Nutr 245: Medical Nutrition Therapy: A Case Study Approach 3rd ed.
Case 6 – Hypertension and Cardiovascular Disease

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I. Understanding the Disease and Pathophysiology

1. Dr. Thornton indicated in his admitting note that he will "rule out metabolic syndrome." What is metabolic syndrome?

Metabolic Syndrome is a constellation of metabolic risk factors including abdominal obesity (waist circumference: >35 in women/>40 in men), insulin resistance (Low HDL-C: <40 men/<50 women), dyslipidemia, hypertension (high BP: > or = 130/85, TG > or = 150, glucose > or = 100) and pro-inflammatory and prothrombotic state. In order to be classified as having metabolic syndrome an individual must obtain at least three of the risk factors.

2. What factors found in the medical and social history are pertinent for determining Mrs. Anderson's CHD(Congenital Heart Disease) risk category?

Medical history	Social history
• Diagnosed 1 year ago with HTN, mother died due to heart attack caused by HTN, High BP 160/100, high cholesterol 270mg/dl	• Smoked 2 pack/day for 30 years- quit 1 year ago, Drinks 1-2 beers occ (excessive alcohol intake), adds salt to meals, walks 4-5 times per week but sometimes doesn't due to bingo.

II. Understanding the Nutrition Therapy

3. What are the most recent recommendations for nutrition therapy in hypertension? Explain the history of and rationale for the DASH diet.

Nutrition therapy for hypertension has very specific goals. Such goals consist of reduction in the risk of cardiovascular and renal disease and reduction of blood pressure to <140/80 mmHg (or to <130/80 mmHg in those individuals with diabetes or chronic renal disease.) Recommendations for achieving these goals are weight reduction, increase in physical activity, nutrition therapy, and pharmacological interventions. Specifically, nutrition therapy for HTN recommends reduction in sodium and alcohol intake as primary strategies. In the past 10 years clinical trials, such DASH and premier trials, have found that decreasing sodium, saturated fat, and alcohol intake while increasing calcium, potassium, and fiber typically effects lowering blood pressure. Therefore, education in key in nutrition therapy in regards to HTN.

The DASH diet is a concept approach for nutrition therapy with a comprehensive dietary method. It was brought forth by Dietary Approaches to Stop Hypertension in the late 1900's. Clinical trials which they preformed focused on using a plethora of foods that reduced sodium intake but also increased potassium, calcium, magnesium, and fiber intakes within a moderate energy intake. The DASH diet is based on a 2000 calorie diet which provides about 4700 mg potassium, 500 mg magnesium, 1240 mg calcium, 90 g of protein, 30 g of fiber and 2400 mg of sodium. The DASH diet has resulted in a reduction of blood pressure

due to the increase of potassium, magnesium, calcium, and fiber while reducing sodium and saturated fat.

4. *What is the rationale for sodium restriction in treatment of hypertension? Is this controversial? Why or why not?*

    Sodium restriction as a treatment of HTN has been controversial in the past. Recent and consistent evidence has shown the effectiveness of a reduction in sodium to control HTN. For instance, the INTERSALT study has shown that urinary sodium excretion has a significant as well as direct relationship with systolic blood pressure. DASH trials have also supported the idea of sodium reduction in treatment for HTN. Individual response to sodium restriction can vary based on whether the individual is salt sensitive or salt resistant.

5. *What are the Therapeutic Lifestyle Changes? Outline the components of the nutrition therapy interventions.*

    TLC is a treatment for HTN. TLC contains three components of nutrition therapy interventions which are lowering LDL-c, Treatment Metabolic Syndrome, and Healthful Choices.

    Lower LDL-c: requires restriction in saturated fat and trans fatty acids as well as dietary cholesterol. In addition, having a high fiber diet and/or plant sterol/stanols in the diet can aid in lowering LDL even more.
    Treatment Metabolic Syndrome: decrease obesity and sedentary lifestyle by increasing physical activity targeted to improve triglyceride/HDL, BP, and avoid hyperglycemia. Therefore, emphasis is on weight control and increasing exercise. Additionally, moderate intakes of fat are recommended (should not be too low or too high.)
    Healthful Choices: diets should consist of fiber, fruits and vegetables, fish and other sources of n-3 (omega 3) fatty acids.

