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## What Do Resident Physicians Know about Nutrition? An Evaluation of Attitudes, Self-Perceived Proficiency and Knowledge

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### Abstract

**Objective**—Despite the increased emphasis on obesity and diet-related diseases, nutrition education remains lacking in many internal medicine training programs. We evaluated the attitudes, self-perceived proficiency, and knowledge related to clinical nutrition among a cohort of internal medicine interns.

**Methods**—Nutrition attitudes and self-perceived proficiency were measured using previously validated questionnaires. Knowledge was assessed with a multiple-choice quiz. Subjects were asked whether they had prior nutrition training.

**Results**—Of the 114 participants, 61 (54%) completed the survey. Although 77% agreed that nutrition assessment should be included in routine primary care visits, and 94% agreed that it was their obligation to discuss nutrition with patients, only 14% felt physicians were adequately trained to provide nutrition counseling. There was no correlation among attitudes, self-perceived proficiency, or knowledge. Interns previously exposed to nutrition education reported more negative attitudes toward physician self-efficacy ( $p = 0.03$ ).

**Conclusions**—Internal medicine interns' perceive nutrition counseling as a priority, but lack the confidence and knowledge to effectively provide adequate nutrition education.

### INTRODUCTION

The most recent NHANES data released in April 2006 revealed that approximately two-thirds of US adults are over-weight or obese, with significant increases in the prevalence of obesity among men, children and adolescents [1]. Obesity-related diseases including diabetes, coronary artery disease, stroke, hypertension, and certain cancers are among the leading causes of death in the US [2,3]. Given its' epidemic proportions, obesity has emerged as one of our nation's most important public health challenges. More and more, the primary care provider is expected to be a key player in tackling this battle, especially given data suggesting that

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patients consider physicians to be one of the most credible sources of nutrition information [4]. However, less than half of primary care physicians routinely discuss weight loss with obese patients or provide dietary counseling [4,5]. Why? Although lack of time and lack of patient compliance are the most commonly perceived barriers, 67% of physicians report lack of training in counseling skills and 62% report deficits of knowledge about nutrition as major barriers [4]. Physicians do, however, hold positive views about the importance of nutrition [4,6]. The need for nutrition education for physicians, therefore, has never been more urgent.

Within recent years, nutrition has emerged as an important topic in medical education. In 1997, the National Heart, Lung, and Blood Institute created the Nutrition Academic Award (NAA) in an effort to develop innovative strategies for nutrition education for medical students. Twenty-one medical schools have been recipients of the award since that time [7]. Although more material on nutrition has been integrated into medical school curricula since the inception of the NAA, 51.1% of US medical school graduates in 2005 (compared to 64.4% in 1998) still reported that they received inadequate nutrition education during their undergraduate medical training [8]. Although fewer studies are available, it appears that training in nutrition during residency is even more deficient [9]. This trend is concerning, as medical students' interest and enthusiasm in nutrition education has been found to wane rapidly in the absence of reinforcement from their clinical house staff and faculty mentors, who also feel inadequate in their own nutrition knowledge and counseling skills [4,10].

To guide the design of an effective nutrition curriculum for residents, we performed a targeted needs assessment to determine the attitudes, self-perceived proficiency, and knowledge related to nutrition and obesity among internal medicine interns. Although prior studies have reported on the relationship between nutrition attitudes and knowledge [11-13], results have been equivocal and there are no studies examining the correlations among attitudes, self-perceived proficiency, and knowledge. This study seeks to further elucidate these relationships.

## METHODS

### Subjects

We anonymously surveyed 114 internal medicine interns (64 incoming interns and 50 current interns) from a university-based internal medicine training program to evaluate their attitudes, self-perceived proficiency, and knowledge about clinical nutrition.

