5-1-2017

# Hypertension Now and Then: Hypertensive Adolescents Who Consume Sugar Sweetened Beverages Are Associated with Hypertension in Adulthood

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# Permission

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Department Nursing

Degree Master of Science

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## Abstract

Hypertension is a common disease that is seen in abundance in primary care and has been found to be on the rise in the adolescent population. Hypertension has both modifiable and non-modifiable risk factors. The beverages people consume are modifiable risk factors. Sugar sweetened beverages have been shown to have a negative impact on blood pressure. The highest consumers of sugar sweetened beverages are adolescents. A literature review of multiple studies, have shown consumption of at least one sugar sweetened beverage a day has shown to increase blood pressure by approximately 1.8 mmHg. Sugar sweetened beverage consumption has shown to have a steady correlation with hypertension in adolescence. Screening for hypertension in adolescents is important; as early detection can help reduce the negative health effects that impacts overall health. Reducing the amount of added sugar consumed, people will be able to reduce their risk of stroke by 10% and their risk of ischemic heart disease by 7%. Providing adolescents with education on sugar sweetened beverages, hypertension, and the negative cardiovascular risks is of the utmost importance as correcting hypertension early in childhood can prevent long term negative cardiovascular health effects in adulthood.

## Background

Sugar sweetened beverages (SSB) make up the majority of the added sugar in the American diet. Sugar sweetened beverages range from soda to fruit drinks to sport and energy drinks. In the United States, high-fructose corn syrup (HFCS) is the major added sweetener component in sugared beverages and the consumption of HFCS over the last 30 years has risen by forty percent. Sixty-seven percent of adults and four in five adolescents consume SSB in the United States. The Center for Disease Control and Prevention (CDC) recommends that SSB should make up no more than 200 calories out of a 2,000 calorie diet (Center for Disease Control and Prevention [CDC], 2016). One can (360 mL) of regular soda contains approximately 35 grams of sugar (140 calories) which equals 7% of a person's total calories. In 2016, the CDC calculated that youth in the United States consume approximately 7.3% of their daily calories from sugar-sweetened beverages (SSB) (CDC, 2016). The consumption of total calories from SSB varied between gender by 0.1%; however, there was a noticeable increase with age amongst both genders (CDC, 2016). As we continue to age our consumption of SSBs tend to decrease. In the adolescent period, the consumption of SSBs is an average of 125 milliliters per day compared to adults who consume 100 milliliters per day and the elderly population only consume an average of 40 milliliters per day (Souza, Cunha, Pereira, & Sichieri, 2016). Increased SSB consumption has lead to increased risks of obesity, type 2 diabetes mellitus, and cardiovascular disease. According to the American Heart Association, consumption of sugar sweetened beverages results in 180,000 deaths/year (American Heart Association [AHA], 2014).

The increased intake of sugar sweetened beverages has been studied and shown to have an impact in raising blood pressure amongst children and adults. The United States has a diet based on convenience which consists of a high calorie, processed, high fat, and high sugar diet.

The continuation of an unhealthy diet places individuals at risk for unwanted diseases such has hypertension. Diet places a significant impact in a person's overall health and it is a modifiable risk factor that can be changed. The case study demonstrates a 67-year-old female whose diet was "not very good" with the addition of consuming two sodas per day. Her dietary choices place her at risk for cardiovascular disease such as hypertension; therefore, the literature review started out with researching diet. The topic was further narrowed to adolescents and the consumption of sugar sweetened beverages because the cardiovascular risks of diet in adolescents has not been studied as much as in adults.

The health impact connected to the consumption of sugar sweetened beverages is an eye opener that has started to become in the forefront of public health. Schools have already taken a stance in reducing the consumption of sugary beverages by shutting off vending machines during school hours and only providing non-sugared beverages. Public facilities are looking at the convenience and accessibility when it comes to accessing free drinking water in hope to increase the consumption of plain water. Furthermore, some states have been allowed to place an additional tax on SSBs. The price of SSBs begun with the City of Berkeley, Alameda County, California, which placed a one percent tax on soda in hope to reduce the overall consumption of soda and obesity (Jansen, 2016). Boulder, Colorado has also placed a tax on SSBs but, increased the tax percentage to two (Jansen, 2016). With the raise in the taxes, some states have chosen to take the monies and apply it to their states health and nutrition programs.