    Visit 1- Begin lifestyle Therapies: reduce SFA/cholesterol, increase moderate physical activity, and consider referral to dietitian.
    Visit 2 (after 6 weeks from visit 1)- Evaluate LDL response, If LDL goal not achieved, intensify LDL- Lowering Tx: reduce SFA/cholesterol, increase moderate physical activity, increase fiber intake and consider referral to dietitian.
    Visit 3 (after 6 weeks from visit 2)- Evaluate LDL response, if LDL goal not achieved consider adding drug Tx: Intake Tx for metabolic syndrome, intensify weight management and physical activity, consider referral to dietitian.
    Visit 4 (4-6mo after from visit 3)- Monitor Adherence to TLC: Intake Tx for metabolic syndrome, intensify weight management and physical activity, consider referral to dietitian.

6. *What is the rationale for the use of plant stanols/sterols and list some products that you may recommend?*

    The rationale for the use of plant stanols/sterols is their efficacy in lowering LDL-c by 9-20%, especially in adults. Plant stanols/sterols have the ability to trap cholesterol because it doesn't excrete thus reduces cholesterol absorption by up to 65%. Likewise, plant

stanols/sterols slow down the liver production of cholesterol thus lowers blood cholesterol levels. It is recommended that only 2-3 g/day be consumed. Products such as spread margarine, corn, fruits and veggies typically contain plant stanols/sterold. Plant stanols/sterols are also sometimes found in yogurt and orange juice.

III. Nutrition Assessment

A. Evaluation of Weight/Body Composition

7. *Calculate Mrs. Anderson's body mass index (BMI). What are the health implications of this number?*

$$BMI = 160 \text{ lbs}/(66 \text{ in})^2 \text{ x } 704.5 = 26$$

According to her BMI, Mrs. Anderson is considered to be overweight. Since she is overweight she has a higher risk for CHD, type-2 diabetes, cancer, hypertension, metabolic syndrome, sleep apnea, and dyslipidemia.

B. Calculation of Nutrient Requirements

8. *Calculate Mrs. Anderson's resting and total energy needs. Identify the formula/calculation method you used and explain your rationale for using it. (HINT: which formula is the most accurate?)*

Mifflin St-Jeor equation:

Resting energy needs:

REE = 10 (73kg) + 6.25 (168 cm) – 5 (54 yrs) -161
REE = 730 +1050 – 270 -161
REE= 1349 kcal/day

Total energy needs:

REE x Activity Factor x Injury Factor
1349 x 1.5 x 1 = 2,023 kcal/day

I chose the Mifflin St-Jeor equation due to the fact that it is the most accurate for estimating caloric needs. I chose an activity factor of 1.5 due to the fact that she is walking for 30 minutes 4-5x per week thus she fits underneath the low activity factor range.

C. Intake Domain

9. *Using a computer dietary analysis program or food composition table, compare Mrs. Anderson's "usual" dietary intake to her prescribed diet (DASH/TLC diet).*

NUTRIENT	PATIENT INTAKE	Prescribed diet	COMPARISON	DISEASE IMPLICATIONS	Your diet recommendations
kcal	3388 kcal	2000 kcal	High	Obesity, HTN, metabolic syndrome	Decrease intake, consume nutrient dense foods
% kcal Pro	12%	15%	Slightly Low, adequate	Inadequate protein intake can lead to anemia	Keep consuming protein from

