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KNH 411

Medical Nutrition Therapy

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Case Study #5: Myocardial Infarction

1. Mr. Klosterman had a myocardial infarction. Explain what happened to his heart.

   A myocardial infarction is defined as "necrosis of the myocardial cells as a result of oxygen deprivation" (Nelms, 2011, G-16), which is also known as a heart attack to the general public. This is most commonly caused by atherosclerosis. During atherosclerosis, the walls of the vessels thicken and there is a loss of vascular elasticity. This thickening and inflexibility is the origin of the myocardial infarction. Therefore, the heart muscle actually suffers from damage or even dies from the restriction of blood flow for a long enough period of time and other physical symptoms are exhibited.

   Mr. Klosterman has a history of smoking a pack of cigarettes per day for the past forty years. Smoking has proven to be a major cause of atherosclerosis. Other contributing factors that would cause the atherosclerosis would be dietary factors such as a glass of wine per day as well as genetic factors such as the family history of coronary artery disease in his father who suffered a myocardial infarction at the age of 59. He also expresses

   The atherosclerosis begins as a response to injury that results in an inflammatory process. The injury occurs to the endothelial cells in the lining of the arterial wall. This injury has a number of different causes such as increased pressure exerted in the wall as in the case of hypertension, geometrics of the blood vessel may make them more susceptible to damage, or chemical irritants such as from tobacco, oxidized LDL, glycated substances, and homocysteine all contribute to the onset of atherosclerosis (Nelms, 2011, 298). In Mr. Klosterman's case, the injury to his arteries would most likely be attributed to the chemical irritants from smoking tobacco and his genetic history.

   Essentially, the pathophysiology of atherosclerosis is that a lesion will occur in the endothelial cells. This lesion will summon the inflammatory process to begin. The damaged area will attract platelets, which attach to the endothelium and form small clots, or a thrombus. The platelets will then secrete ADP and PDGF, which promote platelet accumulation and have an attracting effect that draws smooth muscle, fibroblasts, and other cells to the injured area, thus forming an increase in collagen and a harder, more fibrous

growth. Monocytes cling to the injured area and convert to macrophages. The macrophages act as receptors for oxidized LDL, therefore increasing the amount of oxidized LDL in the artery. Smooth muscle cells then take up the LDL until they turn into foam cells. Foam cells are filled with cholesterol and form a fatty streak. The fatty streak is the earliest sign of atherosclerosis. As the cell migration to the injured area progresses, the plaque eventually develops into a fibromuscular complex and ultimately decreases the size of the lumen. (Nelms, 2011, 304). The heart muscle then suffers ischemia because the clot formation blocks the nutrients and oxygen from reaching the heart. Ischemia is necrosis of heart tissue due to the lack of oxygen, which then leads to the myocardial infarction. (Nelms, 2011, 298-305). Atherosclerosis is the condition in which plaque builds up within the arteries which then leads to a myocardial infarction that inevitably causes coronary artery disease, or ischemic heart disease.

2. Explain angioplasty and stent placement. What is the purpose of this medical procedure?

    An angioplasty, medically known as percutaneous coronary intervention, is a procedure that involves widening a constricted or blocked coronary artery. It is done by inserting a catheter through the skin of the upper thigh or arm into the artery. The catheter has a balloon tip that works by going into the blood vessel and is inflated to compress the plaque against the artery wall so that blood flow may once again be restored. The purpose of the procedure is to reestablish the blood flow through the vessel. (NIH, 2014).

    A stent also works to open a blocked or narrowed artery. Stent placement involves a small, metal mesh tube that keeps the artery open. The stent is usually placed after the angioplasty in order to keep the artery from narrowing yet again. (NIH, 2014).