Healthy People 2020 has an objective to focus on reducing chronic disease and maintain a healthy body weight through health promotion and healthy diet (Healthy People 2020, 2017). Reducing the consumption of calories from added sugars is a goal within Healthy People 2020, which the United States has surpassed their goal of 9.7% in 2012 with 14.4% (Healthy People

2020, 2017). Healthier alternatives such as plain water, ASBs, coffee, tea, 100% fruit juices and milk are being proposed; however, the long term effects of these alternative options are unclear. With adolescents being the main consumer of SSBs, the overall goal of limiting access to SSB and promoting healthier beverage options will improve their overall health by decreasing their cardiovascular health risk now and then.

## Case Report

The following case report, examines a 67-year-old female patient who was recently diagnosed with hypertension and placed on an anti-hypertension medication. The first line in treating any disease is starting with lifestyle modifications in hopes to prevent, improve, or maintain the disease. This case report, shows a female patient whose uses exercise to improve her health, however, diet is a modifiable risk factor that she could adjust to further improve her overall health. Below is the case report of the 67-year-old female patient with hypertension.

**Chief Complaint:** The patient presents to the clinic today with the chief complaint of "I was recently started on a blood pressure medication but my blood pressure is still high"

**History of Present Illness:**

A 67- year old female with no known medication, food, or environmental allergies, newly presents to the clinic today to follow up on her blood pressure since starting Lisinopril three weeks ago. She has a past medical history of hyperlipidemia which has been controlled with exercise and diet. She also takes a multivitamin daily. Since starting Lisinopril 20mg daily, her blood pressure continues to be elevated in the 160's for systolic and 90's for diastolic. She has tolerated her antihypertensive medication with the exception of a non-productive, dry cough, that lasts throughout the day. She describes the cough as a "tickle in the back of her throat." The cough simultaneously started when she started her antihypertensive medication. She denies any fever, chills, recent upper respiratory infection or increased coughing at night or with activity.

**Review of Systems**

Additional subjective information was obtained from the patient regarding any body systems that could be affected by cardiovascular disease or a respiratory infection. The patient delivered the following responses to the listed body systems.

-General: Denies fever, chills, or recent URI.

-Head: Denies headache or dizziness.

-Eyes: Denies blurry vision or double vision.

-Ears: Denies hearing loss, ringing in the ears or ear pain.

-Throat: Denies any sore throat or difficulty swallowing.

-Respiratory: Denies SOB or wheeze. Dry cough that is nonproductive which started 3 weeks ago. It's a nagging, annoying cough that feels like a tickle in the back of her throat.

-Cardiac: Denies chest pain or palpitations.

-Gastrointestinal: Denies any nausea or vomiting.

- Musculoskeletal: Denies any edema to the lower legs or ankles.

**Medications**

Her medications consist of one multivitamin daily and Lisinopril 20 mg daily. Due to her side effect of an ace induced cough, on 3/10/17 her Lisinopril was discontinued and Losartan 25 mg daily will be started on 3/11/17.

**Past Medical History**

She has a recent diagnosis of hypertension and a history of hyperlipidemia that she states is controlled by diet.

**Social History**

The patient is married and lives north of Grand Forks. She has two children, one boy and one girl who are grown and live outside the home. She is retired and is enjoying her retirement. She declines to past or present smoking. She stays active with exercising three times a week by participating in water aerobics. Her appetite is "not as good as it should be" and drinks two pops per day.

**Family History**

Her mother is deceased and had a history of coronary artery bypass graft and small cell lung cancer which resulted in her death in 2011. Her father had a history of a coronary artery bypass graft and passed away in 2002 due to a abdominal aortic aneurysm. She has three bothers. Her older brother is alive at the age of 71 and had coronary artery bypass graft performed at the age of 64. Her middle brother is alive at the age of 69 and has diabetes mellitus. Her younger brother is alive and healthy at the age of 61. Her son is a healthy 48-year-old and her daughter is a healthy 44-year-old.

