Case Study 5: Coronary Artery Disease
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Coronary heart disease (CHD), often interchanged with coronary artery disease (CAD), is developed when the coronary arteries become damaged or diseased therefore affecting the supply of blood, oxygen, and nutrients to the heart. Inflammation or the buildup of plaque causes narrowing in the heart’s arteries and are typically the causes of CAD. Due to the decrease of blood flow, one often experiences angina, also known as chest pain, and shortness of breath. Some people may describe it as chest discomfort, heaviness or tightness rather than chest pain. CAD often develops over time, therefore one may not notice blockage to their heart until it leads to a significant blockage or a heart attack. (Mayo Clinic, 2015). Additionally, the lack of blood flow contribute to the accumulation of plaque in the arteries which highly increases the risk for stroke.

Although the mortality rates of CAD have declined over the past few years, it remains the cause of about one-third or more of deaths in individuals over the age of thirty-five. It was estimated that about one-half of all middle-aged men and one-third of middle-aged women in the United States will develop manifestations of CAD (UpToDate, 2016). Eastern European and former Soviet countries have the highest mortality rates for CAD worldwide, and are continuing to increase at a steady rate (National Academy of Sciences, 2010). According to a research study completed last year, coronary heart disease is the number one cause of death globally (Anderson, 2015). However, one can decrease their risk for CHD by reducing their modifiable risk factors, such as tobacco, physical inactivity, obesity, high blood pressure, high blood cholesterol, diet, stress, alcohol and diabetes mellitus. Unfortunately, there are non-modifiable risk factors as well, which include age, gender, heredity and ethnicity. Males and African Americans are at greatest risk in terms of gender and ethnicity (American Heart Association, 2015).
A study was done in 2013 on the “Multiple risk factor interventions for primary prevention of coronary heart disease.” Risk factors in adults from general populations, occupational groups, and specific risk factor groups (diabetes, HTN, hyperlipidemia, obesity) were modified in randomized controlled trials for six months or more using counselling or education. They found that counselling or education does not reduce total or CHD mortality or clinical events in the general population. However, it is beneficial in reducing mortality among high-risk hypertensive and diabetic populations (Ebrahim, 2013).

G.P. is a 60-year-old male experiencing coronary heart disease. His health history includes, HTN and a five-year history of angina pectoris. Furthermore, both of his parents also suffered from CAD. For the past ten days he has been feeling mid-chest discomfort which has been responding to nitroglycerin (NTG) sublingually. He also complains of recent fatigue and feeling “crappy all of the time”. Several years ago, a cardiac catheterization revealed 50% stenosis in his right coronary artery (RCA) and left anterior descending (LAD) coronary artery. Currently, he is taking amlodipine (Norvasc) for CAD and HTN, metoprolol (Lopressor) for HTN, atorvastatin to lower his lipid levels and aspirin for maintenance of his coronary symptoms (Harding & Snyder, 2016, p. 33). When obtaining information about his chest pain, it is also important to determine the quality, radiation, severity, frequency timing of his pain, and triggering events which would provide important information about what makes it better or worse. Ischemic cardiac pain often spreads to other areas of the body such as the neck, throat, lower jaw, teeth, and shoulders/arms. Typically the pain comes on gradually and gets worse over time. It generally lasts two to five minutes after resting and tends to remain the same regardless of body position. Ischemic cardiac pain is usually described as chest discomfort rather than pain and may feel like squeezing, tightness, or pressure in the chest (Aroesty, J. M. & Kannam, J. P.,
When assessing G.P., it is important to understand his risk factors in order to plan teaching for lifestyle modifications. The nurse should ask him about tobacco/alcohol use, physical activity, diet, and stress. It is also important to determine if he is obese and whether he is managing his blood pressure and cholesterol levels. These are all factors that are modifiable and can help slow any worsening of his disease (American Heart Association, 2015).

During his initial assessment, G.P. stated that he has been experiencing several episodes of mid-chest discomfort the past ten days. He indicated that the chest pain responded to sublingual nitroglycerin (SL NTG), which he has taken about eight to ten times over the past week (Harding & Snyder, 2016, p. 33). Due to his high risk for a heart attack, it is important that he understands how to correctly take this medication and when to call for help if it is not working effectively. When taking SL NTG for chest pain, it is important that he understands to stop the activity and lie or sit down at the onset of pain. The tablet should be placed under the tongue and if unrelieved after taking one tablet, 911 should be called immediately. Nitroglycerin is a vasodilator used to prevent vasospasm of the coronary arteries, reduces preload and afterload and decreases myocardial oxygen demand. G.P. should be informed that headache is a common side effect and is a sign that the medication is working. It can also cause orthostatic hypotension and dizziness; therefore, it is essential to educate patients to sit down before using this medication or get up slowly from a sitting or lying position to reduce the risk for syncope. Other common side effects include flushing, tachycardia, blurred vision, nausea, vomiting, nervousness, xerostomia and burning/tingling under the tongue. It is also important to inform him about the storage of nitroglycerin, since it is very sensitive to light, heat and moisture so it should be stored in a tightly capped dark bottle at room temperature (Suleman, 2014). It is clear that G.P. requires further education when he states “I will discard any open bottle of nitroglycerin after a year”.
The nurse should inform him that tablets in an opened bottle should be discarded after three months and tablets in an unopened bottle are good for a year (UpToDate, 2016).

