Dama International Journal of Researchers (DIJR), ISSN: 2343-6743, ISI Impact Factor: 1.018
Vol 3, Issue 01, January, 2018, Pages 96 - 102, Available @ www.damaacademia.com

Management Of Pediatric Hypertension

Nurus Sobah[1], Suharjono[2*]
[1]Master of Clinical Pharmacy, [2]Department Of Clinical Pharmacy,
Faculty of Pharmacy, Airlangga University, Surabaya, Indonesia
Email: shj_ms_id@yahoo.co.id & nurus.apt@gmail.com

Abstract
Blood pressure in children is affected by age, sex and height. At a certain age, a child with a higher height will have higher blood pressure. Physiologically, this is related to the surface area of the body. In children, systolic hypertension is more important than diastolic hypertension because systolic hypertension is more common and has a better correlation with left ventricular mass index. Management of hypertension in children begins by changing lifestyles through diet, physical activity and weight management. If by lifestyle modification, the blood pressure is still high or the symptoms occur then pharmacological therapy begins. Some guideline of hypertension therapy in children include ACEI, ARB, CCB, diuretics, aldosterone receptor antagonists, beta-adrenergic antagonist and direct vasodilators.

Keywords: *Pediatric Hypertension, Hypertension Management*

I. INTRODUCTION

Blood pressure is affected by age, sex and height. At a certain age, a child with a higher height will have higher blood pressure. Physiologically, this is related to the surface area of the body. In children, systolic hypertension is more important than diastolic hypertension because systolic hypertension is more common and has a better correlation with left ventricular mass index kiri (Anderson Robert, Baker, Penny, Redington, Rigby, & Wernovsky, 2010). Hypertension in children is defined as a blood pressure level equal to or greater than 95% at a given age and gender and verified by repeated measurements (Flynn Joseph T, 2013).

II. NORMAL BLOOD PRESSURE IN CHILDREN

Physiologically, blood pressure in children varies greatly depending on age, sex and height. Therefore, it takes a standard value as a comparison. In children, blood pressure is more affected by height than age. Thus, the measurement of blood pressure in children is based more on height and weight than age. As a benchmark standard, the National High Blood Pressure Education Program in the USA released a standard table of blood pressure values ranging from 50, 90, 95, and 99 percentiles obtained through auscultation and specified by sex, age, and body height as reference to normal values . This data can also determine the level of hypertension. Normotensi if the blood pressure value is below 90 percentile, pre hypetension if blood pressure value is between 90-95 percentile, stage 1 hypertension if blood pressure value is between 95-99 percentile plus 5 mmHg, and it is said stage 2 hypertension if blood pressure value is more than 99 percentile plus 5 mmHg which will be summarized in the Table 1 (Team, 2004).

Table 1. Classification of Hypertension in Children (Flynn Joseph T, 2013)

Classification	SBP or DBP Percentile	Frequency of BP Measurement
Normal	<90th	Recheck at next scheduled physical examination
Pre Hypertension	90th to <95th or if BP exceeds 120/80 mmHg even if below 90th percentile up to <95th percentile	Recheck in 6 months
Stage 1 Hypertension	95th percentile to the 99th percentile plus 5 mmHg	Recheck in 1-2 weeks or sooner if the patient is symptomatic; if persistently elevated on two additional occasions, evaluate or refer to source of care within 1 month.
Stage 2 Hypertension	>99th percentile plus 5 mmHg	evaluate or refer to source of care within 1 week or immediately if the patient is symptomatic.