**Physical Exam**

A physical exam was performed to rule out differential diagnosis such as respiratory infection, pneumonia, asthma, or ace-induced cough. The patient is alert and orientated to person, place, and time. She is sitting in the chair in the exam room and she appears to not be in any stress. She is able to answer all questions appropriately and is a reliable source of her own information. The patient's vitals signs are as following: temperature 98.6, pulse 80, respirations 20, and blood pressure 160 systolic over 98 diastolic. Below list the physical findings of her exam.

-Head: Equal hair distribution to eyebrows, eyelashes and scalp. Atraumatic and normocephalic.

-Eyes: PERRL. No swelling or lesions noted to upper or lower lids. Conjunctiva clear bilaterally.

-Ears: External auditory canal is clear bilaterally. Tympanic membranes are both clear with visible landmarks and pearly gray in color. Positive light reflects bilaterally. No erythema or bulging.

-Nose: Nares are symmetrical without tenderness or drainage. Nasal mucosa without erythema or edema. Septum midline.

-Neck: No carotid bruits appreciated. Would have assessed for JVD while laying down.

-Throat: Oral cavity is moist without ulcerations or lesions. Uvula rise to phonation. Pharynx without erythema or exudate.

-Cardiac: Regular rate and rhythm. No palpitations, murmurs, or rubs noted. Radial pulses +2. Pedal pulses +2.

-Respiratory: Clear to all posterior lobes.

-Gastrointestinal: Abdomen is soft and non-tender. Bowel sounds normoactive in all four quadrants.

-Musculoskeletal: no edema noted to bilateral lower extremities.

**Assessment**

Today she presents with uncontrolled hypertension and her cough is associated from her Lisinopril which is known as an Ace inhibitor induced cough.

**Plan**

1. Due to the patient's ace induced cough, she will stop her Lisinopril today. Lisinopril will be added her to allergy list so, other healthcare facilities can be alerted of the side effect she encountered. Tomorrow, she will start losartan 25mg daily. The rationale to use Losartan was because it falls into a different class of anti-hypertension medication known as angiotensin receptor blocker (ARB) and the medication has a low association with cough and is also recommended as a first line therapy for hypertension.
2. The patient was instructed to monitor her blood pressure over the next two weeks. She was instructed to have her take her blood pressure in the morning, before her medication, two hours after her medication, in the evening, and anytime throughout the day as needed. She was instructed to bring those blood pressure readings to her next follow up appointment.
3. The patient will have a blood draw in 2 weeks so, her electrolytes and liver function enzymes can be monitored as recommended with prescribing an ARB. The lab ordered is known as a complete metabolic panel.
4. Education was provided with the patient regarding her diet. A discussion was held regarding eating a healthy diet and reduce the amount of sodium used in her diet as this can help with reducing blood pressure.
5. Praise was given on her exercise habits and will the goal to continue to exercise by participating in water aerobics.
6. The patient will follow up in the clinic in two weeks to review her blood pressure readings and review her laboratory results.
   The above patient verbally agreed to the above plan and verbally understood the plan.

## Literature Review

Hypertension associated to the consumption of sugar sweetened beverages (SSB) has been studied more with animal trials than human studies. There is more research found in the young to older adults versus adolescents. An extensive literature review was completed to gather information regarding the correlation between adolescents consuming sugar sweetened beverages and hypertension. The following databases were utilized through the University of North Dakota Harley E. French Library of the Health Sciences: CINAHL and PubMed. Additional online resources included Google Scholar, Center for Disease Control and Prevention, Healthy People 2020, and the American Heart Association.

The literature search was refined to articles ranging between the years of 2010 to 2017. The terms used during the literature review were hypertension in adolescents, sugar sweetened beverages and hypertension, sugar sweetened beverages in adolescents, hypertension in adolescents who consumed sugar sweetened beverages and fructose and hypertension. The search resulted in several studies that were further reviewed and narrowed down to adolescents who consume sugar sweetened beverages with the association of hypertension. A literature review was completed on ten studies that were a combination of five cross-sectional analysis studies, two systematic review and a meta analysis studies, two systematic review studies, and one prospective study. All of the studies involved were associated with either adolescents or adults, the consumption of sugar sweetened beverages or artificially sweetened beverages, and the negative cardiovascular health outcomes.

