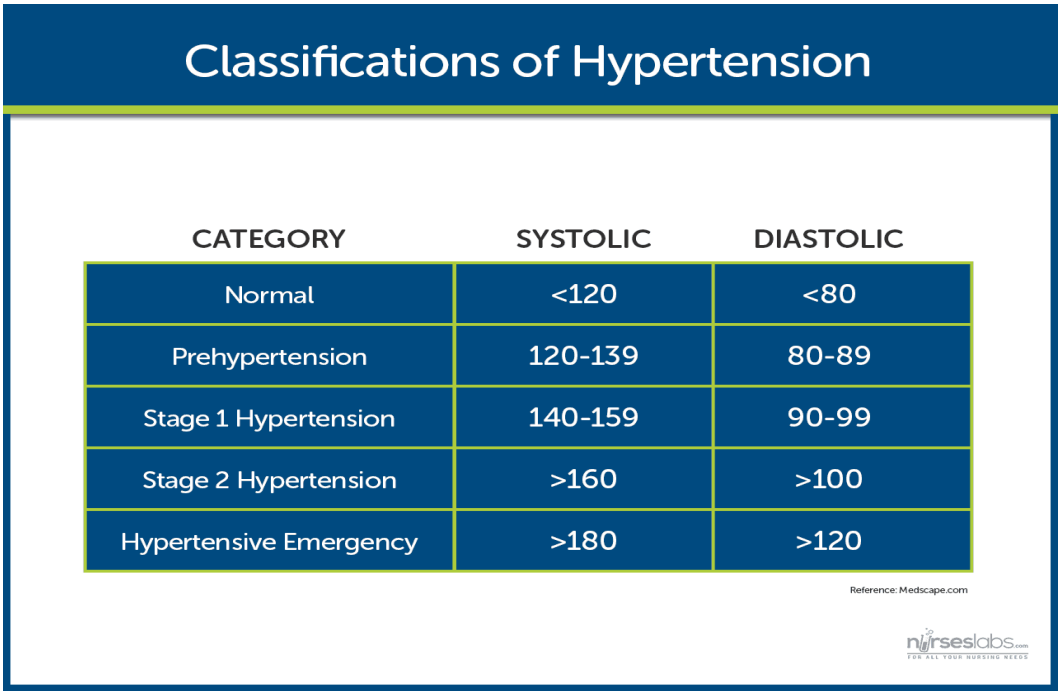
HYPERTENSION BY TIMOTHY, I. A

Hypertension is one of the most common lifestyle diseases to date. It affects people from all walks of life. Let us get to know hypertension more by its definitions.

- Hypertension is defined as a **systolic** blood pressure **greater than 140 mmHg** and a **diastolic** pressure of **more than 90 mmHg**.
- This is based on the average of **two or more accurate blood pressure measurements** during two or more consultations with the healthcare provider.
- The definition is taken from the **Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure**.

Classification

Hypertension has four categories that have no compelling indications. These four categories rely on the blood pressure measurements of the patient so these must be taken accurately.



- **Normal**. The normal range for blood pressure is between, less than 120 mmHg and less than 80 mmHg.
- **Elevated**. Elevated stage starts from 120 mmHg to 129 mmHg for systolic blood pressure and less than 80 mmHg for diastolic pressure.
- **Stage 1 hypertension**. Stage 1 starts when the patient has a systolic pressure of 130 to 139 mmHg and a diastolic pressure of 80 to 89 mmHg.
- **Stage 2 hypertension**. Stage 2 starts when the systolic pressure is already more than or equal than 140 mmHg and the diastolic is more than or equal than 90 mmHg.

Forms of hypertension

Hypertension is divided into two forms**:**

- Primary (or essential) hypertension (95% of people)
- Secondary hypertension

Primary Hypertension

- Primary hypertension has no single known cause but several mechanisms are linked to altered pathways in BP control. These are genetic factors, diet especially increased salt (sodium chloride) intake, obesity, insulin resistance, endothelial dysfunction, chronic excess alcohol, ageing, stress and sedentary lifestyle.
- The pressure against the blood vessel walls is affected by cardiac output and peripheral resistance. Altered pathways in BP control leads to sustained constriction of the arterioles (microscopic blood vessels in the circulation) resulting in increased peripheral resistance in the blood vessels. As the heart continues to pump normally, the pressure in the whole arterial system rises. This normally has no outward symptoms for the individual, unless very high.

Constricted, stiff arteriole vessel walls lead to increased pressure from blood flow within the arterioles

The increased pressure of blood flow against the artery wall leads to damage, resulting in atherosclerotic plaque formation. Signs of prolonged or severe hypertension can be found in target organ damage in the eyes, left ventricle, and kidneys. Presence of target organ damage increases the risk of vascular morbidity and mortality, and the need for treatment to lower blood pressure.