III. CLASSIFICATION OF HYPERTENSION

Hypertension in children is classified as either primary or essential hypertension and secondary hypertension. Primary hypertension is an unknown hypertension and is most common in children. While the cause of secondary hypertension can be identified (Flynn Joseph T, 2013).

i. Primary Hypertension: Primary hypertension in children is associated with family history or other cardiovascular disease. Other comorbidities associated with primary hypertension in children and may increase the risk of cardiovascular disease include abnormal lipid profiles, glucose intolerance and sleep disturbances (Flynn Joseph T, 2013). Hypertension occurs when the number of cardiac output and total peripheral resistance increases. Primary hypertension settled was characterized by an increase in total peripheral resistance and cardiac output that returned to normal (Korner PI, 1992). Increased cardiac output is affected by increased heart rate, cardiac index, sympathetic tone and cardiac contractility (Sorof JM, 2002). Some of the risk factors of primary hypertension in children include age and sex, race, genetics, obesity, salt intake, and stress conditions (Flynn Joseph T, 2013).

ii. Secondary Hypertension: Secondary hypertension is a known cause hypertension. Approximately 70-85% of children aged 0-12 years are identified to have secondary causes of hypertension. Based on the cause, hypertensive patients were categorized into 2 groups. Patients with a history of illness and a clear result of physical examination so as to confirm the diagnosis of secondary hypertension and patients with no symptoms and normal examination results can not be ascertained whether the patient has secondary hypertension or not. Here are the causes of chronic secondary hypertension (Table 2 and 3) (Flynn Joseph T, 2013).

Table 2. Acute/transient secondary causes hypertension (Flynn Joseph T, 2013)

No.	Cause	Clues on history and clinical exam
1.	Acute glomerulonephritis	Preceding streptococcal infection; tea or cola-cola colored urine; edema; oligouria; sore throat; skin rash
2.	Acute tubular necrosis	Dehidration; decrease cardiac output; NSAID use
3.	Hemolytic uremic syndrome/ thrombotic microangiopathy	Diarrhea; pneumonia; bone marrow transplant; use of calcineurine inhibitor; pallor; oligouria/anuria; edema
4.	Obstructive uropathy	Abnormal prenatal US; poor stream of urine; abnormal abdominal musculature; undescended testes
5.	Iatrogenic (volume and medication related)	Infusion of intravenous 0.9% saline; glucocorticoid
6.	Vasculitis	HSP; SLE; SVV; Goodpasture syndrome; APSGN
7.	Neurological	Head injury; seizures; altered mental status; increase intracranial pressure; anatomic instability; pain related
8.	Orthopedic	Long bone fracture; traction
9.	Medications/drugs	OTC nasal decongestan containing ephedrine/pseudoephedrine; cocaine and amphetamine; steroids and calcineurine inhibitor

Table 3. Chronic cause of secondary hypertension (Flynn Joseph T, 2013)

No.	Cause	Clues on history and clinical exam
1.	Neonatal	Prematurity, low birth weight, umbilical artery lines; chronic lung disease; post-ECMO; congenital renal malformations
2.	Coarctation of aorta	Upper to lower extremity BP gradient; absent femoral pulses; ejection systolic murmur
3.	Renovascular	Fever, malaise, signs of claudication; absent femoral pulses; abdominal bruit; features of NF1,TS, Williams, Turner, and Alagille syndrome
4.	Renal parenchymal disease	Newborn with antenatal diagnosis of ARPKD or CAKUT; history of chronic kidney disease, recurrent UTI and scarring, patients on dialysis or post-renal transplant patient
5.	Endocrine	Diabetes mellitus and proteinuria; tachycardia, episodic flushing, sweating, palpitations, headache; thyromegaly, exophthalmos, tremors; ambiguous genitalia/virilization, features of Cushing's syndrome – obese, buffalo hump, moon facies, acne, hirsutism, abdominal striae, and myopathy
6.	Pulmonary	Snoring; repeated nighttime awakenings; daytime somnolence

IV. MANAGEMENT OF HYPERTENSION IN CHILDREN

A. Non Pharmacological Therapy

1. Diet: One of the diets in people with hypertension is to reduce salt intake (sodium). Based on 20 observational studies, decreased salt intake in children was able to lower blood pressure significantly (Kotsis

V, 2011). The National High Blood Pressure Education Program (NHBPEP) recommends a 1.2 g / day salt intake for children aged 4-8 years and 1.5 g / day for older children (Sugiyama T, 2007). In infants, breast milk has low sodium levels compared with other nutrients. Other nutrients that are also associated with blood pressure values are magnesium, folic acid, unsaturated fats, total fiber and total fat although the effect is very small and not significant (Falkner B, 2000). Recent guidelines on management of hypertensive therapy in children suggest that increased consumption of fresh fruits and vegetables, fiber and nonfat dairy products can help to decrease blood pressure (Team N. H., 2004).