Hypertension in adults is known as a systolic blood pressure greater than or equal to 140 mmHg and a diastolic blood pressure greater than or equal to 90 mmHg, however, hypertension in adolescents is based off of either mean percentiles or greater than or equal to 120/80 mmHg.

The National High Blood Pressure Education Program (NHBPEP) uses four different percentile charts that distinguish adolescents from being normotensive to stage II hypertension. Normotensive is considered to be less than the 90$^{th}$ percentile. Adolescents reach prehypertension when their blood pressure raises greater than the 90$^{th}$ percentile, but less than the 95$^{th}$ percentile or also defined as a blood pressure greater than 120/80 mmHg (Rao, 2016). Stage I hypertension results when adolescents blood pressure is an additional 5 mmHg above the standard blood pressure or between the 95$^{th}$ and 99$^{th}$ percentile (Rao, 2016). If an adolescent's blood pressure is greater than the 99$^{th}$ percentile than they have entered stage II hypertension (Rao, 2016). Screening for hypertension starts at the age of three, therefore, early detection and identifying risks factors associated with hypertension can be initiated.

The United States Preventative Services Task Force (USPSTF) does not recommend routine blood pressure screening in children and adolescents due to the inability to identify hypertensive individuals and those at increased risk for cardiovascular disease (Moyer, 2013). Blood pressure screenings are still being done in a clinical setting, however, the sensitivity of the results have been identified with false-positive hypertension results. Children and adolescents diagnosed with a false-positive hypertension leads to unnecessary additional tests or medication usage.

In the United States, children and adolescents have a reported 1% to 5% prevalence of hypertension (Moyer, 2013). The prevalence of hypertension has been rising over the past decades due to the increase in overweight children and obesity. The prevalence of hypertension in obese children is nearly doubled at 11% (Moyer, 2013). Children and adolescents are mainly diagnosed with primary hypertension which has been associated with the following risk factors: overweight and obesity, male sex, older age, family history of hypertension, race/ethnicity, and

dietary salt intake (Rao, 2016). An additional risk factor linked to predisposing adolescents to hypertension is the consumption of sugar sweetened beverages.

It is presumed that as people age, the linear pathway between SSB consumption and hypertension will spike due to the damage the vessels will sustain over time from poor dietary decisions. Damaged blood vessels are often composed of atherosclerosis which restricts adequate blood flow through the vessels. Adolescents' vessels have less damage than adults, however, their poor dietary choices now can affect their cardiovascular health later in life.

Studies have linked increased sugar sweetened beverage consumption with cardiovascular risks such as hypertension. The mechanism of action sugar has within blood vessels involves uric acid, renin-angiotensin system, and the intake of sodium. The correlation between artificially sweetened beverages and hypertension is still unclear within multiple studies and needs further data. Uric acid has been identified as a causative agent in the elevation of blood pressure. It was found that by ingesting fructose, the body stimulates the production of uric acid which then stimulates vascular oxidative stress and causes endothelial dysfunction. "Serum uric acid may raise systolic blood pressure by increasing renal inflammation, which then activates the renin-angiotensin system and decreases the nitric oxide production" (Souza, et. al., 2016). Nitric oxide is a strong vasodilator that elevates blood pressure. When the renin-angiotensin system is activated then production of nitric oxide is initiated which dilates the vessels (Souza, et. al., 2016). However, the renin-angiotensin system theory has mainly been studied in rats and not in humans. Therefore, more studies are necessary to prove the renin-angiotensin system theory in humans. Within the body, sodium helps to regulate blood pressure. When SSBs are consumed, sodium excretion is decreased, which then causes an accumulation of sodium within the body. Sodium is absorbed and retained in the gastrointestinal tract which

stimulates an elevation in blood pressure (Malik, Akram, Shetty, Malik & Njike, 2014). SSBs consumption can be altered depending on the intake of salt. Reducing salt to 1 gram per day shows a 27 gram per day reduction in SSB intake for Australian children and Adolescents (Souza, et.al., 2016). Approximately fifty percent of the studies in the literature view discussed the mechanism of action. Knowing the mechanism of action can help healthcare providers understand the cause and effect SSBs has within the body and therefore be able to help educate their patients as to how SSBs produces negative cardiovascular health risks.