3. What role does cardiac rehabilitation play in his return to normal activities in determining his future heart health?

    Mr. Klosterman's cardiac rehabilitation is vital in order to return to normal activities so that he may live an active, healthy lifestyle to prevent other cardiac issues from arising. The cardiac rehabilitation consists of educational and counseling sessions in order to increase physical fitness, reduce cardiac symptoms and risk of future heart problems, and improve his overall health. He must start participating in some sort of physical activity in order to decrease his risk for a recurrence of a myocardial infarction. He must also make sure he is eating a healthy diet, which requires him to be healthy so that he may be mobile enough to cook and eat well as well as stay physically active.

4. What risk factors as indicated in his medical record can be addressed through nutrition therapy?

The risk factors that can be addressed through nutrition therapy are his weight, making modifications to his normal diet, his high overall cholesterol levels, other lab values such as his Apo A levels, and LDL and HDL levels. His smoking, and working on his physical activity may also be an indirect change through nutrition therapy.

5. What are the current recommendations for nutritional intake during hospitalization following a myocardial infarction?

During Mr. Klosterman's hospital stay, he is ordered to be on an NPO diet. NPO means that he cannot consume anything orally. After the procedure, he should transition to a limited oral intake consisting of clear liquids without caffeine in order to decrease risk of vomiting or aspirating. Once Mr. Klosterman proves to handle the clear liquid diet he will move to a modified soft diet of easily chewable foods in smaller portions. As he improves, his diet will transition based on his individual improvements to eventually be able to implement the Therapeutic Lifestyle Changes Dietary Recommendations, also known as the TLC diet.

The TLC diet suggests an increase in whole grain breads and cereals, vegetables, fruits, dairy, eggs, meat, poultry and fish, and adjusted amounts of fats and oils. It also suggests limiting intake of bakery-type products, grain-based snacks such as chips, fried vegetables or those prepared with butter, cheese or cream sauce, fruits that are fried or served with butter or cream, egg yolks, high fat meats, and over consumption of fats and oils. This diet gives strategies for weight reduction such as recording weight regularly, gradually losing weight, and gives tips on developing healthy eating patterns. Finally, the diet recommends increasing the amount of physical activity through making daily routines and treating exercise as a recreational activity. The diet advocates increasing walking, playing basketball, walking the dog, gardening, raking leaves, cleaning the house, swimming, biking, golfing, dancing, taking the stairs, or playing any other type of sport. (Nelms, 2011).

The specific recommendations of the TLC diet are:

- Saturated fat: less than 7% of total kcal
- Polyunsaturated fat: up to 10% of total kcal
- Monounsaturated fat: up to 20% of total kcal
- Total fat: 25-35% of total kcal
- Cholesterol: <200mg per day
- Carbohydrate: 50-60% of total kcal
- Fiber: 20-30g per day
- Protein: About 15% of total kcal
- Sodium: <2400mg per day
- Stanol Esters: 3-4g per day

(Nelms, 2011).

6. What is the healthy weight range for an individual of Mr. Klosterman's height?

Hamwi Method:
106lbs for the first 5ft. of height and add 6lbs for every inch over 5ft. or subtract 6lbs for every inch under 5ft.

Mr. Klosterman is 5'10".
106lbs + (6lbsx10in.) = 166lbs.
Adjusted Body Weight:
Ideal body weight + 0.25 (usual body weight – ideal body weight)
(166lbs) + 0.25 (185lbs-166lbs) = 171lbs

Mr. Klosterman should be somewhere in the range from 166lbs to 171lbs based on the Hamwi method to determine ideal body weight and the calculation to determine adjusted body weight.