A study was conducted to compare “Systematic Versus Opportunistic Risk Assessment for the Prevention of Cardiovascular Disease.” The objective of this study was to “assess the effectiveness, costs and adverse effects of systematic risk assessment compared to opportunistic risk assessment for the primary prevention of CVD” (Dyakova, 2016). Both healthy adults from the general population and those at risk for CHD were selected for this study. Overall, lower total cholesterol levels and lower systolic and diastolic blood pressure resulted from systematic risk assessment. However, their results revealed limited data available on mortality due to all causes and cardiovascular mortality. There is not enough evidence to show whether CVD systematic risk assessment has an effect on risk factors. However, there are currently five ongoing trials that will contribute to this evidence (Dyakova, 2016).

To better understand the situation G.P. was placed on telemetry to assess and monitor his cardiac rhythm revealing atrial fibrillation. The primary complication that could occur if atrial fibrillation is left untreated is stroke. The abnormal rhythm causes blood to pool in the atria which can lead to the development of clots that could possibly dislodge, travel to your brain, and block blood flow. When reviewing G.P.’s history, it is evident that he has many risk factors that may have contributed to the development of atrial fibrillation, including: age, heart disease, hypertension and a family history of CAD (Mayo Clinic, 2015).

After reviewing G.P.’s laboratory test results and noting they were all within normal range (troponin, creatinine phosphokinase [CPK] and potassium). Due to his history and test results, it is likely that the cause of his symptoms the past week were due to the worsening of his heart disease. The test results verify this because we are able to rule out muscle damage to the
heart, such as a heart attack. Within the next hour, G.P. quickly converted with medication (diltiazem [Cardizem]) to sick sinus syndrome with long sinus pauses causing lightheadedness and hypotension (Harding & Snyder, 2016). Therefore, the natural pacemaker of his heart is not sending out enough signals to inform his heart to beat and the blood is not flowing adequately. The new rhythm G.P. experienced posed many risks for him, such as angina, decreased exercise capacity, syncope, injury caused by syncope, heart failure, poor heart pumping and loss of consciousness. Sick sinus syndrome is progressive, but can have an excellent prognosis if a permanent pacemaker is implanted (MedlinePlus, 2014). Due to the dysrhythmia causing intolerable symptoms, he is immediately taken to surgery where a permanent DDDR pacemaker is positioned and set at a rate of 70 beats per minute. The code DDDR stands for dual chambers paced, dual chambers sensed, dual response to this, and rate modifiable. The benefits of this pacemaker is that it allows AV synchrony and a normal sinus response and therefore mimics the normal cardiac conduction more closely. Unfortunately, there is a risk of losing AV conduction completely. However, the implantation of the pacemaker greatly improves G.P.’s quality of life and reduces his risk for death (Shea, 2015).

In 2008, a study was done to compare “Dual Chamber versus Single Chamber Ventricular Pacemakers for Sick Sinus Syndrome and Atrioventricular Block.” The results revealed that there is no preference for pacing for the prevention of stroke, heart failure, atrial fibrillation and mortality. However, dual chamber pacing regarding pacemaker syndrome and exercise capacity. There were no studies that reported a significantly more favorable outcome with single chamber ventricular pacing (Dretzke, 2008). According to a study done in 2014, “the implantation of a permanent pacemaker positively influences patients’ quality of life especially in domains of health and functional status” (Kurucová, Žiaková, Gurková, & Šimková, 2014).
Pacemaker insertion surgery places G.P. at risk for several serious complications. Three potential complications a nurse should assess for are infection or hematoma at the insertion site, a pneumothorax or hemothorax, and arrhythmias related to ventricular irritation from pacemaker electrode. He is at risk for infection or hematoma at the insertion site. Therefore, antibiotics should be administered as prescribed and the incision site should be assessed for redness, pain, drainage or swelling. It is also important to monitor PT, PTT and CBC. To monitor for a pneumothorax or hemothorax, a nurse should assess his breath sounds, oxygen saturation, and chest movement in order to assess for any abnormalities. A chest X-ray is done after the procedure which can determine placement and also assess for pneumothorax or hemothorax. Additionally, his ECG and BP should be monitored to determine if there are any arrhythmias related to ventricular irritation from pacemaker electrodes. Antiarrhythmics should be given as prescribed and emergency resuscitation equipment and medications should be readily available (Sommer et al., 2013).