The consumption of high fructose corn syrup (HFCS) has increased by forty percent over the past thirty years. “On an average day, 67% of adults and 4 out of 5 adolescents consume SSBs in the United States” (Malik, et. al., 2014). Adolescents are found to consume the most of their fructose through sugar sweetened beverages and the added sugar in snacks such as desserts. Malike, et. al., (2014) determined the chance of developing hypertension with the consumption of SSBs ranged from twenty-six to seventy percent. Twenty-six to seventy percent is a significant range of risk. It can be assumed that a person’s risk varies depending on their non-modifiable and modifiable risk factors. In both genders, those who do not have a history of hypertension only have a 12% risk for developing hypertension (Jayalath, et. al., 2015). The risk of developing hypertension can be significantly altered by the following modifiable risk factors: amount of SSBs consumed and what type of sugared beverage is being consumed. Data has identified that adolescents are the top consumers of SSBs and their risk for developing hypertension increases with each serving of SSB. There is a 12% risk for developing hypertension with the consumption of a SSB, however, the risk will increase by 0.27% for each additional SSB consumed per month or 8.2% increase for each additional SSB per day (Jayalath,

et.al., 2015). Adolescents who consume more than three SSB per day have an 87% increased risk of becoming hypertensive (Malik, et. al., 2014).

Without taking into effect other modifiable risk factors, SSB consumption has shown to take a direct effect on blood pressure. Typically, in children, diastolic blood pressure is often the first to be elevated unlike adults. A child's diastolic blood pressure is found to increased by 0.0206 mmHg per one gram of sugar added (Kell, Cardel, Brown & Fernandez, 2014). Diastolic blood pressure has shown to vary amongst genders with males having a higher diastolic pressure (1.8643 mmHg) compared to females (1.4523 mmHg) (Kell, et. al., 2014). The effect SSBs has on blood pressure varies slightly between systolic and diastolic blood pressure. When the heart is contracting, the blood pressure tends to rise 0.16 to 1.6 mmHg higher (Malik, et. al., 2014). It has been proven that consuming SSBs over a period of 18 months will result in an average 1.8 mmHg elevation in systolic blood pressure (Malik, et. al., 2014).

It has often been assumed that diet beverages with artificial sweeteners are healthier than regular sugar sweetened beverages. However, studies have proven that beverages with artificial sweeteners raises an individual's blood pressure and cardiovascular risk more than regular SSBs. The correlation between artificially sweetened beverages (ASBs) and hypertension is unclear, however, aspartame and saccharine are the artificial sweeteners in diet beverages that have been potentially linked to raising blood pressure. The consumption of diet soda has increased over the years due to the false assumption of it being healthier. In the United States, households with children have been known to purchase more diet soda. Stroke, obesity, and hypertension have been associated with the consumption of diet sodas. Shockingly, the risk for developing hypertension rises with the consumption of artificial sweetened beverages. Individuals who consumed one or more servings of SSB per day had a 12% risk for developing hypertension,

whereas, those who consumed ASBs had a 14% risk (Kim & Je, 2016). Any additional servings of either SSB or ASB would raise the risk of hypertension by 8% and 9% (Kim & Je, 2016). Not only does the risk for developing hypertension increase with the consumption of diet soda, systolic blood pressure has been proven to rise 5.4 mmHg. Furthermore, consuming carbonated and cola-containing beverages increases adolescents risk for developing hypertension, but there is no difference in hypertension risk for those who consumed caffeinated or non-caffeinated beverages. Since blood pressure can be effected by either SSB or ASB intake, therefore, individuals must look at their overall individualized risk factors and determine if the consumption risk is worth it. By having better control on blood pressure, a person's cardiovascular risk decreases. Even a small 2 mmHg reduction in systolic blood pressure can decrease the risk of stroke mortality by 10% and ischemic heart disease by 7% (Souza, et. al., 2016).