2. Physical Activity: Research on children conducted by Gidding et.al. 2016 shows that physical activity is associated with a decrease in systolic blood pressure (Gidding SS, 2006). The mechanism of physical activity can lower blood pressure is not known clearly. Allegedly, physical activity provides changes in neurohormonal, vascular elasticity and heart structure. Routine physical exercise can decrease catecholamine levels, insulin resistance and peripheral vascular resistant. The recommended physical activity for children is moderate activity for 60 minutes per day followed by intense training such as running for 3 days a week. However, in patients with stage 2 hypertension, physical activity needs to be limited until the blood pressure returns to normal (Demorest RA, 2010).

3. Weight Management: In adult patients, weight loss of 10 kg can decrease systolic blood pressure 5-20 mmHg. While in children, a decrease in BMI 8-10% can decrease blood pressure by 8-10 mmHg. Weight control in children can use several approaches simultaneously through lifestyle changes, stimulus control, make a target, physical activity monitoring, and reward. The stimulus control can be done by changing the environment to limited the child's access to non-physical activity and increase the caloric intake in his spare time. For example, move a television or computer from a child's room. For the diet modification, children should not skip breakfast at least 5 days a week. Because skipping breakfast is associated with an increase in body mass index (Schwartz RP, 2007).

V. PHARMACOLOGICAL THERAPY

1. Angiotensin Converting Enzyme Inhibitor (ACEI): ACE inhibitors work by inhibiting the conversion of angiotensin I to angiotensin II, a potent vasoconstrictor that also stimulates aldosterone secretion from the adrenal cortex. In addition, ACE inhibitors also inhibit bradykinin metabolism, endogenous vasodilators and natriuresis stimulators through direct effects on the renal tubules. Captopril is the first orally marketed. It is effective and safe as an antihypertensive agent in children. The shortcomings, short duration of work so that its use up to 3 times a day. Enalapril, lisinopril and ramipril have a long half-life, 12-24 hours so the use is only 1 time a day thus expected to improve patient compliance. The decrease in aldosterone production due to the use of ACE inhibitor class drugs may increase potassium levels, especially in patients who had renal impairment previously. Side effects include neutropenia, redness and cough. This class of drugs is contraindicated in patients with renal artery stenosis because ACE inhibitors inhibit angiotensin II formation mediating the compensatory mechanisms in the efferent artery vasoconstriction (Anderson Robert H, 2010).

2. Angiotensin Receptor Blocker (ARB): ARBs lower blood pressure through RAAS modulation. ARB works by inhibiting the activation of AT1R by angiotensin II so that the effect of the angiotensin II bond on AT2R increased. Unlike ACEI, ARB does not work on the bradykinin system (Flynn Joseph T, 2013).

3. Aldosterone Receptor Antagonist (ARAs): The mechanism of action of ARAs to lower blood pressure is through competing resistance to mineralocorticoid receptors in the distal tubule thus increasing the excretion of water and sodium retention. There are two types of drugs included in the class of ARAs, namely spironolactone and eplenerone. Eplenerone is newer and selective so its side effects are also less (Li JS, 2010).

