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Primary Hypertension

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Primary Hypertension

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Introduction

Hypertension- *The Silent Killer*

- Affects 85 million Americans, age 20 years and older (American Heart Association [AHA], 2017)
- There is no cure but proper health care management minimizes lifestyle impact
- Two different categories:
 - Primary Hypertension (also referred to as idiopathic or essential hypertension)
 - Caused by genetic and/or environmental changes
 - Secondary Hypertension
 - Caused by an underlying condition that may involve the renal, vascular, or endocrine systems (Alexander, 2017)

"Essential hypertension accounts for 90-95% of adult cases" according to Alexander (2017) and is the focus of this poster. With such high prevalence rates, the family nurse practitioner will be faced with evaluating this disease daily. It is crucial to have a thorough understanding of the pathophysiology of primary hypertension and guidelines for management, and to ensure the patient has a thorough understanding of the diagnosis.

The significant amount of modifiable risk factors and multiple variations in treatment guidelines for hypertension make it a complex disease process for clinicians. Smoking, obesity, and a sedentary lifestyle are all aspects of a patient's life that can be altered to reduce the risk of primary hypertension. This can be a challenging aspect of patient care as these risk factors are becoming more prevalent as evidenced by 30% of the adult population being obese (Rosendorff et al., p. 1377, 2015). Primary care providers are in an especially unique position to not only diagnose and treat but also provide education about primary hypertension that will make a significant impact in reducing the negative effects of the disease to individual patients and society.

Signs and Symptoms of Primary Hypertension

Hypertension is known as the "silent killer" because an individual with the disease may experience no warning signs or symptoms; this results in 47% of those with hypertension not knowing they have the disease (Patel et al., p.1284, 2016). Of those patients who are aware of the diagnosis, only 35% are receiving pharmacologic treatment (Patel et al., p. 1284, 2016). This further indicates the need for improved education and community resources through primary care to prevent disease advancement and to reduce mortality. It is not until later stages of the disease that any dysfunctions to an individual's normal state of health are noticed, which puts an individual at increased risk for end organ damage related to hypertension.

The following guidelines are from the American Heart Association as of 2017 on how to categorize blood pressure readings (American Heart Association, 2017).

	Systolic Blood Pressure (SBP)	Diastolic Blood Pressure (DBP)
Normal Blood Pressure	<120	<80
Prehypertension	120-139	80-89
Hypertension Stage I	140-159	90-99
Hypertension Stage II	160 or higher	100 or higher
Hypertensive Crisis	> 180	>110

Normal blood pressure requires SBP and DBP to meet parameters unlike the other four classifications where either the SBP or the DBP parameters must be met.

- Vomiting and headaches may be noticed by some individuals as a symptom that triggers the need for medical attention that may then lead to a diagnosis of primary hypertension (Centers for Disease Control and Prevention [CDC], 2017).
- During a hypertensive crisis additional signs and symptoms may be experienced (American Heart Association, 2017).
 - Shortness of breath, anxiety, blurry vision, and seizures

It is the responsibility of the patient to have regular blood pressure monitoring to be able to identify changes in blood pressure values that warrant medical attention for potential primary hypertension diagnosis.

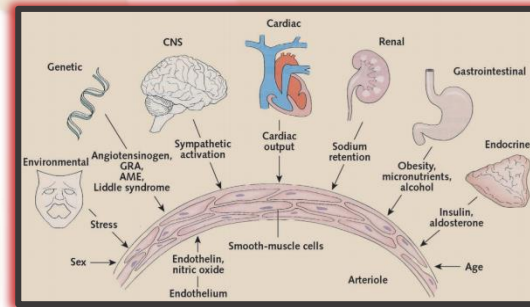
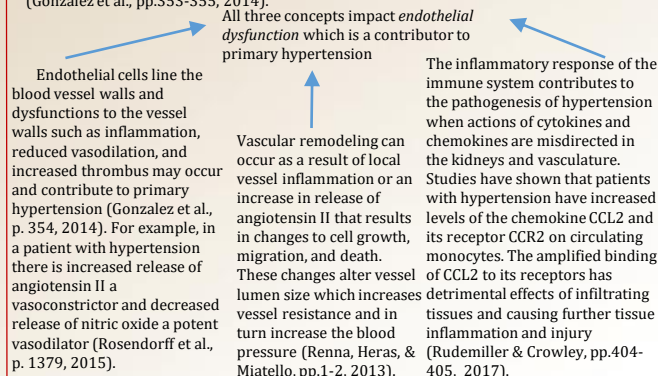


