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

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

• [https://www.polleverywhere.com/multiple_choice_polls/w4ERr08fU96vu0rV0X2Qs](https://www.polleverywhere.com/multiple_choice_polls/w4ERr08fU96vu0rV0X2Qs)

What do you want to know about hypertension?

• [https://www.polleverywhere.com/free_text_polls/ID600gYrrE0W4xZS0B3f6](https://www.polleverywhere.com/free_text_polls/ID600gYrrE0W4xZS0B3f6)
Learning Objectives

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)
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
- NHLBI ceased sponsorship of cardiovascular GL in 2013
- Increased emphasis on basing new GL on thorough literature reviews
Rationale for the Guideline

• 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

Definition of HTN (1-18y)

• 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 2nd TF report
• Subcommittee maintained similar approach
Definition of HTN (1-18y)

- Changes in HTN definition compared to the Fourth Report:
  - BP >90th 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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**TABLE 3 Updated Definitions of BP Categories and Stages**

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

Flynn et al, Pediatrics 2017; 140:e20171904
New Normative BP Tables

- 4th 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:

New BP Tables

<table>
<thead>
<tr>
<th>TABLE 4 BP Levels for Boys by Age and Height Percentile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (y)</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>50th</td>
</tr>
<tr>
<td>55th</td>
</tr>
<tr>
<td>55th + 12 mm Hg</td>
</tr>
</tbody>
</table>

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 90th percentile BP values for children at 5th height percentile

<table>
<thead>
<tr>
<th>Age, y</th>
<th>Boys</th>
<th>Girls</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Systolic</td>
<td>DBP</td>
</tr>
<tr>
<td>1</td>
<td>98</td>
<td>52</td>
</tr>
<tr>
<td>2</td>
<td>100</td>
<td>55</td>
</tr>
<tr>
<td>3</td>
<td>101</td>
<td>59</td>
</tr>
<tr>
<td>4</td>
<td>102</td>
<td>60</td>
</tr>
<tr>
<td>5</td>
<td>103</td>
<td>63</td>
</tr>
<tr>
<td>6</td>
<td>105</td>
<td>66</td>
</tr>
<tr>
<td>7</td>
<td>106</td>
<td>68</td>
</tr>
<tr>
<td>8</td>
<td>107</td>
<td>69</td>
</tr>
<tr>
<td>9</td>
<td>107</td>
<td>70</td>
</tr>
<tr>
<td>10</td>
<td>108</td>
<td>72</td>
</tr>
<tr>
<td>11</td>
<td>110</td>
<td>74</td>
</tr>
<tr>
<td>12</td>
<td>113</td>
<td>75</td>
</tr>
<tr>
<td>≥13</td>
<td>120</td>
<td>80</td>
</tr>
</tbody>
</table>

_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
Repeat High BP Measurements

- 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

Let’s talk about BP measurement...

- What do you do in your clinic?
- Why?
- https://youtu.be/gUHALsLeeoM
**BP Measurement & Classification**

Flynn et al, Pediatrics 2017; 140:e20171904

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

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Oscillometric vs Auscultatory BP

- Pediatric normative BP values are based on auscultation

- Despite this, oscillometric devices commonly used in many healthcare settings
  - Several perceived benefits
  - Known inaccuracies

Does it matter?
Getting BP readings away from the clinic

- ABPM
- Home monitoring
- School monitoring

Ambulatory BP Monitoring

- 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
### BP Patterns by casual BP & ABP

<table>
<thead>
<tr>
<th></th>
<th>Ambulatory BP</th>
<th>Office BP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal BP</td>
<td>Normal</td>
<td>Normal</td>
</tr>
<tr>
<td>Sustained HTN</td>
<td>Elevated</td>
<td>Elevated</td>
</tr>
<tr>
<td>White Coat HTN</td>
<td>Normal</td>
<td>Elevated</td>
</tr>
<tr>
<td>Masked HTN</td>
<td>Elevated</td>
<td>Normal</td>
</tr>
</tbody>
</table>

### ABPM – Ambulatory HTN

[Graph of ambulatory blood pressure readings]
Ambulatory BP Monitoring

- 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

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
Home BP Measurement

- 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

School BP Measurement

- 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
Primary Hypertension

• Predominant cause of HTN in US children
• Characteristics include:
  – Age ≥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

Secondary Causes: Renal/Renovascular

• 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
Patient Evaluation

- 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

Laboratory Evaluation

- 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
### 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:**
  - $<90^{th}$ percentile / $<130/80$ mm Hg in adolescents
Pharmacologic treatment

- 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)

- 1st line agents may include:
  - ACE inhibitor or ARB
  - Long-acting calcium channel blocker
  - Thiazide diuretic

- In CKD or diabetes:
  - ACE inhibitor or ARB

Treatment Follow-Up and Monitoring

- 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
HTN and the Athlete

• 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

In Summary: Major Points

• 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!
Thanks for inviting me and for your attention!

Questions?