Secondary Hypertension

- In secondary hypertension BP is raised due to a known underlying cause:
    - Renal disorders (e.g. chronic pyelonephritis, diabetic nephropathy).
    - Vascular disorders (e.g. coarctation of the aorta).
    - Endocrine disorders (e.g. primary hyperaldosteronism).
    - Drugs (e.g. alcohol, cocaine)
    - Miscellaneous causes (e.g. scleroderma, obstructive sleep apnoea).
- A search for secondary hypertension is only suggested by history, physical examination or routine tests indicate abnormalities.
- Investigations for secondary hypertension are not cost effective.

Pathophysiology

The pathogenesis of essential hypertension is multifactorial and complex. Multiple factors modulate the blood pressure (BP) including humoral mediators, vascular reactivity, circulating blood volume, vascular caliber, blood viscosity, cardiac output, blood vessel elasticity, and neural stimulation. A possible pathogenesis of essential hypertension has been proposed in which multiple factors, including genetic predisposition, excess dietary salt intake, and adrenergic tone, may interact to produce hypertension. Although genetics appears to contribute, the exact mechanisms underlying essential hypertension have not been established.

Investigations into the pathophysiology of hypertension, both in animals and humans, have revealed that hypertension may have an immunological basis. Studies have revealed that hypertension is associated with renal infiltration of immune cells and that pharmacologic immunosuppression (such as with the drug mycophenolate mofetil) or pathologic immunosuppression (such as occurs with HIV) results in reduced blood pressure in animals and

humans. Evidence suggests that T lymphocytes and T-cell derived cytokines (eg, interleukin 17, tumor necrosis factor alpha) play an important role in hypertension.

One hypothesis is that prehypertension results in oxidation of lipids such as arachidonic acid that leads to the formation of isoketals or isolevuglandins, which function as neoantigens, which are then presented to T cells, leading to T-cell activation and infiltration of critical organs (eg, kidney, vasculature). This results in persistent or severe hypertension and end organ damage. Sympathetic nervous system activation and noradrenergic stimuli have also been shown to promote T-lymphocyte activation and infiltration and contribute to the pathophysiology of hypertension.

The natural history of essential hypertension evolves from occasional to established hypertension. After a long invariable asymptomatic period, persistent hypertension develops into complicated hypertension, in which end-organ damage to the aorta and small arteries, heart, kidneys, retina, and central nervous system is evident.

Epidemiology

Hypertension is slowly rising to the top as **one of the primary causes of morbidity in the world**. Here are the current statistics of the status of hypertension in some of the leading countries.

- About **31%** of the **adults** in the United States have hypertension.
- **African-Americans** have the highest prevalence rate of 37%.
- In the total US population of persons with hypertension, **90% to 95%** have **primary hypertension** or high blood pressure from an unidentified cause.
- The remaining **5% to 10%** of this group have **secondary hypertension** or high blood pressure related to identified causes.
- Hypertension is also termed as the **"silent killer"** because **24%** of people who had pressures exceeding 140/90 mmHg were **unaware** that their blood pressures were elevated.

Causes

Hypertension has a lot of causes just like how fever has many causes. The factors that are implicated as causes of hypertension are:

- **Increased sympathetic nervous system activity**. Sympathetic nervous system activity increases because there is **dysfunction** in the **autonomic nervous system**.
- **Increase renal reabsorption**. There is an increase reabsorption of sodium, chloride, and water which is related to a **genetic variation** in the pathways by which the kidneys handle sodium.
- **Increased RAAS activity**. The renin-angiotensin-aldosterone system increases its activity leading to the **expansion** of **extracellular fluid volume** and increased systemic vascular resistance.
- **Decreased vasodilatation of the arterioles**. The **vascular endothelium** is **damaged** because of the decrease in the vasodilatation of the arterioles.

Clinical Manifestations

Many people who have hypertension are asymptomatic at first. Physical examination may reveal no abnormalities except for an elevated blood pressure, so one must be prepared to recognize hypertension at its earliest.

- **Headache**. The red blood cells carrying **oxygen** is having a hard time reaching the brain because of **constricted vessels**, causing headache.
- Dizziness occurs due to the **low concentration of oxygen** that reaches the brain.
- **Chest pain.** Chest pain occurs also due to **decreased oxygen levels**.
- **Blurred vision.** Blurred vision may occur later on because of **too much constriction in the blood vessels of the eye** that red blood cells carrying oxygen cannot pass through.

Prevention

Prevention of hypertension mainly relies on a healthy lifestyle and self-discipline.