7. Calculate his energy and protein requirements.
   Mifflin-St. Jeor:
   REE = (10 x weight (kg)) + (6.25 x height (cm)) – 5 (age (years)) + 5
   REE = (10 x 77.7kg) + (6.25 x 177.8cm) – 5 (61 years) + 5
   REE = 777 + 1111.25 – 305 + 5
   REE = 1588 kcal
   Activity factor = 1.6
   TEE = REE x Physical Activity Level
   TEE = 1588 x 1.6
   TEE = 2540.8 kcal
   Energy requirement range of 2500-2600 kcals per day.
   Protein Requirements:
   The RDA states individuals need about 0.8g of protein per kg per day. Patients under stress, trauma, or disease should receive about 1.0-1.5 g of protein per kg per day. Mr. Klosterman falls under the category of being under stress so should receive about 1.0-1.5g of protein per kg per day.
   Estimated Protein Requirements:
   1.0-1.5g/kg/day
   1.0(78kg) = 78 g/day
   1.5(78kg) = 117 g/day
   Calories from Protein = grams of protein x 4kcal/g
   78g x 4kcal/g = 312 kcal
   117 x 4kcal/g = 468 kcal.
   Mr. Klosterman's estimated protein requirements are about 78 – 117g per day. This is equivalent to 312 – 468 kcal/gram based on 4kcal per gram of protein.

8. Using Mr. Klosterman's 24-hour recall, calculate the total number of calories he consumed as well as the energy distribution of calories for protein, carbohydrates, and fat using the exchange system.
   Mr. Klosterman consumed 2,436 calories for the day. The distribution of calories is 306g of carbohydates, which is 1224 calories, 87g of fat,

which is 783 calories, and 117g of protein, which is 468 calories. 50% of his total calories were from carbohydrates, 32% of his calories were from fat, and 19% of his calories were from protein. His fat intake is on the higher end. (Calorie Counter, 2014).

9. Examine the chemistry results for Mr. Klosterman. Which labs are consistent with the MI diagnosis? Explain. Why were the levels higher on day 2?

The lab results that consistent with the MI diagnosis are the increased levels of troponin. "When a myocardial cell dies, cellular membranes lose integrity, and intracellular enzymes and proteins slowly leak into the blood stream. These enzymes and proteins can be detected by a blood sample analysis" (Bolooki, Askari, 2014). Typically troponin is not found in the serum but is released during a myocardial infarction. Mr. Klosterman was found to have an increased level of troponin I and troponin T on the first and the second day, which is consistent with the MI diagnosis. Creatine kinase is also another lab value that would be consistent with the MI diagnosis. Mr. Klosterman's CPK levels were increased when taken on the second day. Lactate dehydrogenase also elevates from an MI. The rise in each of the levels is a direct indicator of a myocardial infarction. Additionally, increased levels of ALT and AST are strong indicators of a heart attack as shown on the second and third day (Dugdale, 2013). Mr. Klosterman's high cholesterol levels are also significant because they are a strong contributor to the occurrence of a myocardial infarction.

Levels were higher on day 2 because many of the chemical measurements peak within 24-48 hours, as in the case of troponin and CPK. As the heart muscle dies further, more chemicals are released. This would explain why Mr. Klosterman's levels of troponin, CPK, LDH, ALT, and AST were all higher on the second and third day than they were on the first day upon the initial admission to the hospital. (Dugdale, 2013)

10. What is abnormal about his lipid profile? Indicate the abnormal values.

Mr. Klosterman's lipid profile is very undesirable and proves to be too high. The lipid profile is indicated by cholesterol levels, HDL and LDL levels, the LDL/HDL ratio, Apo A, Apo B, and triglyceride levels. The table below shows the comparison of desirable levels to the patient's levels:

	Desirable Level	Patient Level (12/1)
Cholesterol (mg/dL)	<200	235
HDL (mg/dL)	>45 (males)	30
LDL (mg/dL)	<130	160
LDL/HDL ratio	<3.55 (males)	5.3
Apo A (mg/dL)	94-178 (males)	72
Apo B (mg/dL)	63-133 (males)	115
Triglyceride (mg/dL)	40-160 (males)	150

His levels show to be high in cholesterol, LDL, LDL/HDL ratio, and on the higher end in triglyceride levels. His HDL and Apo A levels are low. A higher level of HDL and Apo A are desirable in typical patients.

