Detection & Management of High Blood Pressure

Maine’s Blood Pressure Training Program

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Our Program

This training course was designed in partnership with the Maine CDC Cardiovascular Health Program, Maine Cardiovascular Health Council, and Virginia Department of Health, Division of Chronic Disease Prevention and Control, Heart Disease and Stroke Prevention Project.


(No Disclosures)
What’s Your Excuse?

There’s no time!

We’re behind schedule!

Which cuff?

Just take it over the shirt!

One reading or two?
Prevalence in Adults

1 in 3 Americans

Of these:
- 30% are not aware
- 50% are untreated
- 35% have BP under good control

Another 25% have pre-hypertension

Prevalence increases with age,
> 60% over age 65

If normotensive at 55, 90% lifetime risk of hypertension
Types

Secondary High Blood Pressure

5% of cases

Cause

Treatment

Primary High Blood Pressure

95% of cases

Cause

Symptoms “Silent Killer”

Treatment
Blood Pressure Classifications:

- **Normal Blood Pressure**
  - Less than 120 mmHg
  - Less than 80 mmHg

- **Pre-Hypertension**
  - 120 - 139 mmHg systolic
  - 80 - 89 mmHg diastolic

- **Hypertension**
  - 140 or higher mmHg systolic
  - 90 or higher mmHg diastolic

- **Isolated Systolic Hypertension**
  - More common in elderly
  - Systolic ≥ 140 with diastolic below 90

- **Variability**
  - Need successive measurements
What happens when someone has high blood pressure?

**The artery walls stiffen & become less elastic**

**The heart works harder, the walls thicken and/or dilate**

**End organ damage**
High Blood Pressure’s Effects

High Blood Pressure is a major risk factor for:
- Heart disease
- Stroke
- Kidney failure

Treatment lowers the incidence of heart disease, stroke and kidney failure

Small changes in BP can result in large risk reductions
Blood Pressure Goals

- **Treatment Goals**
  - <140/90 for most hypertensive's
  - <130/80 for high risk patients
    - Chronic kidney disease (CKD)
    - Coronary artery disease (CAD)
    - Peripheral artery disease (PAD)
    - Framingham Risk Score >10
  - <120/80 for patients with heart failure
Adult Management (JNC 7)

- **Normal**
  - Lifestyle modifications

- **Pre-Hypertension**
  - Lifestyle modifications
  - Drug therapy if compelling indications

- **Stage 1 Hypertension**
  - Lifestyle modifications
  - Drug therapy 1 + meds

- **Stage 2 hypertension**
  - Lifestyle modifications
  - Drug therapy 2 + meds
Lifestyle Modifications

- Lose excess weight
- Reduce sodium
- Limit alcohol
- Increase physical activity
- Adopt DASH diet
- Quit tobacco
- Reduce stress
- Limit caffeine
Auscultatory-Palpatory Technique

The Gold Standard For Measurement

Only method recommended by:

- American Heart Association
- United States Preventive Services Task Force
- American Society of Hypertension
- JNC 7

Why?

- Need for accuracy
- Comfort of patient
- Prevent trauma to screener
“Measurement of Blood Pressure is one of the most frequently performed medical tests.

Because it seems to be such an easy measurement to make, the accuracy of the results is seldom questioned.

However, studies have shown that there is good reason to doubt the accuracy of blood pressure readings.”
Impact of Errors

- Costs $1,000/person/year if treated unnecessarily
- Undiagnosed
  - 5mmHg error = 21 million undetected
- Medication side effects
  - 125,000 will have CVD related death
  - 20% could have been prevented

In Partnership with Medical Care Development  www.mcd.org
Measurement Variations

Errors in procedure:
- Equipment
- Screener
- Client

Physiological variations
Sphygmomanometers

- **Aneroid**
  - Not as reliable over time
  - Use only validated equipment
  - Check for accuracy every 3 – 6 months

- **Automated**
  - Accuracy?
  - Finger not recommended
  - Wrists are less accurate
  - Manually re-take abnormal readings
  - Treatment should not be based on results

- **Mercury**
  - Most Accurate
  - Prohibited in Maine

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Includes:

- Cuff
- Bladder
- Pressure Bulb
- Control Valve
- Rubber Tubing

Bladder size determines cuff size:

Length encircles 80% of arm
Width covers 40% of the circumference of the arm

Too narrow or short: BP will be high
Too wide or long: BP will be low
Can occur in:

- Cuff
- Bladder
- Bulb
- Control valve
- Tubing
- Manometer
- When control valve is in closed position
- Present if mercury or aneroid gauge falls

Test for Air Leaks

Replace defective parts
Stethoscope

Bell vs. Diaphragm

- Apply directly over brachial artery, never under the cuff or tubing
- Apply with light pressure
- Point ear tips toward face
- Not necessary to cover hole
Cuff Size and Application

- Apply cuff to bare arm
- Apply cuff snugly
- Center the bladder
- If upper arm is too short?
Korotkoff Sounds

