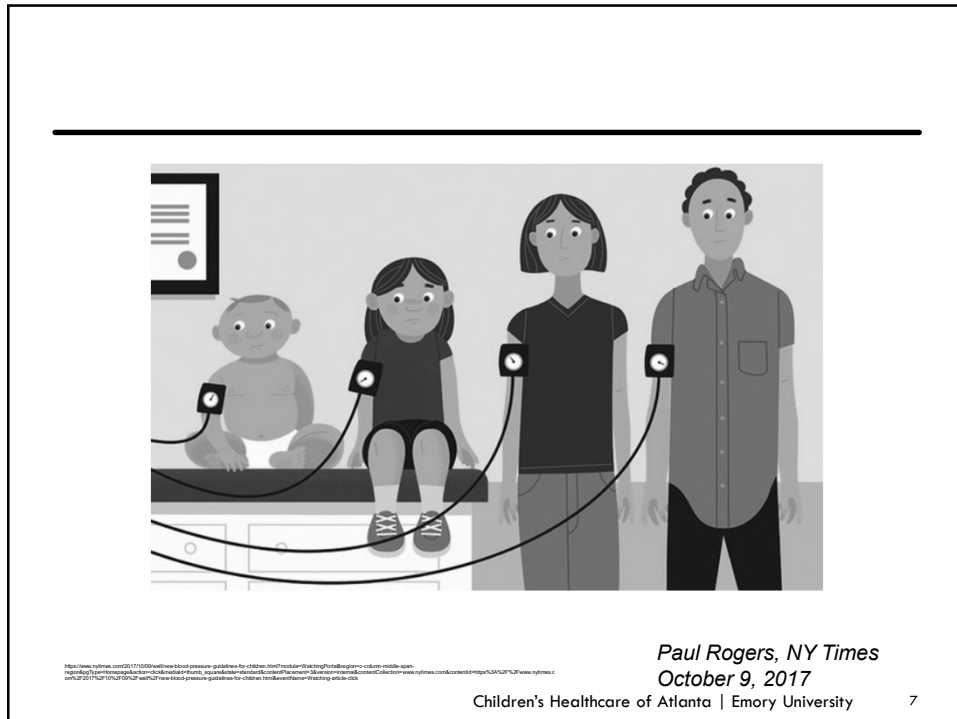
Joseph T. Flynn, MD, MS, FAAP;<sup>a</sup> David C. Kaelber, MD, PhD, MPH, FAAP, FACP, FACMI;<sup>b</sup> Carissa M. Baker-Smith, MD, MS, MPH, FAAP, FAHA;<sup>c</sup> Douglas Blowey, MD;<sup>d</sup> Aaron E. Carroll, MD, MS, FAAP;<sup>e</sup> Stephen R. Daniels, MD, PhD, FAAP;<sup>f</sup> Sarah D. de Ferranti, MD, MPH, FAAP;<sup>g</sup> Janis M. Dionne, MD, FRCPC;<sup>h</sup> Bonita Falkner, MD;<sup>i</sup> Susan K. Flinn, MA;<sup>j</sup> Samuel S. Gidding, MD;<sup>k</sup> Celeste Goodwin;<sup>l</sup> Michael G. Leu, MD, MS, MHS, FAAP;<sup>m</sup> Makia E. Powers, MD, MPH, FAAP;<sup>n</sup> Corinna Rea, MD, MPH, FAAP;<sup>o</sup> Joshua Samuels, MD, MPH, FAAP;<sup>p</sup> Madeline Simasek, MD, MSP, FAAP;<sup>q</sup> Vidhu V. Thaker, MD, FAAP;<sup>r</sup> Elaine M. Urbina, MD, MS, FAAP;<sup>s</sup> SUBCOMMITTEE ON SCREENING AND MANAGEMENT OF HIGH BLOOD PRESSURE IN CHILDREN

*Published August, 21 2017*

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## Rationale for the Guideline

- 1977: The First Task Force
- 1987: The Second Task Force
- 1996: Update of the Second Task Force
- 2004: The Fourth Report
- 2017: The AAP Clinical Practice Guideline
  - ‘the fifth report’
- Prior pediatric HTN guidelines issued by NHLBI
  - in 1977, 1987, 1996 and 2004
- NHLBI ceased sponsorship of cardiovascular GL in 2013
- Increased emphasis on basing new GL on thorough literature reviews