Sugar sweetened beverages can either be sodas, sport drinks, or energy drinks. The percentage at which students consumed one SSBs one or more times per day included, regular soda 17%, sport drinks 16%, and energy drinks 5% (Park, Blanck, Sherry, Brener & O'Toole, 2012). Educating adolescents on alternative beverage options will allow for them to make healthier options such as non-fat milk. Compared to SSBs, non-fat milk and fruit juices do not show any signs of cardiometabolic effects. It is also important for the child to understand that they do not need to completely eliminate SSBs from their diet. The key to any successful diet and maintaining a healthy lifestyle is consuming SSBs in moderation. The American Heart Association recommended that children and adolescents should consume no more than eight ounces of sugar sweetened beverages in one week and less than six teaspoons of added sugar in one day (AHA, 2017). On a daily basis, adolescents are consuming above the recommended

intake. An average twelve ounce can of regular soda contains between eight and nine teaspoons of sugar and a 20-ounce bottle of regular soda contains thirteen teaspoons of sugar (Ponsot, 2016). Sport drinks contain approximately 6.8 teaspoons of sugar and various sizes of energy drinks have between five and eleven teaspoons of sugar (Ponsot, 2016). It is important to place emphasis on the sugar content in a child's beverage in order for them to know how much sugar they are consuming in one day.

The increase in SSB consumption amongst adolescents is thought to be related to the easy access and convenience of products. Schools are starting to play a positive role in decreasing the availability of SSBs in vending machines. Between the years of 2006 and 2008, schools have shown a decline in students accessing vending machines. One of the main reasons for the decline was schools turning off their vending machines during school hours and only supplying students with non-sweetened beverages (Park, et. al., 2012). This option is highly effective for those children who are unable to leave the school premises, but not for those children who are able to leave on their lunch break. Educating children on healthy beverage options will likely contribute to those children making healthy beverage choices when given the option. In order to improve the negative health consequences, schools along with the public have been increasing their access to free drinking water to allow for a healthier beverage choice. Improving access to free drinking water within schools and communities can be noted by increasing water fountain locations, marking them for easy identification, and ensuring convenient access. Parents can support their children in drinking more water by purchasing them a water bottle so they can have access to drinking water at any time.

Adolescents have been known to consume large amounts of SSBs in conjunction with frequent fast-food diets and sedentary lifestyles (Park, et. al., 2012). Adolescents associated with

frequent fast food diets and sedentary lifestyles consume a SSB three or more times per day (Park, et. al., 2012). The convenience of restaurants and fast food restaurants tends to be one of the culprits in excessive SSB consumption in adolescents as it's easily accessible (Park, et. al., 2012). Limiting the access of SSBs is vital to decreasing the negative health consequences that have correlated with SSB consumption. Restaurants have started to eliminate soda as an option with kid meals and only offering fruit juice, milk or water. These healthier beverage options will help reduce the consumption of SSBs. The public has also started to take a role in reducing the consumption of SSBs by expressing the idea of placing health-related warning labels on SSBs in order to decrease the consumption in children. The topic of health-related warning labels on SSBs have made its way into debate in the following states California, New York, Vermont, Hawaii and Washington (AHA, 2017). As of now, these states have not come to an agreement on placing warning labels. By placing warning labels on SSBs, the goal is to reduce the consumption of SSBs by emphasizing the negative health risks associated with consumption.

The beverage choices adolescents make is highly influenced by their parents, therefore, parents need to lead by example by consuming healthier beverages and reinforcing healthy beverage consumption amongst their children. As healthcare providers, it is our responsibility to educate our patients and their parents regarding the cardiovascular risk associated with SSB consumption. With each child screening, it is vital for healthcare providers to start educating patients at a young age on healthy beverages options. In each exam room, providers should have a chart that visualizes common beverages with the amount of added sugar in each. The chart should range from beverages with high sugar content to low sugar content so parents and patients can see where they can identify themselves and then strive for healthier alternatives. By having this chart visible, it will allow for an open conversation between the provider and adolescent.

Providers should ask the following questions: what beverage do you currently consume the most of, what beverage would be a healthier alternative, are you ready to make a healthier beverage choice and how can I help you reach your goal of a healthier beverage option? By allowing the conversation to be composed of open-ended questions, the patient feels more in control which will allow for better patient commitment and willingness to change. Parents need to be encouraged to assist their children in making the change, therefore, parents should reduce or eliminate purchasing SSBs and promote healthy beverage alternatives.