4. Beta-Adrenergic Antagonist: Beta-Adrenergic antagonists work by inhibiting the stimulation of adrenoreceptor β1 and β2 in the nervous system leading to a decrease in blood pressure through several mechanisms such as decreased cardiac output, renin release restriction, decreased sympathetic central nervous system flow and presinaps blockade which inhibits catecholamine release. β-adrenergic antagonists also have a vasodilating effect through alpha resistance or through the formation and release of nitric oxide (Manrique C, 2009). Research on the use of metoprolol and bisoprolol combined with hydrochlorthiazide (HCT) using extended release formulation showed that doses of 1 mg / KgBB and 2 mg / KgBW metoprolol were able to significantly reduce systolic blood pressure. However, the drop in diastolic blood pressure is only significant at high doses only (2mg / KgBB) (Batisky DL, 2007). While the combination of bisoprolol and HCT showed no significant difference in blood pressure reduction compared with placebo (Sorof JM C. P., 2002).

5. Calcum Channel Blocker (CCB): CCB is an antagonist of L-type voltage-dependent slow channel located in myocardial cell membrane and smooth muscle of blood vessel causing decrease of contraction and blood pressure through peripheral arterial dilatation. CCB is divided into 2 groups: dihydropyridine and nondihidropyridine (verapamil and diltiazem). The nondihidropyridine group is primarily used as an antiarrhythmic therapy because it has an effect on AV nodal conduction. But there is no specific study related to the use of these two drugs in conditions of childhood hypertension. Groups dihydropyridine (nifedipine, isradipine, felodipine and amlodipine) are more commonly used as antihypertensives in children. Nifedipine is available in short-acting and extended release formulations. In the literature it is mentioned that nifedipine short-acting is only used in conditions of urgency hypertension. A cohort study in children with renal transplantation compares the efficacy and tolerability of nifedipine extended-release and amlodipine. Both have comparable effectiveness but the side effects of nifedipine are greater than amlodipine, one of which is ginggival hyperplasia. Thus, nifedipine extended release can be used as a management of chronic hypertension therapy in children (Sahney, 2006). Similar to nifedipine, data on the effectiveness and safety of isradipine use as a treatment of childhood hypertension is also very limited. A case series study in hospitalized children with secondary hypertension states that isradipine effectively decrease systolic and diastolic blood pressure with minimal side effects. However, the isradipine regimen used 3-4 times a day becomes an obstacle to use as a long-term therapy. In acute conditions, isradipine can lower blood pressure effectively and safely so that it is more recommended than nifedipine (Miyashita Y, 2010). Next is felodipine. Based on crossover studies, the daily use of felodipine in renal hypertension was more effective than nifedipine extended release with better adherence (Trachtman H, 2003). The next CCB group that has been more studied is amlodipine. In a single-center study, it was found that amlodipine was effective for lowering blood pressure in both primary and secondary hypertension. Amlodipine can be used 1-2 times a day. Amlodipine can significantly decrease systolic and diastolic blood pressure at doses greater than 0.06 mg / kg / day (Flynn JT, 2004).

6. Diuretics: Diuretics work by reducing the reabsorption of sodium in the renal tubules so that the volume of urine increases. Diuretics are often used as adjunctive therapy to control fluid retention associated with long-term vasodilator use. Thiazide diuretics will be effectively used if the patient's GFR value is more than 50% of the normal value. While loop diuretics such as furosemide are used in more severe kidney disorders. Metolazone may be added to furosemide therapy in an oedem condition caused by congestive heart failure. Common side effects associated with the use of diuretics are hypokalemia, and otoksoksik (on the use of loop diuretics). Meanwhile, mineralokortkoid antagonists (spironolactone) are used in excess mineralocorticoid conditions. It may also be used as adjunctive therapy in thiazide diuretics as K-sparing agent (Anderson Robert H, 2010).

7. Direct Vasodilator: Vasodilators such as minoxidil and hydralazine lower blood pressure by relaxing the smooth muscle wall of the arterial vessels thereby decreasing peripheral vascular resistance. Some case series studies suggest that the use of minoxidil is effective in treating severe hypertension in children (Strife CF, 1986). But, there is not much data on the effectiveness and safety of hydralazine use in children.

