HIGH BLOOD PRESSURE IN CHILDREN AND ADOLESCENTS

Pediatric Clinical Learning Day 2017

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PCP Blood Pressure Readings

- Jan. 2015 – BP 111/75 – 91\textsuperscript{st}/95\textsuperscript{th} pctl
- Feb. 2015 – BP 109/85 – 91\textsuperscript{st}/99\textsuperscript{th} pctl
- Jun. 2016 – BP 120/84 – 99\textsuperscript{th}/99\textsuperscript{th} pctl
- Sep. 2016 – BP 120/83 – 99\textsuperscript{th}/99\textsuperscript{th} pctl
- Dec. 2016 – BP 124/87 – 99\textsuperscript{th}/99\textsuperscript{th} pctl
Cardiologist Blood Pressure Reading
• Jan. 2017 – BP 121/81 – 98th/93rd pctl

Nephrologist Blood Pressure Reading
• Feb. 2017 – BP 92/46 – 26th/12th pctl
Why focus on High Blood Pressure?
What do the measurements mean?
What are we doing about it?
High Blood Pressure is one of the leading causes of death worldwide.
Evidence of end-organ damage in children

- Left ventricular hypertrophy and carotid intima-media thickness changes
- Hyperlipidemia
- Chronic renal failure
- Diabetes
Mounting evidence that childhood BP correlates with adult BP.

Diagnosis is often missed and is not straightforward.

- 3.5% prevalence of HBP in US children
- 30,000 children in Utah with HBP
Measuring Blood Pressure

- Normal BPs vary by age, sex and height
- Cuff size matters – better too big than too small
- Oscillometric method tends to read higher than auscultatory method
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<th>BP Percentile</th>
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WHAT DO THE MEASUREMENTS MEAN?

Pediatric Blood Pressure Table

Pediatric Blood Pressure Calculator

- Sex: Male, Female
- Age: 10 years, 7 months
- Height: 142 cm, 54th %
- BP: 115 / 75 mmHg
- SBP: 89th percentile
- DBP: 91st percentile
- 90% BP for age: 115 / 74 mmHg
- 95% BP for age: 119 / 78 mmHg
- 99% BP for age: 126 / 86 mmHg

Patient's BP is in prehypertension.
Defining High Blood Pressure

- Pre-HBP: 90th to 95th percentile or >120/80
- Stage 1 HBP: 95th to 99th percentile +5 mm Hg
- Stage 2 HBP: >99th percentile +5 mm Hg
- Based on three readings on separate visits
- One Stage 2 HBP reading is sufficient for work up and referral
- Ambulatory BP monitoring is helpful
Risk factors for High Blood Pressure

- Overweight, obesity
- Family history of High BP, CVD
- Male gender
- Maternal smoking during pregnancy (breast feeding reduces this risk)
WHAT DO THE MEASUREMENTS MEAN?

Primary or secondary High Blood Pressure?

- Secondary High BP is more common in younger children and Stage 2 High BP
- White Coat high BP-as high as 35% in some studies
WHAT DO THE MEASUREMENTS MEAN?

Secondary High Blood Pressure

• Yes, it is more common
• Yes, renal causes most common (34%)
• Pulmonary causes also common (20%)
WHAT DO THE MEASUREMENTS MEAN?

Some secondary causes

- Coarctation of aorta
- Cushing Syndrome
- Drug effect
- Pheochromocytoma
- Hyperthyroidism
- Obstructive sleep apnea
- Rheumatological disease
And finally...renal causes

- Renal artery stenosis
- Renal parenchymal disease
- In Stage 2 HBP, 85% likelihood of kidney disease as the cause
Evaluation of High Blood Pressure

- All: UA/BUN/Cr./electrolytes.
- Fasting glucose, lipid profile may be helpful.
- Targeted evaluation:
  - Echocardiography
  - Retinal analysis
  - Renal ultrasound with Doppler
  - Angiography, Digital Subtraction Angiography
Treatment goals*

- Decrease to <95\textsuperscript{th} percentile if no end-organ damage
- Decrease to < 90\textsuperscript{th} percentile if damage present

*Expert opinion, extrapolated from adult studies
Treatment

• New lifestyle and weight management care pathway
WHAT ARE WE DOING ABOUT IT?

Medication Treatment

- Symptomatic High BP
- Secondary High BP or end-organ damage
- No studies yet on long-term outcomes
- Short-term studies are of varying quality
WHAT ARE WE DOING ABOUT IT?

International Childhood Cardiovascular Cohort (i3C)

- Seven large cohorts in the US, Finland, Australia followed since 2002
- An effort to link childhood cardiovascular risks to adult disease
- Closes in 2018
WHAT ARE WE DOING ABOUT IT?

Medication choices

- ACE inhibitors, calcium channel blockers preferred by a group of surveyed nephrologists
- Candesartan, Lorsartan
- Diuretics, β-blockers
- Safe and well tolerated
- Have been shown to reverse progression of end organ damage
WHAT ARE WE DOING ABOUT IT?

Medication choice depends on associated condition

• ACE inhibitor for proteinuric renal disease
• Avoid β-blocker in athletes (prohibited in some events)
Current recommendation is for nephrologists to manage meds

- Will this be possible if our increased screening is effective?
WHAT ARE WE DOING ABOUT IT?

VRP goals

• Increase awareness
• Increase measurement and improve accuracy of BP
• Educate about diagnosis and management
WHAT ARE WE DOING ABOUT IT?

2017 VRP

• Measure BP in 20% of patients 12 – 18 years old (all visits) from January – June 2017
• Measure BP in 60% of patients from July – December 2017
• Attend Clinical Learning Day on High BP
• Develop a tool in iCentra to compare BPs to normal ranges for the patient variables
• Document PAVS in 20% of unique adolescent patients by June 30, and 40% by December 31.
THE FUTURE

• Diagnose and treat High Blood Pressure
• Determine outcomes and share our findings to improve care for more patients
• Get started — 40 years is long enough!
Why focus on High Blood Pressure?
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QUESTIONS?