### Survey Instrument and Administration

The survey instrument was a 111-item close-ended questionnaire (see online Appendix at [www.jacn.org](http://www.jacn.org)). Nutritional attitudes were assessed using the previously validated Nutrition In Patient care Survey (NIPS) [14]. A validated survey developed by Mihalyuk [15] was used to evaluate self-perceived proficiency in nutrition. Possible responses ranged from "strongly disagree" to "strongly agree" on a five-point Likert scale. Previous factor analysis by the above authors identified ten attitudinal and self-perceived proficiency subscales, including 1) nutrition in routine patient care, 2) clinical behavior, 3) physician-patient relationship, 4) patient behavior/motivation, 5) physician efficacy, 6) nutrition and prevention/wellness, 7) macronutrients and health, 8) women, infants and children, 9) micronutrients in health, and 10) nutrition and disease management. As no previously validated nutrition knowledge tests have been developed, questions selected from a standardized nutrition textbook were used on the basis of face validity [16]. Nutrition knowledge was assessed by calculating the percentage of correct responses to 40 multiple-choice questions.

Current interns were asked to complete the survey during a seminar at the end of their first year of residency, while incoming interns completed the survey during orientation. Administration

occurred in June 2005. The survey was anonymous and all data was de-identified. The study was approved by the New York University School of Medicine Institutional Review Board on Human Subjects Research.

### Statistical Analysis

Analyses were conducted using Statistical Analysis System software (version 9.0; SAS Institute, Cary, NC). Missing data were excluded and all data entries were double-checked for errors. The  $\chi^2$  test was used to assess differences in baseline categorical characteristics between incoming and current interns. The 2-sample *t*-test or Wilcoxon rank sum test was carried out to compare mean attitudes, self-perceived proficiency, and knowledge scores among different training years and prior exposure to nutrition education. We also computed Pearson's correlation coefficient to assess the association of interns' attitudes, self-perceived proficiencies, and knowledge. All statistics were performed using a 2-sided test and a p-value <0.05 was considered statistically significant.

## RESULTS

Of the 64 incoming interns and 50 current interns, 61 (54%) completed the survey. The characteristics of the sample are provided in Table 1. Because no differences in responses (to attitudinal, self-perceived proficiency, and knowledge questions) were found by training level, all surveyed variables are reported for the group overall. Sixty-two percent of interns had prior nutrition exposure, defined as either having completed undergraduate or graduate coursework in nutrition, reported nutrition education in medical school, or attended a Nutrition Academic Award medical school (16%). Although most medical schools offered a nutrition elective, only 3% of our subjects participated.

### Nutrition Knowledge Test

The average correct score on the knowledge quiz was 66%. Mean knowledge scores for individual topics are provided in Table 2. Knowledge was particularly lacking in the areas of nutrition assessment and obesity, endocrine disease, and cardiovascular nutrition. For example, only half (54%) knew the correct answer to the question "How many calories are in a gram of protein?"

### Nutritional Attitudes and Self-Perceived Proficiency

Seventy-seven percent of interns agreed or strongly agreed that nutrition assessment should be included in routine primary care visits and 94% agreed or strongly agreed that it was their obligation to discuss nutrition with patients. Most (92%) agreed or strongly agreed that specific advice about how to make dietary changes could help some patients improve their eating habits. However, 86% agreed or strongly agreed that most physicians are not trained to discuss nutritional issues with patients.

Despite having positive attitudes about nutritional assessment and counseling, interns did not feel proficient in their ability to provide adequate counseling. Even when stratified by prior nutrition education, no significant differences were noted between groups. Most respondents felt particularly inadequate in their ability to counsel patients on serving sizes and food labels, vitamin/mineral supplementation, and HIV nutrition. Only 35% of interns agreed or strongly agreed that they felt knowledgeable about the role of omega-3 and omega-6 fatty acids in heart health. Less than half (46%) of respondents felt comfortable calculating BMI and waist-to-hip ratio. Slightly more (58%) interns felt knowledgeable about the role of dietary cholesterol and saturated fat in elevating blood lipids. In contrast, 89% of respondents expressed proficiency in discussing the benefits of exercise with patients.