VI. MANAGEMENT OF CRISIS HYPERTENSION THERAPY

Hypertension crisis is differentiated into emergency and urgency. Emergency hypertension is defined as severe hypertension accompanied by life-threatening symptoms or target organ damage (eg encephalopathy, nephropathy, heart failure). While in urgency hypertension also occurs a significant increase in blood pressure but not accompanied by damage to target organs (Team N. H., 2004). The mechanism of hypertension developing into emergency hypertension often involves the RAAS system. Activation of this system will lead to vasoconstriction through the production of angiotensin I and sodium retention as a result of aldosterone. Angiotensin II causes endothelial dysfunction and proinflammatory cytokine release such as NF-κB (kappa). Another mechanism is the fluid overload that occurs in the condition of AKI (Acute Kidney Injury) or CKD (Chronic Kidney Disease); activation of the sympathetic nervous system due to the release of vasoactive substance; vasculitis and drugs (Grossman E, 2008).

The goal of chronic hypertension therapy in children is to lower blood pressure up to <95%. However, in conditions accompanied by heart disease or diabetes, blood pressure targets are <90% or below 75% in children with CKD without proteinuria and <50% if proteinuria is present.

The initial target of blood pressure to be achieved in an emergency hypertension condition is higher than that of acute hypertension. It aims to prevent the decrease of blood flow to the brain and ischemia. The high blood pressure ≤25% in the first 8 hours is reduced regularly within 26-48 hours to avoid complications. While for

urgency hypertension, a drop in blood pressure can be done within a few hours to days with oral or intravenous antihypertensive depending on the symptoms experienced by the child (Lurbe E, 2009). Intravenous antihypertensives used to treat severe hypertension conditions are nicardipine, labetalol, sodium nitroprusside, and hydralazine. Other additional therapies are esmolol, fenoldopam, and enalapriate. While recommended oral medications include clonidine, isradipine, and minoxidil (Flynn Joseph T, 2013).

Diazoxide, a bolus-injected direct vasodilator is no longer recommended as first-line antihypertensive therapy in emergency hypertension because of its long half-life and unpredictable duration (Flynn Joseph T, 2013).

Sodium nitropruside, a direct vasodilator of the arteries and veins of smooth muscle cells of the blood vessels, was used as a treatment of severe hypertension in children since 1970. The recommended dose is a continuous infusion of 0.53-10 μg / kg / min. Nitropruside works by releasing nitric oxide that will dilate arterioles and venules thereby decreasing the total resistance of peripheral blood vessels. The onset of action of nitropruside is 30 minutes. The antihypertensive effect will be gone a few minutes after treatment was stopped. The toxicity of ntropruside is related to the metabolism results in the form of cyanide and thiocyanate. Toxic accumulation of cyanide will lead to metabolic acidosis with elevated levels of lactate, tachycardia, loss of consciousness, pupil dilatation and methemoglobinemia. The toxicity of thiocyanate is characterized by changes in mental status, nausea, seizures, anorexia or coma. The infusion of nitroprusside must be stopped if the symptoms appear (Flynn Joseph T, 2013).

Labetalol (α (alpha) 1- and β (beta) -adrenergic blocking agent) lowers blood pressure through blockade on α and β receptors. The inhibitory effect on α receptors is vasodilation and decreases peripheral vascular resistance with little effect on decreased cardiac output. The effect on the beta receptor blockage is the decrease in heart rate. The effects of hypotension will be obtained within 2-5 minutes, peak at 5-15 minutes and last up to 2-4 hours. Metabolism and elimination of these drugs are not affected by renal function. Labetalol is 3-7 times more potent as β-blocker than α-blocker. Labetalol is contraindicated in the condition of left heart failure. Used cautiously in diabetics because it can mask the signs and symptoms of hypoglycemia. The use of labetalol is recommended as a therapeutic management in a neurologic emergency condition because it does not increase intracranial blood pressure. Labetalol may be administered bolus at a dose of 0.2-1 g / kg / dose to a maximum dose of 40 mg or administered infusion at a dose of 0.25 mg / kg per hour with a maximum dose of 300 mg / 24 hours (Flynn Joseph T, 2013).

