

Acute Management of Hypertension in Pediatrics

This is a talk on the acute management of high blood pressure in pediatric patients. The goal is to discuss the different medications we commonly use in the acute setting (mostly in urgent cares, emergency departments and on the inpatient service) to manage high blood pressures. Chronic management of blood pressure in pediatrics will not be covered in this talk.

How do we measure blood pressure?

- In most emergency departments and hospitals, the blood pressures that we measure are taken using a machine
- The way this machine works is that it calculates a mean arterial pressure, and then the systolic and diastolic pressures are calculated based on this value.

Common blood pressure mishaps:

- 1) Using the wrong size cuff
 - a. The short side of the cuff (if looking at the cuff as a long rectangle) should measure 40% of the child's upper arm (from shoulder to elbow)
 - b. Bladder should measure 80-100% of the circumference of the child's arm
- 2) Using the wrong extremity
 - a. Blood pressure norms are constructed based off studies that looked at blood pressure in the right upper extremity, so taking a BP in the leg, for example, may give you a falsely elevated result
- 3) Taking the measurement when the child is agitated, crying or in pain (although this sometimes can't be avoided)
- 4) Trusting the machine too much.
 - a. A machine is just a machine – it is not a substitute for a skilled manual blood pressure done by a nurse or physician.
 - b. Sometimes the pressures are incorrect. In particular, diastolic blood pressures can be calculated incorrectly.

What do I do if I get called about an elevated blood pressure?

1. Whenever you get called about an abnormal vital sign, the first thing to do is to **look at a complete set of vital signs**.
 - a. Hypertensive + Tachycardic + Tachypneic + Febrile = Upset and Febrile?
 - b. Hypertensive + Tachycardic but Afebrile = Upset? Dry? Hungry?
 - c. Hypertensive + Normal HR + Normal RR = True hypertension?
 - d. Hypertensive + Bradycardic + Variable RR = Cushing's triad?!?
 - e. Hypertensive + Tachycardic (or normal HR) + Pain scale of 9/10 = Pain related hypertension?
2. Next, assess patient for secondary signs.
 - a. Are they mentating well? Headache? Well perfused?
3. Next, obtain manual blood pressure.
4. Think about common blood pressure mishaps. Do we have the right cuff?
5. Finally, if convinced that your patient has acutely elevated blood pressure, consider medical management.

Medical Management:

1. Treat underlying cause of hypertension. For example:
 - a. Pain control
 - b. Volume overload (for example: dialysis patients)
 - c. Drug related (steroids, cocaine, amphetamines)
2. Sometimes removing causal agent is not quick enough or not feasible. Other times the etiology of hypertension is unknown. In those cases, to achieve decrease in blood pressure, refer to medication chart below.



- In otherwise healthy child with acute hypertension (think: child on pulse dose steroids, with known normal kidneys, normally is normotensive) treat to achieve normal or high-normal BP.
- In child presenting in hypertensive crisis, and it is unknown if the hypertension is chronic or not (think: child admitted with acute hypertension, BP 160/95 and we don't know if this is chronic or not) goal is to reduce BP by 25% over 8 hour time frame. So in our example, down to systolic of 120 over the course of 8 hours.

Calcium channel blocker: Isradipine

- Isradipine is a **PO only** medication
- Onset of action: 1-2 hours. Dose = 0.1-2 mg/kg/dose. Up to 5mg per dose.
- Pros: Don't need an IV to give it and works quickly. Safe in most kids.
- Cons: Can cause tachycardia and headache

Beta Blocker: Labetalol

- Labetalol is available **IV and PO**.
- IV form: Onset in 5-10 minutes. Lasts for 2-4 hours. Dose = 0.2-1 mg/kg/dose. Typically 10-20mg per dose. Max dose: 40mg.
- PO form: Onset in 20min - 2h. Lasts 8-12h. Dose = 1-3mg/kg/day in 2 divided doses
- Pros: Safe in most people. Quick on, quick off.
- Cons: **bad for asthmatics** (bronchospasm), bad for heart failure because decreases HR and worsens squeeze (negative inotrope)

Hydralazine

- Hydralazine works by dilating arterioles (little effect on veins). Exact mechanism unknown. It is available **IV and PO**.
- IV form: Onset of action in 10-30 minutes. Lasts for 4-12 hours. Dose = 0.1-0.5mg/kg/dose with max of 20mg per dose.
- PO form: 0.25mg/kg/dose every 6-8 hours as needed. Duration varies, 4-12h.
- Cons: Not as strong as other agents.

If severe and uncontrolled on above: escalate to Nicardipine

- Nicardipine is different from isradipine because it can be given IV. However, is very unsteady in solution, so usually given in a **drip**.
- Great for quick titration because the IV form works in 2-5 minutes and wears off in 30-60 minutes.
- This is given via a drip in the ICU.
- Dose = 0.5-3.0 ug per kilo per min

Why aren't ACE inhibitors on this list?

Two reasons. One, remember ACE inhibitors like lisinopril work by dilating the efferent arteriole which is the little vessel that drains blood after it runs through the glomerulus. Because they dilate the efferent arteriole, they cause a decrease in GFR, which can lead to AKI in kids who are already dehydrated or already have an AKI. Second, most ACE inhibitors are long acting which make them suboptimal choices. The exception to that is Captopril, which in rare cases can be used to treat acute hypertension.

Sources:

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