- **Weight reduction**. Maintenance of **normal body weight** can help prevent hypertension.

- **Adopt DASH**. DASH or the Dietary Approaches to Stop Hypertension includes consummation of a diet rich in **fruits, vegetable, and low-fat dairy**.
- **Dietary sodium retention**. Sodium contributes to an elevated blood pressure, so reducing the dietary intake to **no more than 2.4 g sodium per day** can be really helpful.
- **Physical activity**. Engage in **regular aerobic physical activity** for 30 minutes thrice every week.
- **Moderation of alcohol consumption**. Limit alcohol consumption to **no more than 2 drinks per day in men** and **one drink for women** and people who are lighter in weight.

Complications

If hypertension is left untreated, it could progress to complications of the different body organs.

- **Heart failure.** With increased blood pressure, the heart pumps blood faster than normal until the **heart muscle goes weak** from too much exertion.
- **Myocardial infarction. Decreased oxygen** due to constriction of blood vessels may lead to MI.
- **Impaired vision. Ineffective peripheral perfusion** affects the eye, causing problems in vision because of decreased oxygen.
- **Renal failure.** Blood carrying oxygen and nutrients could not reach the renal system because of the **constricted blood vessels**.

Assessment and Diagnostic Findings

Assessment of the patient with hypertension must be detailed and thorough. There are also diagnostic tests that can be performed to establish the diagnosis of hypertension.

Assessment

- Assess the patient's **health history**
- Perform **physical examination** as appropriate.

- The retinas are examined to **assess possible organ damage**.
- Laboratory tests are also taken to **check target organ damage**.

Diagnostic Tests

- Urinalysis is performed to check the **concentration of sodium** in the urine though the specific gravity.
- **Blood chemistry** (e.g. analysis of sodium, potassium, creatinine, fasting glucose, and total and high density lipoprotein cholesterol levels). These tests are done to determine the level of sodium and fat in the body.
- **12-lead ECG**. ECG needs to be performed to rule **presence of cardiovascular damage**.
- **Echocardiography**. Echocardiography assesses the presence of **left ventricular hypertrophy**.
- **Creatinine clearance**. Creatinine clearance is performed to check for the level of BUN and creatinine that can determine if there is renal damage or not.
- **Renin level**. Renin level should be assessed to determine how RAAS is coping.
- **Hemoglobin/hematocrit:** Not diagnostic but assesses relationship of cells to fluid volume (viscosity) and may indicate risk factors such as hypercoagulability, anemia.
- **Blood urea nitrogen (BUN)/creatinine:** Provides information about renal perfusion/function.
- **Glucose:** Hyperglycemia (diabetes mellitus is a precipitator of hypertension) may result from elevated catecholamine levels (increases hypertension).
- **Serum potassium:** Hypokalemia may indicate the presence of primary aldosteronism (cause) or be a side effect of diuretic therapy.
- **Serum calcium:** Imbalance may contribute to hypertension.
- **Lipid panel (total lipids, high-density lipoprotein [HDL], low-density lipoprotein [LDL], cholesterol, triglycerides, phospholipids):** Elevated level may indicate predisposition for/presence of atheromatous plaques.
- **Thyroid studies:** Hyperthyroidism may lead or contribute to vasoconstriction and hypertension.
- **Serum/urine aldosterone level:** May be done to assess for primary aldosteronism (cause).

- **Urinalysis:** May show blood, protein, or white blood cells; or glucose suggests renal dysfunction and/or presence of diabetes.
- **Creatinine clearance:** May be reduced, reflecting renal damage.
- **Urine vanillylmandelic acid (VMA) (catecholamine metabolite):** Elevation may indicate presence of pheochromocytoma (cause); 24-hour urine VMA may be done for assessment of pheochromocytoma if hypertension is intermittent.
- **Uric acid:** Hyperuricemia has been implicated as a risk factor for the development of hypertension.
- **Renin:** Elevated in renovascular and malignant hypertension, salt-wasting disorders.
- **Urine steroids:** Elevation may indicate hyperadrenalism, pheochromocytoma, pituitary dysfunction, Cushing's syndrome.
- **Intravenous pyelogram (IVP):** May identify cause of secondary hypertension, e.g., renal parenchymal disease, renal/ureteral calculi.
- **Kidney and renography nuclear scan:** Evaluates renal status (TOD).
- **Excretory urography:** May reveal renal atrophy, indicating chronic renal disease.
- **Chest x-ray:** May demonstrate obstructing calcification in valve areas; deposits in and/or notching of aorta; cardiac enlargement.
- **Computed tomography (CT) scan:** Assesses for cerebral tumor, CVA, or encephalopathy or to rule out pheochromocytoma.
- **Electrocardiogram (ECG):** May demonstrate enlarged heart, strain patterns, conduction disturbances. Note: Broad, notched P wave is one of the earliest signs of hypertensive heart disease.