Series of sounds heard when measuring BP

5 Phases:

- Tapping very faint at first
- Swishing
- Knocking
- Muffling
- Sounds disappear

http://static.flickr.com/63/166404055_3a32887233.jpg
Play DVD and have students write down answers.
Enhancing the Korotkoff Sounds

- Rapidly inflate cuff
- Inflate cuff while arm is elevated
- Open, close fist 8-10 times after inflating cuff above estimated systolic level
Screener Error

Poor Technique

- Rapid cuff deflation
- Inattention
- Manometer not at eye level
- Reaction Time
- Confusion of auditory and visual signals
Client Errors

Position of Body
- Support
- Heart level
- Leaning on arm

Position of arm

Mentally relaxed

Recent eating or smoking

Rest vs. Exercise

Talking

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The Client

Position the patient
Mentally relaxed

Environment

Position of arm
• Supported
• At heart level
• Not leaning on arm

No smoking 30 minutes prior
No caffeine/exercise 30 minutes prior
Physiological Variations

- Physiological
  - Medications
  - Full bladder
  - Emotional state
  - Time of day/Fatigue
  - Temperature of Room
  - Recent Exercise
  - Tobacco/ Caffeine use
What's Wrong?

Are you ready for your big wedding?

Not really, there's so much to do - I am very nervous these days.
## Cumulative Effects of Errors

<table>
<thead>
<tr>
<th>Common Errors</th>
<th>Effect on SYSTOLIC BP</th>
<th>CORRECTIVE ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sitting without back support</td>
<td>+ 6 to 10</td>
<td>Support back (sit in chair)</td>
</tr>
<tr>
<td>Full bladder</td>
<td>+ 15</td>
<td>Empty bladder prior to BP is taken</td>
</tr>
<tr>
<td>Tobacco/caffeine use</td>
<td>+ 6 to 11</td>
<td>Don’t use before clinic appointment</td>
</tr>
<tr>
<td>BP taken when arm is:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Incorrect position</td>
<td>+ 9 to 13</td>
<td>While seated in chair, patient’s arm must be supported, with elbow at heart level</td>
</tr>
<tr>
<td>• Unsupported</td>
<td>+ 1 to 7</td>
<td></td>
</tr>
<tr>
<td>• Elbow too high</td>
<td>+ 5</td>
<td></td>
</tr>
<tr>
<td>• Elbow too low</td>
<td>False low</td>
<td></td>
</tr>
<tr>
<td>“White coat” reaction</td>
<td>+ 11 to 28</td>
<td>Have someone else take the BP</td>
</tr>
<tr>
<td>Talking or hand gestures</td>
<td>+ 7</td>
<td>No talking or using hands during BP measurement</td>
</tr>
<tr>
<td>Cuff too narrow/small</td>
<td>+ 8 to 10</td>
<td>Place the correct-sized cuff properly AND...</td>
</tr>
<tr>
<td>Cuff too wide/large</td>
<td>False low</td>
<td>Place it over a bare upper arm</td>
</tr>
<tr>
<td>Cuff not centered</td>
<td>+ 4</td>
<td></td>
</tr>
<tr>
<td>Cuff over clothing</td>
<td>+ 5 to 50</td>
<td></td>
</tr>
</tbody>
</table>
Maximum Inflation Level – (MIL)

What is it?
- Level to which the pressure in cuff needs to be raised to accurately assess the systolic Blood Pressure

2 step procedure
- Estimate Systolic
- Measure the blood pressure

Why?
- Auscultatory gap
- Accurate inflation

Caution
- Once needle falls, do not re-inflate w/o deflating and waiting 15-30 sec.
AP Technique

- Position patient
- Size and place the cuff
- Palpate the radial pulse
- Estimate the Systolic Pressure
- Determine the Max Inflation Level
- Wait – 30 seconds
- Place stethoscope
- Raise Blood Pressure to MIL
- Take additional Readings
**Measurement Criteria**

- **Deflation Rate**
  - 2 mmHg per second

- **Systolic Blood Pressure is:**
  - The first of two consecutive sounds

- **Diastolic Blood Pressure is:**
  - The disappearance of sound
  - It is not the last sound heard

- **Absent 5th phase is:**
  - Sounds that are heard all the way down to zero
Online Tools

BP training: BP in the 21st Century & Korotkoff Sounds
www.mainecardiohealth.org/trainings.html

BP device validation information and library
www.dableducational.org

Aneroid Maintenance
http://www.nda.ox.ac.uk/wfsa/html/u03/u03_018.htm

QuantiaMD - ME Health - Training for clinical staff
www.quantiamd.com/community/mainehealth?u=other

Pediatric BP charts - calculates automatically
http://www.bcm.edu/bodycomplab/Flashapps/BPVAgeChartpage.html
<table>
<thead>
<tr>
<th>Condition</th>
<th>Blood Pressure Range</th>
<th>Referral Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>less than 120/80</td>
<td>No referral</td>
</tr>
<tr>
<td>Prehypertension</td>
<td>120-39 systolic &amp;/or 80-89 diastolic</td>
<td>Follow up at next physician visit</td>
</tr>
<tr>
<td>Hypertension</td>
<td>140/90 (average of 3 readings)</td>
<td>Physician Referral</td>
</tr>
<tr>
<td>Emergency</td>
<td>180/110</td>
<td>Immediate referral ER/Physician</td>
</tr>
</tbody>
</table>
Screener Responsibilities