An important factor in preventing, maintaining, or treating chronic diseases such as hypertension would be striving for a healthy lifestyle. Hypertension is a modifiable risk factor that can be prevented through lifestyle modifications. It is evident that adolescents and adults who consume sugar sweetened beverages will have negative cardiovascular effects such as hypertension, dyslipidemia, obesity, and diabetes (Malik, et. al., 2014). The adverse effects of consuming SSBs at a younger age can continue to alter one's health in adulthood. The 67-year-old female patient in the case study who drank two SSBs per day will have a 12% risk for developing hypertension. Her two sodas a day surpassed the recommended daily sugar in-take of six teaspoons. By limiting her intake of SSBs, she can decrease her blood pressure by approximately 1.8 mmHg which can have a positive decrease in her cardiovascular risk. The patient in the case study has a significant family history of cardiovascular disease. Since the patient can't change her gender, age, nor genetics, she needs to be influenced to make healthier lifestyle changes starting with a healthy diet and decreasing her consumption of sugar sweetened beverages in order to help lower her cardiovascular risk. The patient is active which helps reduce her cardiovascular risk because those who are sedentary consume more SSBs and gain more weight. The assumption prior to the literature review was that SSBs play a role in a person's

negative health but the questions came down to, how much of a risk do SSBs pose and what are the negative health consequences correlated with SSB intake? The literature review made it evident that by consuming SSBs in large amounts, the risk of cardiovascular disease, obesity, diabetics, and hyperlipidemia will increase. Knowing that hypertension in childhood can be followed into adulthood should bring awareness to patients, parents, healthcare providers, and the public that early intervention are the key to successfully reducing or eliminating an individual's cardiovascular health risk.

Education is the foundation in preventing, treating or maintaining a patient's diagnosis. Initially, providers need to educate adolescents on the appropriate blood pressure parameters so they know whether or not they are within normal limits. If their blood pressure is borderline or high, then education needs to start with lifestyle modifications. Discussion on diet and exercise are of utmost importance and the plan must be individualized and specific to each person. Early intervention is key, therefore, discussion on SSB consumption should start at the age of three when blood pressure is starting to be monitored and with each additional appointment. The more education health care providers can give to their patients, the more their patients will retain which will then help them make better choices now and later in life.

## Learning Points

- Those who are diagnosed with a disease such as hypertension in childhood, will potentially have the disease follow them into adulthood unless early intervention is initiated.
- Drinking one serving of SSB can increase the systolic blood pressure by 1.8 mmHg and any additional SSB intake can continue to raise the blood pressure even more.
- Consuming diet soda can elevate a person's systolic blood pressure by 5.4 mmHg.
- Decreasing systolic pressure by 2 mmHg can decrease the risk of a stroke by 10% and ischemic heart disease by 7%.
- Knowing the patient's non-modifiable risk factors helps deliver appropriate care via guidelines; however, influencing a change in the patient's modifiable risk factors are a result of the education that is delivered to them by their healthcare provider or within the public.

# References

American Heart Association. (2014, March 5). *Soda debate bubbling across the country.* Retrieved April 6, 2017 from http://news.heart.org/soda-debate-bubbling-across-the-country/

American Heart Association. (2017). *Warning labels could impact kids' sugary drink choices.* Retrieved on March 27, 2017 from http://news.heart.org/warning-labels-could-impact-kids-sugary-drink-choices/

Centers for Disease Control and Prevention. (2016, September 27). *Know your limit for added sugars*. Retrieved on April 6, 2017 from https://www.cdc.gov/nutrition/data-statistics/know-your-limit-for-added-sugars.html

Cohen, L., Curhan, G., & Forman, J. (2012). Association of sweetened beverage intake with incident hypertension. *Journal of General Internal Medicine, 27(9),* 1127-34. doi:10.1007/s11606-012-2069-6

Couch, S., Crandell, J., Shah, A., Dolan, L., Merchant, A., Liese, A., Lawrence, J., Pihoker, C., & Mayer-Davis, E. (2013). Fructose intake and cardiovascular risk factors in youth with Type 1 diabetes: SEARCH for diabetes in youth study. *Diabetes Research and Clinical Practice, 100,* 265-271. doi:10.1016/j.diabres.2013.03.013