Before discharge, it is essential that G.P. receives patient education regarding his new pacemaker and how it works. His pacemaker was inserted due to his “natural pacemaker” (SA node) of his heart not functioning properly, therefore causing his heart to beat rapidly and irregularly. This resulted in insufficient blood flow to the heart which correspondingly increases his risk for other heart-related complications in the future. The pacemaker does not beat for the heart, but rather stimulates the heart to beat at a regular rhythm. G.P. should be informed that he must carry a pacemaker identification card at all times. For the first one to two weeks, he cannot raise his arm above his head to prevent wire dislodgment. No contact sports or heavy lifting for at least two months. G.P. should be informed that placing items that generate a magnetic field directly over the pacemaker can affect its function and settings. He should understand that theft
and security sensors are unlikely to cause significant symptoms for patients with pacemakers; however, they will set off the airport security detectors. When traveling, he must notify airport security personnel and they should not place wand detection devices directly over the pacemaker. (Sommer et al., 2013).

Later in the shift, G.P.’s wife approaches and anxiously inquires, “My neighbor saw this science fiction movie about this guy who got a pacemaker and then he couldn’t die. Is that for real?” As her nurse, it is important to reassure her that this is not true, but it is a common misconception. A suitable response to a question of this nature would be to explain that many people believe that a pacemaker beats for the heart, but it actually delivers energy to stimulate the heart to beat. If someone with a pacemaker were to stop breathing their heart muscle would die and stop beating from a lack of oxygen, even with the pacemaker in place.

Later on, “G.P. and his wife tell you they have heard that people with pacemakers can have their hearts stop because of microwave ovens and cell phones” (Harding & Snyder, 2016). The nurse should inform them that microwaves, cell phones, and most other home appliances have not been shown to have an affect on pacemakers. However, newer cellphones are beginning to use new frequencies that may make pacemakers less reliable than previously. They can also find more information regarding pacemakers on the American Heart Association website, including a list of devices that can interfere with them (American Heart Association, 2014).

G.P. must also receive patient education regarding how to best manage his cardiovascular problems. He should quit smoking if he does so and limit his alcohol intake. It is important that he is taking his hypertension medication regularly, because hypertension increases the heart’s workload resulting in a thickened and stiffened heart muscle. Physical activity is another way to
reduce further complications because it can help control blood pressure, blood cholesterol, diabetes and obesity. He should also be watching his weight and diet and reducing his amount of cholesterol intake. In a healthy individual, there should be high levels of HDL cholesterol and low levels of LDL cholesterol. Too much LDL cholesterol can contribute to the buildup of fatty deposits in the arteries (American Heart Association, 2015).

After discharge, G.P. was referred to a cardiac rehabilitation center to start an exercise program. He will undergo an exercise test that will help individualize his exercise prescription. The exercise test is also known as a stress test to better understand his heart’s response to exercise with ECG and blood pressure monitoring by measuring your cardiovascular fitness and functional capacity. The results from the test can either assist in screening for cardiovascular disease or can be used for the development of an exercise program. For G.P., it is to help develop his exercise prescription which includes specific type of exercises/activities, workloads, duration, and frequency of the activity as well as intensity guidelines (Suleman, 2014). A study was conducted “to assess the effectiveness and cost-effectiveness of exercise-based cardiac rehabilitation” (Anderson, 2015). One-fourth of the trials reported significant improvement with exercise-based cardiac rehabilitation compared to a no exercise control. However, more quality research must be done to assess the impact of exercise-based cardiac rehabilitation in CHD.

The next steps for G.P. would be to follow-up for a pacemaker check six weeks from insertion and regularly get it checked every three to six months following. Typically, pacemakers last four to eight years. The doctors will be able to determine when it needs to be changed with a special computer called a programmer. The programmer has a wand that is placed over the chest which is able to assess the pacemaker’s sensing and pacing functions, battery life, and obtain diagnostic information. About every eight weeks he will also be asked to
check his pacemaker over the telephone, which is known as trans-telephonic monitoring. He will have a small monitoring device that transmits ECG over the telephone to a receiver station (Shea, 2015). Additionally, he should continue with his exercise prescription, be mindful of his diet, and control his blood pressure and cholesterol to reduce his risk for further complications and live a quality life.

Due to G.P.’s multiple modifiable and non-modifiable risk factors, his coronary artery disease continued to worsen resulting in multiple episodes of chest discomfort and atrial fibrillation. The blockage of his major arteries does not allow adequate flow of blood, oxygen and nutrients to the heart. This poses a high risk for further complications such as stroke, heart attack and heart failure. After his conversion to sick sinus syndrome, a permanent pacemaker was inserted. G.P. would greatly benefit from patient education regarding lifestyle modifications and his new pacemaker. After discharge from the hospital, he will complete an exercises test and given an individualized exercise prescription.
References


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