## Rationale for the Guideline

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- Significant increase in interest in childhood HTN since 2004 Fourth Report
  - 3.5% of children have HTN; another 10-11% have elevated BP
    - Increase in prevalence due to obesity
  - High BP in childhood increases the risk for adult HTN and cardiovascular disease
  - Even youth with HTN have evidence of accelerated vascular aging

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## Definition of HTN (1-18y)

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- Lack of outcome data on BP and CV endpoints in children & adolescents
- Childhood HTN is defined according to BP distribution in healthy children
  - This has been approach since 1987 2<sup>nd</sup> TF report
- Subcommittee maintained similar approach

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## Definition of HTN (1-18y)

- **Changes in HTN definition compared to the Fourth Report:**
  - BP >90<sup>th</sup> percentile now termed 'elevated BP'
    - ['Prehypertension' is gone.]
  - BP cut-points for stage 1 and 2 HTN simplified
  - BP cut-points for adolescents ≥13 years old are the same as in new AHA/ACC adult HTN guideline

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## Definition of HTN (1-18y)

**TABLE 3** Updated Definitions of BP Categories and Stages

For Children Aged 1–13 y	For Children Aged ≥13 y
Normal BP: <90th percentile	Normal BP: <120/ <b>&lt;</b> 80 mm Hg
Elevated BP: ≥90th percentile to <95th percentile or 120/80 mm Hg to <95th percentile (whichever is lower)	Elevated BP: 120/ <b>&lt;</b> 80 to 129/ <b>&lt;</b> 80 mm Hg
Stage 1 HTN: ≥95th percentile to <95th percentile + 12 mmHg, or 130/80 to 139/89 mm Hg (whichever is lower)	Stage 1 HTN: 130/80 to 139/89 mm Hg
Stage 2 HTN: ≥95th percentile + 12 mm Hg, or ≥140/90 mm Hg (whichever is lower)	Stage 2 HTN: ≥140/90 mm Hg

Flynn et al, *Pediatrics* 2017; 140:e20171904

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## New Normative BP Tables

- 4<sup>th</sup> Report BP tables generated from BP values in ~70,000 healthy children
  - Many children had overweight or obesity
  - Inclusion of these children likely biased normative BP values upward
- New normative BP tables used for this CPG, based only on BP readings from ~50,000 normal-weight children
- *A helpful resource:*
- <https://itunes.apple.com/us/app/pediatric-blood-pressure-guide/id1321932608?mt=8>

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## New BP Tables

**TABLE 4** BP Levels for Boys by Age and Height Percentile

Age (y)	BP Percentile	SBP (mm Hg)						
		Height Percentile or Measured Height						
		5%	10%	25%	50%	75%	90%	95%
1	Height (in)	30.4	30.8	31.6	32.4	33.3	34.1	34.6
	Height (cm)	77.2	78.3	80.2	82.4	84.6	86.7	87.9
	50th	85	85	86	86	87	88	88
	90th	98	99	99	100	100	101	101
	95th	102	102	103	103	104	105	105
	95th + 12 mm Hg	114	114	115	115	116	117	117
3	90th	100	100	101	102	103	104	105
	95th	104	104	105	106	107	108	109
	95th + 12 mm Hg	116	117	118	119	120	121	122
	Height (in)	35.1	37	37.9	39	40.1	41.1	41.7
	Height (cm)	89.5	93.9	96.3	99	101.8	104.3	105.8
	50th	88	89	89	90	91	92	92
	90th	101	102	102	103	104	105	105
	95th	106	106	107	107	108	109	109
	95th + 12 mm Hg	118	118	119	119	120	121	121
	95th + 12 mm Hg	118	118	119	119	120	121	121

Flynn et al, *Pediatrics* 2017; 140:e20171904

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## Simplified BP Table

- Full BP tables are complicated
  - Leads to under-recognition of childhood HTN
- Simplified BP table created for use in initial screening of BP values
  - Based on 90<sup>th</sup> percentile BP values for children at 5<sup>th</sup> height percentile

**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

*Flynn et al, Pediatrics 2017; 140:e20171904*

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## BP Measurement Frequency

- Unclear what age is optimal to begin routine BP measurement
- Data suggest that prevention and intervention efforts should begin early
- New guideline does not change recommendation to begin BP measurement at age 3
  - Now only annual measurement recommended unless risk factors present

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## Repeat High BP Measurements

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- BP in childhood may vary considerably between visits and even during the same visit
  - Many potential etiologies for isolated elevated BP in children and adolescents
- Therefore the clinician should:
  - Repeat high BP readings at a visit
  - Obtain multiple measurements over time before diagnosing HTN

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## Let's talk about BP measurement...