Nicardipine, more selective in smooth muscle of blood vessels than in cardiac myocites. Nicardipine has a strong effect as a cerebral and coronary vasodilator and has minimal inotropic effect. The onset of action of nicardipine is 1-2 minutes with the duration of work reaches 3 hours. Similar to labetalol, nicardipine also does not increase intracranial pressure so it is also used as a hypertensive treatment of choice in neurological emergence or ischemic stroke. The recommended dose in children is 1-3 μg / kg per minute and is administered by continuous infusion at a concentration of 0.1 mg / mL. The reported side effects include hypotension, nausea and vomiting (Flynn Joseph T, 2013).

Hidralazine, a direct vasodilator in smooth muscular arterioles. The induction of vasodilatation by hydralazine causes the stimulation of the sympathetic nervous system resulting in the occurrence of tachycardia, increased release of renin and fluid retention. The onset of action is 5-30 minutes and peaks at 10-80 minutes after injection is given. The recommended dose for a child is 0.1-0.6 mg / kg per IV dose every 4-6 hours (Flynn Joseph T, 2013). Esmolol is an ultra short acting selective β blocker agent. Onset of action occurs within 60 seconds and lasts up to 10-20 minutes. Giving a dose of 125 μg / kg, 250 μg / kg, 500 μg / kg can lower systolic blood pressure in the range 6-12.2 mmHg, while heart rate decreased in the range 7.4-13.2 bpm (Flynn Joseph T, 2013). Fenoldopam is a dopamine D1 receptor agonist but does not work on D2 receptors leading to renal, coronary and cerebral vasodilation of the arteries. Onset works 5 minutes and reaches peak at 1 hour. The duration of action after the drug is 30-60 minutes (Flynn Joseph T, 2013).

Enalaprilate, IV ACE nhibtor, causes vasodilation and decreases peripheral vascular resistance. Onset works 30-60 ment with 4-6 hours of work duration. It needs dose adjustment in kidney conditions because it is largely eliminated in the kidneys. Side effects that may occur include hypotension, oligureneningkat serum creatinine, and hyperkalemia (Flynn Joseph T, 2013).

Clonidine is acting α (alpha) 2 - central adrenergic agonist with onset of action 30-60 minutes after administration and duration of action 6-8 hours. Clonidine is contraindicated in patients with mental status

disorder, because it will further aggravate the condition with increased side effects are common (Flynn Joseph T, 2013).

Isradipine, a second generation of dihydropyridine group CCBs may be used in patients with reduced myocard function because it does not affect myocardial contractility. Onset of action 1 hour with peak effect at 2-3 hours after oral administration. A half life of this drug is 3-8 hours. The most common side effects are nausea, vomiting, and headache (Flynn Joseph T, 2013).

Minoxidil, oral antihypertensive, will be metabolized to minoxidil sulfate, which will open the potassium canal in smooth muscle cells of the blood vessels causing potassium, hyperpolarization and smooth muscle relaxation. The peak concentration is accomplished within 1 hour of rendering with a working duration of up to 24 hours (Flynn Joseph T, 2013).

References

Anderson Robert, H., Baker, E. J., Penny, D., Redington, A. N., Rigby, M. L., & Wernovsky, G. (2010). *Paediatric Cardiology 3rd Edition.* Philadelphia: Elsevier.

Batisky, D., Sorof, J., Sugg, J., Llewellyn M Klibaner, M., & Hainer, J. (2007). Efficacy and safety of extended release metoprolol succinate in hypertensive children 6 to 16 years of age: a clinical trial experience. *J Pediatr* , 150(2):134–9. 9.e1.