### Associations between Measures

There was no correlation among knowledge, attitudes, and self-perceived proficiency in nutrition. Prior training in nutrition was not associated with a difference in knowledge or attitude items. However, interns who had prior exposure to nutrition education reported more negative attitudes overall about physician self-efficacy ( $p = 0.03$ ). In particular, interns with prior nutrition education were more negative about the utility of counseling on increasing patients' compliance with nutritional recommendations. Questions relating to physician efficacy are provided in Table 3.

## DISCUSSION

We used previously validated questionnaires and a multiple-choice quiz to examine the attitudes, self-perceived proficiency, and nutrition knowledge of internal medicine interns. Consistent with prior studies [11,12,17], interns answered only 66% of knowledge questions correctly overall. They performed best on general nutrition knowledge and worse on specific nutrition interventions. There were notable deficits in knowledge of nutrition assessment and obesity, endocrine nutrition, and cardiovascular nutrition.

Self-perceived proficiency was also low; fewer than one-third of participants were confident in their ability to assess the nutritional status of patients or to discuss general nutritional issues. However, they did feel proficient in more general lifestyle topics, such as counseling patients on the benefits of exercise and the impact of alcohol consumption on health and disease. Similar findings were reported by Mihalnyuk [15]. Proficiency scores were significantly lower for specific topics as opposed to general nutrition. For example, only 46% of interns felt proficient in calculating BMI and waist-hip ratios and 33% were confident in their ability to analyze food labels.

We found that prior nutrition education was associated with more negative attitudes about the utility of nutrition interventions among residents who are likely several years removed from their nutrition coursework, given that nutrition is typically integrated into the pre-clinical curriculum of medical education [18]. Similarly negative views about physician efficacy were reported in a study by Tobin et al., in which the Nutrition In Patient care Survey (NIPS) was administered to all medical students at Mercer University School as a baseline measure prior to the development of a horizontal and vertical nutrition curriculum. Prior exposure to nutrition was presumably minimal [19]. And while multiple studies of the immediate impact of nutrition interventions among medical students found improvements in knowledge, confidence, and self efficacy [20,21], our work, similar to others [22], suggests there may be a deterioration of these gains and raises questions about the optimal timing of nutrition education and its' integration into the medical education curriculum.

Medical students may not grasp the clinical relevance of nutrition when it is placed within the preclinical years. As an alternative, nutrition education has been incorporated into all four years of medical education at a number of institutions [23,24]. Preliminary evaluation of this approach suggests that students became knowledgeable about nutrition and were better able to address the nutritional needs of their patients than their counterparts in a traditional curriculum [24]. Further study is needed to determine whether restructuring nutrition education will be associated with a more positive attitude toward its clinical utility.

We suggest that resident physicians' knowledge and counseling skills can be enhanced by a shift in the timing of nutrition education, with an emphasis during the clinical clerk-ships in medical school and throughout postgraduate training. Given the trend towards office-based nutrition intervention [25], the ambulatory care rotation may be a particularly opportune time to integrate nutrition into curricula. Medical students and residents have significantly more

contact with patients during these times, maximizing opportunities to practice and further develop nutrition skills. In an effort to standardize nutrition education for residency programs, the Society of Teachers of Family Medicine's Group on Nutrition (GON) created The Physicians' Curriculum in Clinical Nutrition [26]. This monograph, most recently updated in 2005, emphasizes the integration of nutrition education into patient care activities in both the inpatient and outpatient settings and provides specific strategies for incorporating nutrition education into residency curricula. Core educational guidelines applicable to primary care providers are also included.