					healthy sources (lean meats)
% kcal CHO	45%	50-60%	Low	Hypertriglyceridemia, increase risk for CVD	Increase whole grains, decrease simple sugars
% kcal Fat	35%	25-35%	High	CVD	Consume wide variety of fats
%SFA	*12%*	*Less than 7%*	*High*	*CVD*	*Decrease butter, pastries, desserts, frostings and other SFA foods*
%MUFA	*4%*	*Up to 20%*	*Low*	*MUFA can decrease risk for atherosclerosis and CVD*	*Increase olive oils, nuts, olives, avocado*
%PUFA	*2%*	*Up to 10%*	*Low*	*PUFA can decrease risk for atherosclerosis and CVD*	*Increase vegetable oil, sunflower, soy bean, fish, corn*
Cholesterol	358 mg/day	< 200mg/day	High	CVD, Atherosclerosis	Lower intake of trans fatty foods, fried foods, fatty meats
Fiber	32 mg/day	20-30 g/day	High	Help lower cholesterol levels	Maintain
Na	4763 mg/day	2400mg	High	HTN, CVD	Reduce salt, restrict sodium containing foods
Ca	981 mg/day	1240mg	Low	Low amounts- Osteoporosis, High amounts- complications with kidney	Increase calcium, low-fat milk/dairy products
K	4822 mg/day	4700mg	High	HTN	N/A
Mg	361 mg/day	500mg	Low	CVD, HTN, diabetes, osteoporosis	Increase Mg rich foods: potatoes, leafy greens, bananas

10. **What nutrients in Mrs. Anderson's diet are of major concern to you?**
Nutrients that are of a major concern are consumption of fat (SFA, MUFA, and PUFA), cholesterol, Na, Ca, and Mg.

Mrs. Anderson's intake is extremely high in SFA and extremely low in MUFA and PUFA. A heart healthy diet is a diet high in MUFA and PUFA while low in SFA which is exactly opposite of Mrs. Anderson's.

Mrs. Anderson's intake is very high in sodium and cholesterol.

Mrs. Anderson's intake is considerably low in Mg.

11. **From the information gathered within the intake domain, list possible nutrition problems using the diagnostic term.**

Within the intak domain possible problems are:

Energy Balance:

- **Excessive Energy Intake**: She is consuming approximately 3390 kcal/day when her estimated caloric needs are only approximately 2020 kcal/day and her prescribed diet recommends 2000 kcal/day.

Nutrient:

- **Inappropriate Intake of Fats**: She is consuming the maximum amount of fat. Most fat in her diet is from SFA rather than MUFA and PUFA. Cholesterol intake 358mg/day compared to recommend <200mg/day.
- **Inadequate Mineral Intake:** Ca intake of 981mg/day compared to recommended 1240mg/day, Mg intake of 361 mg/day compared to recommended 500mg/day
- **Excessive Mineral Intake:** Na intake of 4763 mg/day compared to recommended 2400mg/day

D. Clinical Domain

12. Dr. Thornton ordered the following labs: fasting glucose, cholesterol, triglycerides, and creatinine. He also ordered an EKG. In the following table, outline the indication for these tests (tests provide information related to a disease or condition).

Parameter	Normal Value	Patient's Value	Reason for Abnormality	Your diet recommendations
Glucose	70-110	92	N/A	N/A
BUN	8-18	20	N/A	N/A
Creatinine	0.6-1.2	0.9	N/A	N/A
Total cholesterol	120-199	270 (H)	Diet high in SFA	Increase fiber (oats, barley, pectin rich fruits and veggies)
HDL-cholesterol	>55	30 (L)	High TG levels, BMI, Diet high in SFA/TFA/simple sugars	Increase exercise, obtain moderate fat diet
LDL-cholesterol	<130	210 (H)	Diet high in SFA/TFA and dietary cholesterol	Decrease SFA, TFA, and dietary cholesterol by increasing PUFA/MUFA, 2-3g plant sterols/stanols
Apo A	101-199	75 (L)	Low levels of HDL-c, impaired clearance of cholesterol from the body	Increase HDL-c levels by increasing MUFA and PUFA while decreaseing SFA (moderate fat diet), increase exercise
Apo B	60-126	140 (H)	High TG/LDL-c and low HDL-c	Moderate fat diet, reduce simple CHO by choosing whole-grains.

Parameter	Normal Value	Patient's Value	Reason for Abnormality	Your diet recommendations
Triglycerides	35-135	150 (H)	High consumption of simple sugars and refined CHO's	Reduce simple sugars consumed, choose whole-wheat grains when possible

**MUFA can be increased through consumption of nuts, olive oils, nut oils, peanuts, avocado, canola oil, olives, ect.
**PUFA can be increased through vegetable oil, soybean, corn, sunflower, ect.
**SFA can be reduced through limiting butter, pastries, whole milk, med fat meats, ect.