- Be properly trained
- Use accurate, maintained devices
- Recognize patient factors (anxiety, smoking...)
- Position patient properly
- Select the right cuff. Position it correctly
- Accurately perform and record the measurement
Pediatric Blood Pressure

Objectives

- Background
- Definitions
- Tools
- Technique
High Blood Pressure in Children

Present in 30% of overweight children (BMI > 95th percentile)

Secondary hypertension common

Early markers of CVD
- LVH, arterial compliance, atherosclerosis, diastolic dysfunction

Metabolic syndrome higher in kids with hypertension
High Blood Pressure in Children

Correlates with:

- Family history
- Low birth weight
- Overweight
## Pediatric Classifications

### Normal BP
- Less than 90\textsuperscript{th} percentile for gender, age, height
- Systolic is used to define HTN in children <1 yr

### Prehypertension
- Average Systolic and/or Diastolic are greater than or equal to 90\textsuperscript{th} percentile
- And less than 95\textsuperscript{th} percentile
- 3 or more occasions
- Or BP exceeds 120/80

### Stage 1 HTN
- 95\textsuperscript{th} - 99\textsuperscript{th} percentile plus 5 mmHg

### Stage 2 HTN
- Greater than 99\textsuperscript{th} percentile plus 5 mmHg

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Source: CenV Anet: Accountability in Healthcare
Types

Primary Hypertension
- Usually mild or Stage I hypertension
- Family history
- More than 30% attributed to overweight or obesity

Secondary Hypertension
- More prevalent in children

Treatment of Secondary hypertension
- Eliminate or treat cause
- Medication

Measure BP in both arms and one leg
- Lower in leg may mean coarctation of the aorta
Measurement in Children

Children over age 3 – check BP at every visit or… at least, yearly

Take BP in both arms

Use auscultatory/palpatory technique

Proper patient position and BP cuff size
- Bladder 100% circumference of arm

May have absent 5th phase of Korotkoff sounds
### TABLE 3. BP Levels for Boys by Age and Height Percentile

<table>
<thead>
<tr>
<th>Age (year)</th>
<th>BP Percentile</th>
<th>Systolic BP (mm Hg)</th>
<th>Diastolic BP (mm Hg)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5th</td>
<td>10th</td>
<td>25th</td>
</tr>
<tr>
<td>1</td>
<td>50th</td>
<td>80</td>
<td>81</td>
</tr>
<tr>
<td>2</td>
<td>50th</td>
<td>84</td>
<td>85</td>
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<tr>
<td>3</td>
<td>50th</td>
<td>86</td>
<td>87</td>
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<td>4</td>
<td>50th</td>
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<td>89</td>
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<td>5</td>
<td>50th</td>
<td>90</td>
<td>91</td>
</tr>
<tr>
<td>6</td>
<td>50th</td>
<td>92</td>
<td>93</td>
</tr>
<tr>
<td>7</td>
<td>50th</td>
<td>92</td>
<td>94</td>
</tr>
<tr>
<td>8</td>
<td>50th</td>
<td>94</td>
<td>95</td>
</tr>
<tr>
<td>9</td>
<td>50th</td>
<td>95</td>
<td>96</td>
</tr>
</tbody>
</table>
# Abnormal Values Chart

**TABLE 1** Blood Pressure Values Requiring Further Evaluation, According to Age and Gender

<table>
<thead>
<tr>
<th>Age, y</th>
<th>Blood Pressure, mm Hg</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Systolic</td>
<td>Diastolic</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>100</td>
<td>59</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>102</td>
<td>62</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>104</td>
<td>65</td>
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<tr>
<td>6</td>
<td></td>
<td>105</td>
<td>68</td>
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<td>7</td>
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<td>106</td>
<td>70</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>107</td>
<td>71</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td>109</td>
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<tr>
<td>10</td>
<td></td>
<td>111</td>
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<td>13</td>
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<td>117</td>
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<tr>
<td>14</td>
<td></td>
<td>120</td>
<td>75</td>
</tr>
<tr>
<td>15</td>
<td></td>
<td>120</td>
<td>76</td>
</tr>
<tr>
<td>16</td>
<td></td>
<td>120</td>
<td>78</td>
</tr>
<tr>
<td>17</td>
<td></td>
<td>120</td>
<td>80</td>
</tr>
<tr>
<td>≥18</td>
<td></td>
<td>120</td>
<td>80</td>
</tr>
</tbody>
</table>

These values represent the lower limits for abnormal blood pressure ranges, according to age and gender. Any blood pressure readings equal to or greater than these values represent blood pressures in the prehypertensive, stage 1 hypertensive, or stage 2 hypertensive range and should be further evaluated by a physician.
Tips From the Field

- Allow child to play with equipment
- Say how it feels: “like a hug for your arm”
- Tailor approach to the child
- Place it on a stuffed animal
- Give rewards (stickers)
- Calm the child
Demonstration & Practice Session