Image 1. Depicted above are several of the pathophysiologic factors that impact development of primary hypertension.

Jenkins, P. G. (2004). Pathogenesis of hypertension. *ANNALS OF INTERNAL MEDICINE*, 141 Retrieved from annals.org.

The Underlying Pathophysiology

Despite years of research and many different theories, the pathophysiologic process that contributes to the development of primary hypertension is unclear. Several physiologic processes in combination with a genetic and environmental component are the basis for research and understanding this disease that is overwhelmingly seen in the population (Gonzalez, Valls, Brito, & Rodrigo, pp. 353-354, 2014). With each heart beat a systolic and diastolic pressure are created within the blood vessels resulting in the blood pressure. There is an increase in blood pressure when the heart has to increase the force in which it pumps blood out of the heart (American Heart Association, 2017). This pattern of increased pressure over time is what leads to hypertension but the mechanism for which this output and resistance increase is not entirely understood. Most recently the pathophysiologic changes involving endothelial dysfunction and oxidative stress, the effects of the autonomic nervous system, and the renin-angiotensin activation system have been the focus of research (Gonzalez et al., pp.353-355, 2014).



- The *autonomic nervous system* greatly influences homeostasis of the cardiovascular system and studies have shown that sympathetic hyperactivity especially related to adrenergic activation can be influential in primary hypertension (Mancia & Grassi, pp.1806&1812, 2014). Excessive response to environmental stimuli, and a decrease in arterial baroreceptors responsiveness to changes in blood pressure are two thoughts that help explain what causes the sympathetic override (Mancia & Grassi, p. 1810, 2014). Studies have shown that adrenergic neurotransmitters (norepinephrine and epinephrine) are released at higher amounts in those with primary hypertension and the activation continues to rise with an increase in blood pressure (Mancia & Grassi, pp.1804-1805, 2014).
- The *renin-angiotensin aldosterone system* (RAAS) is a well understood component to maintaining a normal blood pressure through regulating blood volume and systemic vascular resistance. Renin is an important enzyme released from the kidneys in response to changes in blood pressure and blood flow through the kidneys (Klabunde, 2016). This release then triggers the cascade of events of RAAS. Angiotensin II has several important functions including vasoconstriction, contributing to endothelial dysfunction, stimulating vasopressin release, and triggering the release of aldosterone (Klabunde, 2016). Aldosterone is a mineralocorticoid that regulates the kidneys to increase sodium and fluid retention (Klabunde, 2016). This system normally gives feedback to the kidneys to then decrease renin secretion but in patients with hypertension there is an abnormal or increased amount of renin released which intensifies the effects of the system as mentioned above (Gonzalez et al., p.355, 2014).
- Oxidative stress* can contribute to endothelial dysfunction and occurs when there is an increased amount of reactive oxygen species (ROS) without sufficient antioxidant defense systems (Gonzalez et al., pp.353-354, 2014) as image 2 shows. Reactive oxygen species are released in the blood vessels by many enzymatic sources, primarily the biochemical source NOX which when released has a primary role in renal dysfunction and vascular damage. Vasoconstriction is another effect of reactive oxygen species that may alter the homeostasis of the vascular wall therefore inducing hypertension (Gonzalez et al., p.354 2014).

Significance of the Pathophysiology

These pathophysiology processes occur over a significant period with minimal signs and symptoms therefore causing significant end organ. With proper health care and treatment, end organ damage can be limited or avoided.

