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Coronary Artery Disease

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Introduction
Coronary artery disease (CAD) is a highly prevalent disease in the United States population. U.S. healthcare cost related to CAD was over $326 billion annually in 2010. The cost is expected to rise 47% by 2040 (Odden et al., 2011, p. 829). CAD is a major burden for the U.S. healthcare system projected to worsen with the aging of the population. Understanding the root causes of CAD will lead to better treatment recommendations from providers. Unfortunately, genetic testing has not been found to be economically viable in detecting CAD (Hooijer, Acsa, Monar, & Laddo, 2014). Developing better testing and treatment options could mitigate the future cost of this highly prevalent disease.

Signs and Symptoms
Coronary artery disease is a silent disease process until it progresses to a symptomatic stage. According to the National Heart, Lung and Blood Institute (2010), some people with CAD show no signs or symptoms until they are having a heart attack, arrhythmia, or heart failure. Other people develop signs and symptoms before they develop these related conditions. CAD causes myocardial ischemia, which can present as stable angina or prinzmetal angina.

Signs and symptoms of myocardial ischemia may include left sternal chest pain, chest tightness or pressure, shortness of breath, diaphoresis, and pallor (McCance & Huether, 2014, p.1154). After coronary artery disease has progressed; heart failure, arrhythmia, and myocardial infarction (heart attack) can cause more severe signs and symptoms. Myocardial infarction (MI) is a serious consequence of advanced CAD. The signs and symptoms of a heart attack include sudden crushing chest pain, described as “an elephant sitting on my chest” (McCance & Huether, 2014, p.1160).

Pathophysiology
Coronary artery disease is the result of atherosclerosis in the arterial vessels of the heart. Atherosclerosis is also responsible for renal artery stenosis, carotid artery stenosis, and lower extremity peripheral arterial disease (Imori et al., 2014). Atherosclerosis narrows the lumen of arterial vessels, leading to a decreased supply of oxygen and nutrition to the myocardium. This constriction of blood flow and the resulting lack of oxygen and nutrients, leads to myocardial ischemia. If ischemia is prolonged or the blood vessel becomes totally occluded it can lead to acute coronary syndrome (McCance & Huether, 2014, p. 1148).

The pathophysiologic process of atherosclerosis is discussed in the development CAD. Listed are the pathophysiologic steps leading to atherosclerosis as discussed by McCance and Huether (2014) on pages 1145-1147:
1. Low-density lipoprotein (LDL) accumulates within arterial vessel walls.
2. Injury occurs to the endothelium of the arterial vessel wall. Hypertension, diabetes mellitus, smoking, autoimmune response, and dyslipidemia contribute to this injury.
3. Contact with the endothelial cell stops producing adequate amounts of ascorbic acid and antithrombotic cytokines.
4. Pro-inflammatory cytokines are released by damaged endothelial cell allowing macrophage and leukocyte adherence to the endothelium.
5. LDL releases toxic oxygen radicals and enzymes that result in oxidative stress, causing LDL to oxidize, forming a ‘foam cell’ which creates the atherosclerotic plaque.
6. Oxidized LDL undergoes phosphorylation by macrophages creating foam cells.
7. Foam cells accumulate in the endotelium creating fatty streaks. A collagen layer forms atop of the fatty streaks creating a fibrous plaque.
8. Fibrous plaques can decrease blood flow causing signs and symptoms ischemia.

The development of fibrous plaque is the foundation of atherosclerosis. The majority of fibrous plaques have the potential to rupture. Prostataes causes apoptosis within the fibrous plaque, which leads to bleeding from the plaque. The clotting cascade is activated and a rapid thrombus forms occluding the vessel. Plaque rupture is known as a complicated plaque. “Other causes of thrombosis include plaque erosion which is less frequent than plaque rupture but can be a common cause of thrombosis in young individuals especially women <50 years of age” (Sakakura et al., 2017).

Conclusion
Prevention of atherosclerosis should be a top priority in the treatment of CAD. Understanding the root causes of CAD will lead to better treatment recommendations from providers. Unfortunately, genetic testing has not been found to be economically viable in detecting CAD (Hooijer, Acsa, Monar, & Laddo, 2014). Developing better testing and treatment options could mitigate the future cost of this highly prevalent disease.

Significance of Pathophysiology
One of the most widely used medications in the prevention and treatment of CAD is aspirin. “Aspirin decreases platelet aggregation, inhibiting thrombosis and reducing the risk of myocardial infarction” (Anderson, 2017). Aspirin is an antiplatelet agent that inhibits thromboxane production, which is a factor in blood clotting. Aspirin is taken daily by millions of people to prevent blood clots from forming. The cost of aspirin is about $1 per week.

References
Listed are the steps needed to reduce the risk of cardiac events (Paukeo, 2000, p. 43):
1. Smoking cessation
2. Hypertension control
3. Regular physical activity
4. Aggressive lowering of elevated low-density lipoprotein (LDL) values
5. Losing weight
6. Making healthier dietary choices
7. Blood pressure medication
8. Anticoagulants
The study by Dmitrieva, Neals, Fookes, & Puckey, (2017) found that elevated serum sodium levels, even within the normal range, is associated with vascular changes that facilitate CAD. The U.S. Food and Drug Administration (2016) recommends 2300mg of sodium per day for U.S. adults and 1500mg per day for hypertensive and pre-hypertensive individuals. Medication education is another important area of nursing care. Patients need to understand why they are taking their medications, and the importance of these medications in their treatment condition. When patients do not understand why they are taking medications, they are more likely to stop taking them without consulting their provider.

Implications for Nursing Care
There are many implications for nursing care. Patients need to understand why they are taking their medications, and the importance of these medications in their treatment condition. When patients do not understand why they are taking medications, they are more likely to stop taking them without consulting their provider.

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