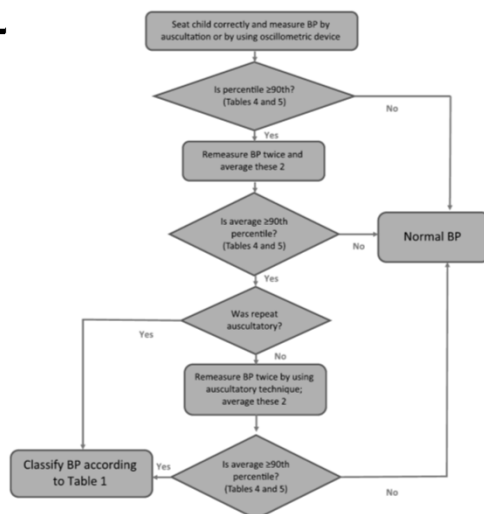
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- What do you do in your clinic?
- Why?
- <https://youtu.be/gUHALsLeeoM>

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## BP Measurement & Classification



Flynn et al, Pediatrics 2017; 140:e20171904

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

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## Oscillometric vs Auscultatory BP

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- Pediatric normative BP values are based on auscultation
- Despite this, oscillometric devices commonly used in many healthcare settings
  - Several perceived benefits
  - Known inaccuracies

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## Does it matter?

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## Getting BP readings away from the clinic

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- ABPM
- Home monitoring
- School monitoring

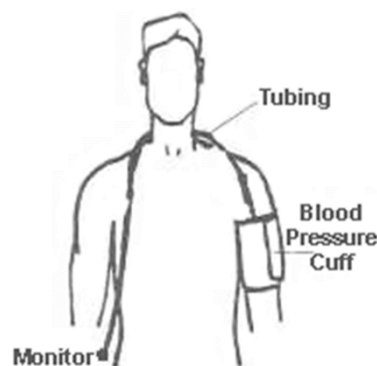
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## Ambulatory BP Monitoring

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- Patient wears a BP cuff continually for 24 hours
  - Readings q20-30 min
- Captures BP in many settings:
  - Home, school, work
  - Awake, asleep
- ABPM allows for evaluation of
  - Out-of-office blood pressure
  - circadian blood pressure patterns



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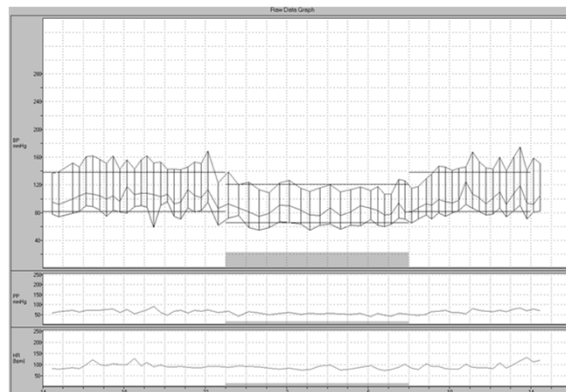
## BP Patterns by casual BP & ABP

	Ambulatory BP	Office BP
Normal BP	Normal	Normal
Sustained HTN	Elevated	Elevated
White Coat HTN	Normal	Elevated
Masked HTN	Elevated	Normal

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## ABPM – Ambulatory HTN



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## Ambulatory BP Monitoring

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- Use of ABPM in pediatric age group increasing
- Normative data tables available based on age, sex, height
- Consensus guidelines for interpretation available\*
- Mentioned as 'useful' but not endorsed in 2004 Fourth Report

*Flynn et al, Hypertension 2014; 63:1116*

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## Ambulatory BP Monitoring

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- New data available regarding
  - Frequency of WCH, Masked HTN
  - Associations with hypertensive TOD
  - Application in high-risk populations: CKD, DM, aortic coarctation, solid organ transplantation
  - Cost-effectiveness in pediatric HTN evaluation

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## Home BP Measurement

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- Pediatric studies do not show that BP measurements obtained in settings other than the office or by ABPM are sufficiently reliable to establish a diagnosis of HTN
- This recommendation should not discourage home or school BP measurement for screening or monitoring purposes.
- Home measurement is convenient and enables repeated measurements over time
- Results differ from office and ABPM measurements
- Commonly used for treatment monitoring\*
- Practical concerns:
  - Little normative data
  - Only a few devices validated for children
  - Cuff sizes limited
  - No consensus about how many measurements across what period of time needed to evaluate BP

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## School BP Measurement

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- Evidence to support use of school measurements is limited.
- Though useful in research, because of insufficient evidence and lack of established protocols, the routine use of school-based measurements to diagnose HTN cannot be recommended.
- School-based BP measurement, however, can be a useful tool to identify children who require formal evaluation as well as a helpful adjunct in monitoring of diagnosed HTN.