- Abnormal stimulation of the sympathetic nervous system as seen with primary hypertension is a predictor of cardiovascular morbidity and mortality due to blood pressure variability and excess norepinephrine release (Mancia & Grassi, p.1809, 2014).
- The single diagnosis of primary hypertension puts an individual at risk for coronary artery disease, stroke, and renal failure (Rosendorff et al., p. 1373, 2015). The sustained high pressure in systemic blood vessels and vascular remodeling as previously discussed ultimately causes these organs to fail.
- Renal function is impaired with sustained high blood pressure and 1 in 5 adults diagnosed with hypertension will develop chronic kidney disease (CDC, 2017).
- It is important to know that 47% of adults have their hypertension controlled, meaning their SBP is less than 140 and DBP is less than 90 (Scordo & Pickett, p.28, 2015).
- Guidelines published by the Joint National Committee, American Heart Association, and American College of Cardiology have differing treatment guidelines, therefore clinical evaluation of co-morbidities and risk factors must be considered in the plan of care as patients with coronary artery disease and renal failure may follow differing regimens (Scordo & Pickett, pp.28 & 32, 2015).

Implications for Nursing

Baseline and successive lab work, physical assessment, and blood pressure monitoring will be needed. It is up to medical professionals to obtain accurate results and interpret them on an individual basis. To accurately diagnose primary hypertension, secondary hypertension must first be ruled out. Then a patient's blood pressure must be taken two or three times on several different visits (Siu, 2015). For those with high blood pressure who are already being monitored, additional measurements outside of the healthcare facility and in a standing position may be of value to their treatment regimen (Siu, 2015).

- The U.S. Preventative Services Task Force has made the following recommendations for screening and treatment (Siu, 2015):
 - Adults 40 years and older and those at risk should have annual screenings. At risk patients include those whose blood pressure is 130 to 139/85 to 89 mm Hg, are overweight or obese, and are African American.
 - Adults 18 to 39 years old with blood pressure of <130/85 mm Hg with no risk factors should be screened every three to five years.
 - Initial treatment for nonblack patients should include a thiazide diuretic, a calcium-channel blocker, an angiotensin converting enzyme inhibitor, or an angiotensin-receptor blocker.
 - Initial treatment for black patients should include a thiazide or a calcium-channel blocker.

Although the underlying pathophysiological mechanism of primary hypertension is unclear, there are risk factors known to put a patient at increased risk for developing the disease. It is crucial to successful prevention and management of primary hypertension to educate on weight loss strategies, methods to reduce salt intake, exercise, and the negative impact of alcohol consumption and cigarette smoking (American Heart Association, 2017).

Conclusion

Patients with the greatest health care complications often have a history of coronary artery disease, renal failure, and stroke, all of which are potential complications of primary hypertension (Rosendorff et al., p.1373, 2015). The underlying cause of many disease processes is multifactorial and the degree to which it impacts the patient often depends on additional co-morbidities, and genetic and environmental factors. Without a clear understanding of how primary hypertension is developed it is imperative that health care providers and patients work together to decrease risk through life style modification and individualized treatment regimens. Primary health care providers can make an enormous impact to patient mortality and health care expenses with proper understanding of the pathophysiology process that is occurring and causing dysfunction in the patient's health.

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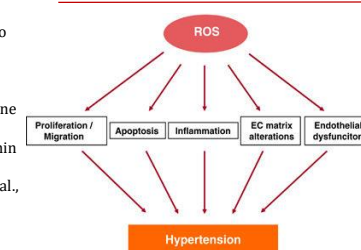


Image 2. How reactive oxygen species (ROS) impact hypertension

Schulz, E., Gori, T., & Münzel, T. (2011). Oxidative stress and endothelial dysfunction in hypertension. *HYPERTENSION RESEARCH: OFFICIAL JOURNAL OF THE JAPANESE SOCIETY OF HYPERTENSION*, 34, 665-673. <http://dx.doi.org/10.1038/hr.2011.39>