13. *Interpret Mrs. Anderson's risk of CHD (congenital heart disease) based on her lipid profile.*

Some modifiable risk factors for CHD which can be seen through a lipid profile are a high LDL-c, low HDL-c, high triglycerides, and inflammatory markers (CRP). After interpreting Mrs. Anderson's chart her risk for CHD is very high. Her chart shows 3 out of the 4 (LDL-c high, HDL-c low, and TG high) markers which increase an individuals risk for CHD.

14. *Indicate the pharmacological differences among the antihypertensive agents listed below.*

Medications	Mechanism of Action	Potential food-drug interactions
Diuretics	Help eliminate water, sodium, and chloride from the body	Take on empty stomach or with milk to decrease upset stomach. Could cause loss of K, Ca, and Mg.
Beta-blockers	Decrease nerve impulses to blood vessels	Take in consistent manner with in relation to food consumption to prevent fluctuation in bioavailability. Some may need to be taken separately from orange juice. Avoid alcohol due to lowering of BP.
Calcium-channel blockers	Receptor antagonists that block AT_1 receptors on blood vessels and other tissues such as the heart	Should typically be taken before meals.
ACE inhibitors	Slow/inhibit the enzyme ACE to decrease production of angiotesin II so blood vessels can enlarge and dilate to reduce HTN. (To relax blood vessels)	Some must be taken on an empty stomach (i.e. catropil/CAPOTEN). High fat meals decrease absorption of quinapril/ACCUPRIL. Take others without regards to food. Ensure adequate fluid intake. Avoid salt substitutes.
Angiotensin II receptor blockers	Antagonize the binding of angiotestin II to the AT1 receptor resulting in the relaxation of vascular smooth muscle	Avoid moderate to high dietary intake of K and salt substitutes to avoid hyperkalimia.
Alpha-adrenergic blockers	Block the alpha$_1$-receptors of vascular smooth muscle, prevent the uptake of catecholamines by the smooth muscle cells causing vasodilation and allows blood to flow more easily	Food can inhibit or delay absorption. Typically consume ½ hr after the same meal every day.

15. *What are the most common nutritional implications of taking hydrochlorothiazide?*

The most common nutrition implication of taking hydrochlorothiazide are thirst and muscle cramps, low potassium, constipation, and renal failure or compromise.

16. **Mrs. Anderson's physician has decided to prescribe an ACE inhibitor and an HMGCoA reductase inhibitor (Zocor). What changes can be expected in her lipid profile as a result of taking these medications?**

HMGCoA reductase inhibitor: lowers cholesterol and reduce production of LDL-c. Therefore, I expect her cholesterol to be lower and LDL-c lower in her next lipid profile. ACE inhibitor: To relax and enlarge blood vessels to reduce BP. In her next profile, BP should be lower.

17. **From the information gathered within the clinical domain, list possible nutrition problems using the diagnostic term.**

Within the Clinical domain, possible nutrition problems are:

Weight

- **Overweight/obesity:** BMI > 25 (overweight), increase weight gain 28%, overconsumption of high-fat and/or calorie dense food or beverages, estimated excessive energy intake, unwillingness or disinterest to apply nutrition-related recommendations

E. **Behavioral–Environmental Domain**

18. **What are some possible barriers to compliance? Within this domain, list possible nutrition problems.**

Possible barriers consist of Mrs. Anderson's inability to enjoy food without salt, she works inside the home where food is constantly available. Additionally, Mrs. Anderson is eating out every Friday and Saturday night with her husband. Typically, eating out provides large portions and hidden ingredients could be in her meals. Furthermore, on nights which Mrs. Anderson attends bingo she doesn't eat dinner and snacks all day. Snacks she consumes typically increase the amount of SFA and TFA's consumed in her diet.

Within this domain, possible nutrition problems consist of:
Knowledge and belief:
- **Not being ready for a diet/lifestyle change**: even though she has began walking she was not able to reduce and limit the amount of salt in her diet due to the fact that food does not taste good without it. Additionally, she was given a sheet which provided a list of foods to avoid for a 4g Na (no salt added) diet but her and her husband abandoned the effort because food tasted too bland.
- **Disordered eating pattern**: Nights which she attends bingo she skips eating dinner and snacks throughout bingo as well as at home after bingo.
- **Undesirable food choices**: Mrs. Anderson does not like food which benefits her health. Food tastes too bland and has resulted in her not even attempting to eat the foods recommended.