11. Mr. Klosterman was prescribed the following medications on discharge. What are the food-medication interactions for this list of medications?

Medications	**Possible Food-Medication Interactions**
Lopressor 50mg daily	• Avoid alcohol: the interaction may lower blood pressure thus causing dizziness, headaches, fainting, or changes in heart rate. • Take with meals: food absorption helps to increase the absorption of the medication. • Take separately from orange juice. • Avoid natural licorice. • Dietary calcium and sodium may decrease absorption therefore be cautious of calcium and sodium consumption.
Lisinopril 10 mg daily	• Take on an empty stomach, one hour before meals because food decreases absorption. • Consume low fat meals. High fat meals decrease absorption. • Avoid salt, calcium, and natural licorice. • Ensure adequate fluid consumption.
Nitro-Bid 9.0 mg twice daily	• Take on an empty stomach, one hour before meals or two hours after, with water in order to increase absorption because food will decrease absorption. • Avoid alcohol.
NTG 0.4 mg sl prn chest pain	• Take on an empty stomach, one hour before meals or two hours after, with water in order to increase absorption because food will decrease absorption. • Avoid alcohol.
ASA 81 mg daily	• Take with food.

	• Increase consumption of vitamin C, vitamin K, and folate for high doses. • Limit caffeine intake. • Limit products that affect blood coagulation such as garlic, ginger, gingko, ginseng, or horse chestnut. • Limit alcohol.

(Bellows, Moore, 2013).

12. What questions will you ask Mr. Klosterman and his wife to assess how to best help them?

I would begin by asking Mr. Klosterman what his typical food intake includes. I would find out his food preferences and his dislikes so that I may incorporate them or exclude them from a sample meal plan. Finding out his food preferences could also act as an educational tool to let him know what types of foods could be contributing to his condition. I would ask about his daily routine with work or days off to see what types of small changes throughout a typical day could help his health condition. It would also be important to inquire what type of budget Mr. Klosterman and his wife are on and how much they allocate to paying for groceries and who does the grocery shopping at home. This would highly impact the types of foods they are consuming based on what types of food they can afford and who is doing the shopping. I would ask who does the cooking at home and how often they cook at home as well as how often they go out to eat. Another important piece of information I would ask about would be how much time does he have to do some sort of physical activity and or to do any sort of cooking.

13. What other issues might you consider to support successful lifestyle changes for Mr. Klosterman?

As many of the important questions suggested, I would ask about their financial status to conclude what types of foods fall within their budget. I would try to find out how demanding their jobs are in order to determine their stress levels and amount of free time. This is important because stress may not be a dietary factor, however it strongly contributes to the myocardial infarction.

Other lifestyle changes that would support successful lifestyle changes would be to increase physical activity in any way possible. Whether that be just parking further away in a parking lot or picking up a sport as a hobby, Mr. Klosterman needs to increase physical activity in order to support a healthy lifestyle and prevent another heart attack from occurring. I would also suggest a program or strategies to help Mr. Klosterman quit smoking. This would increase his health status immensely considering

smoking is one of the leading factors that cause heart disease and heart attacks.

14. From the information gathered within the assessment, list possible nutrition problems using the correct diagnostic terms.

    Possible nutrition problems include the following:

    - NI-5.6.2 – Excessive Fat Intake
    - NI-5.6.3 – Intake of types of fats inconsistent with needs
    - NI-5.7.1 – Inadequate Protein Intake
    - NI-5.8.5 – Inadequate Fiber Intake
    - NI-5.10.2.7 – Excessive Mineral Intake – Sodium
    - NC-3.3.1 – Overweight/Obese Adult
    - NB-1.7 – Undesirable Food Choices
    - NB-2.1 – Physical Inactivity

    (eNCPT, 2014).

15. Select two of the identified nutrition problems and complete the PES statement for each.

    The two nutrition problems that I would select would be NI-5.6.2, which is excessive fat intake, and NB-2.1, which is physical inactivity. I think that these two most strongly contribute to his cardiovascular condition.