Medical Management

The goal of hypertensive treatment is to prevent complications and death by achieving and maintaining the arterial blood pressure at 40/90 mmHg or lower.

Pharmacologic Therapy

- The medications used for treating hypertension **decrease peripheral resistance**, **blood volume**, or the **strength and rate of myocardial contraction**.

- For uncomplicated hypertension, the initial medications recommended are diuretics and beta blockers.
- Only low doses are given, but if blood pressure still exceeds 140/90 mmHg, the dose is increased gradually.
- **Thiazide diuretics decrease blood volume**, renal blood flow, and cardiac output.
- **ARBs** are competitive **inhibitors of aldosterone binding**.
- **Beta blockers block the sympathetic nervous system** to produce a slower heart rate and a lower blood pressure.
- **ACE inhibitors inhibit the conversion of angiotensin I to angiotensin II** and lowers peripheral resistance.

Stage 1 Hypertension

- **Thiazide diuretic** is recommended for most and **angiotensin-converting enzyme-1, aldosterone receptor blocker**, **beta blocker**, or **calcium channel blocker** is considered.

Stage 2 Hypertension

- **Two-drug combination** is followed, usually including thiazide diuretic and angiotensin-converting enzyme-1, or beta-blocker, or calcium channel blocker.

Nursing Management

The goal of nursing management is to help achieve a normal blood pressure through independent and dependent interventions.

Nursing Assessment

Nursing assessment must involve careful monitoring of the blood pressure at frequent and routinely scheduled intervals.

- If patient is on antihypertensive medications, **blood pressure is assessed** to **determine the effectiveness** and **detect changes** in the blood pressure.

- **Complete history** should be obtained to assess for signs and symptoms that indicate target organ damage.
- Pay attention to the rate, rhythm, and character of the apical and peripheral pulses.

Diagnosis

Based on the assessment data, nursing diagnoses may include the following:

- **Deficient knowledge** regarding the relation between the treatment regimen and control of the disease process.
- **Noncompliance with the therapeutic regimen** related to side effects of the prescribed therapy.
- **Risk for activity intolerance** related to imbalance between oxygen supply and demand.
- **Risk-prone health behavior** related to condition requiring change in lifestyle.

Nursing Care Plan and Goals

The major goals for a patient with hypertension are as follows:

- Understanding of the disease process and its treatment.
- Participation in a self-care program.
- Absence of complications.
- BP within acceptable limits for individual.
- Cardiovascular and systemic complications prevented/minimized.
- Disease process/prognosis and therapeutic regimen understood.
- Necessary lifestyle/behavioral changes initiated.
- Plan in place to meet needs after discharge.

Nursing Priorities

1. Maintain/enhance cardiovascular functioning.
2. Prevent complications.
3. Provide information about disease process/prognosis and treatment regimen.
4. Support active patient control of condition.

Nursing Interventions

The objective of nursing care focuses on lowering and controlling the blood pressure without adverse effects and without undue cost.

- Encourage the patient to **consult a dietitian** to help develop a plan for improving nutrient intake or for weight loss.
- Encourage **restriction of sodium and fat**
- Emphasize **increase intake of fruits and vegetables**.
- Implement regular **physical activity**.
- Advise patient to **limit alcohol** consumption and avoidance of tobacco.
- Assist the patient to develop and adhere to an **appropriate exercise regimen.**

Evaluation

At the end of the treatment regimen, the following are expected to be achieved:

- Maintain **blood pressure at less than 140/90 mmHg** with lifestyle modifications, medications, or both.
- Demonstrate no symptoms of angina, palpitations, or visual changes.
- Has stable BUN and serum creatinine levels.
- Has palpable peripheral pulses.
- Adheres to the dietary regimen as prescribed.
- Exercises regularly.
- **Takes medications** as prescribed and reports side effects.
- Measures blood pressure routinely.
- Abstains from tobacco and alcohol intake.
- Exhibits no complications.

Discharge and Home Care Guidelines

Following discharge, the nurse should promote self-care and independence of the patient.

- The nurse can help the patient achieve blood pressure control through **education** about **managing blood pressure.**
- Assist the patient in setting **goal blood pressures**.
- Provide assistance with social support.
- Encourage the **involvement of family members** in the education program to support the patient's efforts to control hypertension.
- Provide written information about expected effects and side effects.
- Encourage and teach patients to measure their blood pressures at home.
- Emphasize strict compliance of **follow-up check up**.