Demorest, R., & Washington, R. (2010). Council on Sports Medicine and Fitness. Athletic participation by chidren and adolescents who have systemic hypertension. *Pediatrics* , 125:1287–94.

Falkner, B., Sheriff, K., Michel, S., & Kushner, H. (2000). Dietary nutrients and blood pressure in urban minority adolescents at risk for hypertension. *Arch Pediatr Adolesc Med* , 154:918–22.

Flynn Joseph, T., Ingelfinger, J. R., & Portman, R. J. (2013). *Pediatric Hypertension 3rd Edition.* New York: Humana Press.

Flynn, J., Newburger, J., Daniels, S., Portman, S. S., & Hogg, R. (2004). A randomized, placebo controlled trial of amlodipine in children with hypertension. *J Pediatr* , 145(3):353–9.

Gidding, S., Barton, B., Dorgan, J., Kimm, S., Kwiterovich, P., Lasser, N., et al. (2006). Higher self reported physical activity is associated with lower systolic blood pressure: the Dietary Intervention Study in Childhood (DISC). *Pediatrics* , 118:2388–93.

Grossman, E., & Messerli, F. (2008). Secondary hypertension: interfering substances. *J Clin Hypertens (Greenwich)* , 10(7):556–66.

Korner, P., Bobik, A., & Angus, J. (1992). Are cardiac and vascular “amplifiers” both necessary for the development of hypertension? *Kidney Int Suppl* , S38–44.

Kotsis, V., Papakatsika, S., & S, S. (2011). The role of obesity, salt and exercise on blood pressure in children and adolescents. *Expert Rev Cardiovasc Ther* , 9:753–61.

Li, J., Flynn, J., Portman, R., Davis, I., Ogawa, M., & H, S. (2010). The efficacy and safety of the novel aldosterone antagonist eplerenone in children with hypertension: a randomized, double-blind, dose-response study. *J Pediatr* , 157(2):282–7.

Manrique, C., Giles, T., Ferdinand, K., & Sowers, J. (2009). Realities of newer beta-blockers for the managementof hypertension. *J Clin Hypertens , 11(7)*, 369–75.

Miyashita, Y., Peterson, D., Rees, J., & Flynn, J. (2010). Isradipine for treatment of acute hypertension in hospitalized children and adolescents. *J Clin Hypertens* , 12(11):850–5.

Schwartz, R., Hamre, R., Dietz, W., Wasserman, R., Siora, E., Myers, E., et al. (2007). Office-based motivational interviewing to prevent childhood obesity: a feasibility study. *Arch Pediatr Adolesc Med* , 161:495–501.

Sorof, J., Poffenbarger, T., Franco, K., Bernard, L., & Portman, R. (2002). Isolated Systolic Hypertension, Obesity,and Hyperkinetic Hemodynamic States in Children. *J Pediatr , 140(6)*, 660–666.

Strife, C., Quinlan, M., Waldo, F., Fryer, C., Jackson, E., & Welch, T. (1986). Minoxidil for control of acute blood pressure elevation in chronically hypertensive children. *Pediatrics* , 78(5):861–5.

Sugiyama, T., Xie, D., Graham-Maar, R., Inoue, K., Kobayashi, Y., & Stettler, N. (2007). Dietary and lifestyle factors associated with blood pressure among US adolescents. *J Adolesc Health* , 40:166–72.

Team, U. D. (2004). National High Blood Pressure Education Program Working Group on High Blood Pressure in Children and Adolescents: The Fourth Report on the Diagnosis, Evaluation and Treatment of High Blood Pressure in Children and Adolescents. *Pediatrics* , 114:555–576.

Trachtman, H., Frank, R., Mahan, J., Portman, R., Restaino, I., & Matoo, T. (2003). Clinical trial of extended-release felodipine in pediatric essential hypertension. *Pediatr Nephrol* , 18(6):548–53.