***Note: School-based health clinics are considered part of systems of pediatric primary care and these comments would not apply to them***

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## Primary Hypertension

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- Predominant cause of HTN in US children
- Characteristics include:
  - Age  $\geq 6$  years; Positive family history of HTN; obesity/overweight
- Severity of BP elevation similar between primary and secondary HTN
  - Diastolic HTN predictive of secondary cause
  - Systolic HTN predictive of Primary HTN

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## Secondary Causes: Renal/Renovascular

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- Retrospective case series of children with secondary HTN show that:
  - Renal parenchymal disease or renal structural abnormalities account for 34-76%; and
  - Renovascular disease accounts for 12-13%
- Renal causes especially likely among children  $< 6$  years old

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## Patient Evaluation

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- Once HTN diagnosis has been confirmed, patient should be evaluated to:
  - Determine underlying cause of HTN
  - Assess for comorbidities
- Evaluation should include:
  - Patient & family history
  - Physical examination
  - Laboratory and imaging studies
- Exam
  - conducted to identify underlying secondary causes of HTN, or target-organ effects of HTN
- Detailed in table 14 in CPG

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## Laboratory Evaluation

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- Laboratory testing
  - may reveal or provide clues to underlying secondary causes of HTN
- Should include:
  - screening tests in all patients
  - additional tests in selected patients based on clues from history, physical exam, or initial screening tests

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## Table 10: Screening Tests

TABLE 10 Screening Tests and Relevant Populations

Patient Population	Screening Tests
All patients	Urinalysis Chemistry panel, including electrolytes, blood urea nitrogen, and creatinine Lipid profile (fasting or nonfasting to include high-density lipoproteins and total cholesterol) Renal ultrasonography in those <6 y of age or those with abnormal urinalysis or renal function
In the obese (BMI >95th percentile) child or adolescent, in addition to the above	Hemoglobin A1c (accepted screen for diabetes) Aspartate transaminase and alanine transaminase (screen for fatty liver) Fasting lipid panel (screen for dyslipidemia)
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) Complete blood count, especially in those with growth delay or abnormal renal function

*Flynn et al, Pediatrics 2017; 140:e20171904*

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## Overall Treatment Goals

- Achieve a BP level that
  - Reduces risk for target organ damage
  - Reduces risk for hypertension related cardiovascular disease in adulthood
- Achieve an optimal BP level:
  - <90<sup>th</sup> percentile / <130/80 mm Hg in adolescents

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## Pharmacologic treatment

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- Prescribe antihypertensive medications if:
  - Patient has failed at least 6 months of lifestyle change
  - Symptomatic HTN
  - Stage 2 HTN without clearly modifiable risk factor (e.g. obesity)
- 1<sup>st</sup> line agents may include:
  - ACE inhibitor or ARB
  - Long-acting calcium channel blocker
  - Thiazide diuretic
- In CKD or diabetes:
  - ACE inhibitor or ARB

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## Treatment Follow-Up and Monitoring

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- Patients treated with antihypertensive medications should be seen every 4-6 weeks for dose adjustments until goal BP reached, then every 3-4 months
- Patients treated with lifestyle change only should be seen every 3-6 months to assess success of BP reduction and to reassess need for pharmacologic treatment

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## HTN and the Athlete

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- There is no evidence that exercising while hypertensive increases sudden death risk.
- Physical activity and improved physical fitness are treatments for HTN
- Treatment of HTN improves sports performance.
  - However if LVH or other target organ damage is present, should withhold from competition until BP controlled

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## In Summary: Major Points

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- There have recently been changes in HTN categorization.
- There are revised BP tables and a screening table.
- ABPM is likely to be used more.
- Lower treatment goals & emphasis on BP reduction, not just LVH.
- ALL of this hinges upon accurate measurements!

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Thanks for inviting me and for your attention!

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**Questions?**

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