# References

Duffey, K., Gordon-Larsen, P., Steffen, L., Jacobs Jr., D., & Popkin, B. (2010). Drinking caloric beverages increases the risk of adverse cardiometabolic outcomes in the Coronary Artery Risk Development in Young Adults (CARDIA) study. *American Journal of Clinical Nutrition, 92,* 954-959. doi:10.3945/ajcn.2010.29478

Gebelhoff, Robert. (2015, June 29). Sugary drinks linked to 180,000 deaths a year, study says. *The Washington Post*. Retrieved from https://www.washingtonpost.com

Healthy People 2020. (2017, April 6). *Nutrition and Weight Status.* Retrieved on April 8, 2017 from https://www.healthypeople.gov/2020/topics-objectives/topic/nutrition-and-weight-status

Healthy People 2020. (2017, April 6). *Mean percent of total daily intake from added sugars (age adjusted, 2+ years) by total.* Retrieved on April 8, 2017 from https://www.healthypeople.gov/2020/data/Chart/4944?category=1&by=Total&fips=-1

Jansen, Bart. (2016, November 9). 4 cities vote to tax sugary drinks, soda. *USA Today.* Retrieved from https://www.usatoday.com

# References

Jayalath, V., Souza, R., Ha, V., Mirrahimi, A., Blanco-Mejia, S., Buono, M., Jenkins, A., Leiter, L., Wolever, T., Beyene, J., Kendall, C., Jenkins, D., & Sievenpiper, J. (2015). Sugar-sweetened beverage consumption and incident hypertension: a systematic review and meta-analysis of prospective cohorts. *American Journal of Clinical Nutrition, 102,* 914-921. doi: 10.3945/ajcn.115.107243

Kell, K., Cardel, M., Brown, M., & Fernandez, J. (2014). Added sugars in the diet are positively associated with diastolic blood pressure and triglycerides in children. *American Journal of Clinical Nutrition, 100(1),* 46-52. doi:10.3945/ajcn.113.076505

Kim, Youngyo, and Je, Youjin. (2016). Prospective association of sugar-sweetened and artificially sweetened beverage intake with risk of hypertension. *Archieves of Cardiovascular Diseases, 109 (4),* 242-253. doi:10.1016/j.acvd.2015.10.005

Malik, A., Akram, Y., Shetty, S., Malik, S., & Njike, Y. (2014). The impact of sugar sweetened Beverages on blood pressure. *The American Journal of Cardiology, 113,* 1574-1580. doi:10.1016/j.amjcard.2014.01.437

Moyer, V. (2013, November 5). Screening for primary hypertension in children and adolescents: U.S. Preventive Services Task Force Recommendation Statement. *Annals of Internal Medicine, 159(9),* 613-618. doi:10.1542/peds.2013-2864

# References

National Health and Nutrition Examination Survey. (2017). The percentage of total daily calories Consumed from sugar-sweetened beverages increased with age for both boys and girls. *The Center for Disease Control.* Retrieved from https://www.cdc.gov/data/databriefs/db271_table.pdf#4.

Park, S., Blanck, H., Sherry, B., Brener, N., & O'Toole, T. (2012). Factors associated with sugar sweetened beverage intake among United States high school students. *The Journal of Nutrition, 142(2),* 306-213. doi:10.3945/jn.111.148536

Ponsot, E. (2016, June 16). Philadelphia approves tax on sweetened and diet beverages. *PBS NEWSHOUR*. Retrieved on March 27, 2017 from http://www.pbs.org/newshour/rundown/philadelphia-becomes-first-major-u-s-city-to-pass-soda-tax/

Rao, G. (2016). Diagnosis, epidemiology, and management of hypertension in children. *Pediatrics, 138(2).* doi:10.1542/peds.2015-3616

Souza, B., Cunha, D., Pereira, R., & Sichieri, R. (2016). Soft drink consumption, mainly diet ones, is associated with increased blood pressure in adolescents. *Journal of Hypertension, 34,* 221-225. doi:10.1097/HJH.0000000000000800

# References

Zheng, M., Allman-Farinelli, M., Heitmann, B., & Rangan, A. (2015). Substitution of sugar sweetened beverages with other beverage alternatives: A review of long-term health outcomes. *Journal of the Academy of Nutrition and Dietetics, 115(5),* 767-779. doi:10.1016/j.jand.2015.01.006