Physical Activity and Function:
- **Inability or lack of desire to manage self-care**: Even though Mrs. Anderson says she wants to control her high blood pressure the only change she has been willing to make is adding light exercise 4-5x a week. Her inability to try and eat the recommended low sodium foods is greatly affecting her health.

IV. Nutrition Diagnosis

19. Select two KEY nutrition problems and complete the PES statement for each.

PES #1: Not ready for a diet/lifestyle change related to disinterest in learning/applying information and lack of self-efficacy for making change as evidence by lack of efficacy to make change or to overcome barriers to change and previous failure to effectively change target behavior, neglecting previous diet and food recommendations, cholesterol 270 (H), HDL-c 30 (L), LDL-c 210 (H), BMI 26, BP 160/100.

PES #2: Inappropriate intake of fat related to changed in taste, appetite, and preference as evidence by cholesterol 270 (H), LDL-c 210 (H), HDL-c 30 (L), TG 150 (H), frequent consumption of SFA, cholesterol, estimated intake of MUFA 4%/PUFA 2% in comparison to recommended MUFA up to 20%/PUFA up to 10%, increase weight gain 28% and mother passing away due to heart attack.

V. Nutrition Intervention

20. When you ask Mrs. Anderson how much weight she would like to lose, she tells you she would like to weigh 125, which is what she weighed most of her adult life. Is this reasonable? What would you suggest as a goal for weight loss for Mrs. Anderson?

Hawaii Equation:
IBW = 100 + 5(6) = 130

Although Mrs. Anderson weight 125 since she weight that most of her adult life this is not an idealistic weight for her anymore. She is 54 now and her ideal body weight using the Hawaii Equation is 130lbs. Additionally, in order to have a healthy weight loss which she will be able to maintain she should only lose 10% of her body weight in 6 months. Therefore, she should only lose approximately 16 pounds resulting in a weight of 144 within the next 6 months.

Goal: 16# weight loss in 6 months to weight 144.

21. How quickly should Mrs. Anderson lose this weight?

Mrs. Anderson should lose the weight in approximately 6 months. This results in losing about 1.5# per week. (1-2 on average)

22. Write Nutrition Prescription for patient. Include Diet type, kcal level, % kcal from CHO, PRO, FAT, Saturated fat, cholesterol, Na.

Rx: Therapeutic Diet, 1500 kcal, 55% CHO, 15% PRO, 30% FAT, <7% Saturate fat, <200mg/day cholesterol, 4200mg/day Na.

23. *For each of the PES statements that you have written, establish an ideal goal (based on the signs and symptoms) and an appropriate intervention (based on the etiology). Use IDNT manual to label Intervention domains and subclasses; and give details of exactly what you are going to do.*

PES #1

o **Goal**: My goal is to increase Mrs. Anderson's confidence in her ability to adopt recommended behaviors. Overally, I would like to see Mrs. Anderson enjoy foods with less salt, preferably no added salt and to help her apply dietary changes which will benefit her health.

o **Intervention**:

Domain: Nutrition Counseling, Subclass: Theoretical Basis/Approach

-I am choosing this subclass due to the fact that the etiology of her diagnosis is disinterest in learning/applying information and lack of self-efficacy for making change while her signs and symptoms are previous failure to effectively change target behavior.

Domain: Nutrition Counseling, Subclass: Strategies/Goal setting

-I am choosing this subclass due to the fact that the etiology of her diagnosis is lack of efficacy to make changes or to overcome barriers to change while her signs and symptoms are previous failures to effectively change target behavior.

I plan through counseling and motivational interviewing she will be able to achieve the goal of not adding salt to her foods in order to lower her blood pressure. I plan to work with her to decide and set goals which are achievable to her. For instance, an appropriate goal would be to not add salt to 1 meal/day for x amount of time.

PES #2

o **Goal**: Decrease Mrs. Anderson's intake of saturated fat.

o **Intervention**:

Domain: Food and/or Nutrient Delivery, Subclass: Modify distribution, type, or amount of food and nutrients within meals or at specific time.