    NI-5.6.3 PES Statement:

    Intake of types of fats inconsistent with needs related to intake of foods high in saturated and trans fats as evidence by the abnormal lipid profile for cholesterol, LDL, and LDL/HDL ratio as well as low HDL levels.

    NB-2.1 PES Statement:

    Overweight related to physical inactivity as evidenced by a BMI of 26.6 and a weight of 185 pounds.

16. For each of the PES statements you have written, establish an ideal goal and an appropriate intervention.

    NI-5.6.2 – An ideal goal that would help with Mr. Klosterman's intake of types of fats that are inconsistent with his needs would be to increase consumption of monounsaturated and polyunsaturated fats to 2-4g per day. An appropriate intervention for this would be to add foods high in unsaturated fats to the diet such as salmon, walnuts, seeds, or oils. An example of this intervention would be to make a salad incorporating salmon and walnuts. (CDC, 2012).

    NB-2.1 – An ideal goal that would help Mr. Klosterman in order to increase his overall activity level would be to increase his physical activity to 30 minutes per day. An appropriate way to incorporate this for Mr. Klosterman would be to gradually

lengthen the amount of time he walks his dog per day until he reaches a 30-minute walk.

17. What does the research say about omega-3 fatty acid supplementation for this patient?

The latest research supports the supplementation of omega-3 fatty acids in order to help prevent heart disease. The current research has not yet determined why the omega-3 fatty acids help lower risk of heart disease. Currently, research has found that omega-3 fatty acids can decrease risk for arrhythmias, decrease risk for thrombosis, decrease triglyceride and lipoprotein levels, decrease the rate of plaque build up, improve endothelial function, lower blood pressure, and reduce inflammatory responses. All of these functions of omega-3 fatty acids play a strong role in dictating whether a myocardial infarction will or will not occur. The current research suggests that individuals consume fish at least twice a week or about 1g of EPA and DHA per day for individuals with cardiovascular disease through the diet or supplementation.

The research also concludes that consuming 2-4g of EPA and DHA per day can lower triglyceride levels anywhere between 20-40%. Patients must be cautious not to exceed these suggested amounts of consumption because it could cause excessive bleeding in some people. A supplement should not be taken without the consultation of a physician. If a patient prefers to obtain omega-3 fatty acids through the diet, strong dietary sources would be salmon, nuts, vegetable oils, canola oil, olive oil, avocado, walnuts, or flaxseed. Any of these foods will increase the amount of omega-3 fatty acids. (Kris-Etherton, et. al, 2014).

18. What would you want to assess in three to four weeks when he and his wife return for additional counseling?

When Mr. Klosterman and his wife return for additional counseling, I would like to begin by addressing his lab values. If Mr. Klosterman follows the suggestion of increasing his consumption of mono and polyunsaturated fatty acids, his overall triglyceride levels should decrease while his overall HDL levels should increase. Along with labs, I would like to evaluate his weight, BMI, and food logs. I would also investigate how much of the physical activity he has completed. If the patient is compliant with the physical activity suggestions and is successfully completing the tasks, I would suggest to gradually increasing to more strenuous activities. Incorporating a sport could be a great way to have fun and still increase activity levels.

If the patient illustrates success in the previously implemented interventions, then I would move on to other interventions in order to further prevent a recurrence of a myocardial infarction. I would strongly encourage Mr. Klosterman to quit smoking, increase fiber intake, and focus his efforts on improving his dietary choices. I would provide programs that help to stop smoking through community or hospital interventions. In order to increase his fiber intake, I could create a sample meal plan or provide

recipes that include foods that are high in fiber. Finally, I would strongly suggest he make more desirable dietary choices in the foods that he selects. I would do this through suggesting more healthy foods and increasing his intake of fresh fruits and vegetables.

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