-I am choosing this subclass due to her diagnosis of excessive fat intake and her signs and symptoms of cholesterol 270, increase weight gain 28%.

-My plan is to have her decrease the amount of saturated fat in her diet by increase monounsaturated fatty acids as well as polyunsaturated fatty acids. Reduction of foods such as butter and desserts with increased food such as peanuts, oats, ect.

VI. Nutrition Monitoring and Evaluation

24. *Evaluate Mrs. Anderson's labs at 3 months and then at 6 months. Have the biochemical goals been met with the current regimen?*

	3 months	6 months
Glucose	Still within range	Still within range
BUN	Within range	High
Creatine	Still within range but increased slightly from initial	Still within range, same as 3 mo

Cholesterol	Decreased from 270 (H) to 230(H)	Decreased from 230 (H) to 210 (H)
HDL-c	Increased from 30 (L) to 35 (L)	Increased from 35 (L) to 38 (L)
LDL	Decreased from 210 (H) to 169 (H)	Decreased from 169 (H) to 147 (H)
Apo A	Increased from 75 (L) to 100 (L)	Increased from 100 (L) to 110 (normal)
Apo B	Decreased from 140(H) to 120 (normal)	Decreased from 120 to 115 (normal)
TG	Decreased from 150 (H) to 130 (normal range)	Decreased from 130 to 125 (still normal)

Nutritional Assessment
11/17/11, 14:00

A: 54 yo female, Ht: 5'6", Wt: 160, BMI 26. Pt diagnosed with HTN 1 yr ago. Smoked 2pack/day for 30 yrs, quit 1 yr ago. Family member (mother) died due to heart attack caused by HTN. Pt reports adding salt to meals, walks 4-5 times per week but sometimes doesn't due to other social events. Increase weight 28% of UBW. BP 160/100 (H) Cholesterol 270mg/day (H), LDL-c 210 (H), HDL-c 30 (L), TG 150 (H). 24 hr-recall reveals intake of 3388 kcal, 380g CHO, 101g PRO, 169g FAT.

Lab Values:
Cholesterol 270 (H) - increased risk for CVD, Atherosclerosis
LDL-c 210 (H) – Increase risk for CHD
HDL-c 30 (L) – Increased risk for CHD
TG 150 (H) –Increase risk for CHD

D:
PES #1: Not ready for a diet/lifestyle change related to disinterest in learning/applying information and lack of self-efficacy for making change as evidence by lack of efficacy to make change or to overcome barriers to change and previous failure to effectively change target behavior, neglecting previous diet and food recommendations, cholesterol 270 (H), HDL-c 30 (L), LDL-c 210 (H), BMI 26, BP 160/100.

PES #2: Inappropriate intake of fat related to changed in taste, appetite, and preference as evidence by cholesterol 270 (H), LDL-c 210 (H), HDL-c 30 (L), TG 150 (H), frequent consumption of SFA, cholesterol, estimated intake of MUFA 4%/PUFA 2% in comparison to recommended MUFA up to 20%/PUFA up to 10%, increase weight gain 28% and mother passing away due to heart attack.

I: Nutrition Rx: Rx: Therapeutic Diet, 1500 kcal, 55% (206g) CHO, 15% (56g) PRO, 30% (50g) FAT, <7% Saturated fat, <200mg/day cholesterol, 4200mg/day Na.
Food and/or Nutrient Delivery: Modify distribution, type, or amount of food and nutrients within meals or at specific time.
Nutrition Counseling: Theoretical Basis/Approach and Strategies/Goal setting to increase confidence in ability to adopt recommended behaviors.

M/E:
1. Check weight at visits
Goal: Weight loss of 1-2 lbs/week
Overall goal: Weight loss of 16 lbs in 6 months

2. Monitor % SFA, %MUFA, %PUFA
Goal: SFA < 7%, MUFA up to 20%, PUFA up to 10%
3. Monitor Cholesterol levels
Goal: <200mg/day

4. Monitor Na Intake:
Goal: =/< 4200mg/day

5.Monitor Blood Pressure
Goal: <140/80

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