Several studies have shown that the presence of a physician nutrition specialist (PNS) is another important factor for effective nutrition training for physicians [27-29]. Lazarus et al. studied the impact of a nutrition education program provided by a physician nutrition specialist in a family practice residency program and found significant increases in the nutrition knowledge of resident physicians. Patients were also found to be more knowledgeable and more compliant with nutrition recommendations [30,31]. Kirby similarly found improvements in nutrition knowledge after an intervention by a physician nutrition specialist in a family practice residency program [32]. Given these findings, a 1995 report by the American Society for Clinical Nutrition recommended that each major medical center employ a full time faculty member with expertise in nutrition who can serve as a role model in incorporating nutrition into patient care and can advocate for change in medical school and residency curricula [33]. Further study is needed to identify effective methods of incorporating nutrition into the medical curriculum.

Our study has several limitations. Our results may not be generalizable to other populations of interns or residents, as all participants in our study were internal medicine interns at a single institution, the majority of whom were from medical schools within the New York metropolitan area, and few had attended schools that were recipients of the Nutrition Academic Award. Just over half of the eligible study population completed our questionnaire, perhaps introducing selection bias. Most of the non-responders were from the incoming intern class, to whom surveys were handed out during their busy orientation. Many of the interns may not have had time or may have felt too overwhelmed to complete the questionnaire. However, because completion of the survey was voluntary, we believe that those interns with more positive attitudes and experiences in nutrition completed the questionnaire, thereby making our estimates conservative with regard to lack of confidence and knowledge toward clinical nutrition. The knowledge quiz came from a standard nutrition textbook but was not validated, and test fatigue due to the length of the questionnaire may have led to lower overall scores. Finally, we cannot determine whether the differences in attitudes, self-perceived proficiency, and knowledge were correlated with self-reported differences in clinical practice.

Despite these drawbacks, our survey corroborated previous findings of significant deficits in medical nutrition education, with low scores in knowledge and self-perceived proficiency regardless of prior coursework (and perhaps because of it), providing a guide for curriculum development. As our study shows, our current system of nutrition education falls short of its goals, and education efforts must address not only knowledge gaps and effective clinical skills, but perhaps more importantly must create a reason for residents to remain optimistic and empowered regarding the utility of addressing their patients' nutritional issues in practice. Further study is needed to determine how to best accomplish this as we face our rising epidemic of poor nutrition and obesity.

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### APPENDIX

#### Nutrition Questionnaire

- 1. Have you had any prior coursework in nutrition (undergraduate classes, nutrition major in college, masters in nutrition, etc)? Have you had any relevant professional training (ie.completing a dietetic internship)? Please specify.

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- 2. Do you remember having any nutrition education during medical school? (Either a separate nutrition course or lectures on selected topics, or nutrition concepts integrated into your coursework) Y N
- 3. Was there an elective course offered in nutrition? Y N  
If yes, did you take the nutrition elective? Y N
- 4. Did you attend one of the following medical schools (recipients of the Nutrition Academic Award)? Y N  
Albert Einstein, Brown University, Columbia University, Harvard University, Mercer University, Northwestern University, Tufts University, Stanford University, University of Alabama, University of Arkansas, University of Colorado, University of Iowa, University of Maryland, University of Nevada, University of Pennsylvania, University of Rochester, University of Texas/Houston, University of Texas Southwestern Medical Center, University of Vermont, University of Washington, University of Wisconsin
- 5. Do you or any close family members have any medical problems that requires greater than average attention to nutrition (ie, diabetes, IBS, etc)? Y N  
Please specify.

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**Please circle your response to the following questions using the scale below.**

1 = strongly disagree	4 = agree
2 = disagree	5 = strongly agree
3 = uncertain	

- 6. A change towards a healthier lifestyle is important in any stage of life. 1 2 3 4 5
- 7. Nutrition assessment and counseling should be included in any routine appointment, just like diagnosis and treatment. 1 2 3 4 5
- 8. I have an obligation to improve the health of my patients including discussing nutrition with them. 1 2 3 4 5



9. Patients will rarely change their behavior if they do NOT have active symptoms of a disease.	1	2	3	4	5
10. Patients need specific instructions about how to change their eating behavior.	1	2	3	4	5
11. All physicians, regardless of specialty, should counsel high-risk patients about dietary change.	1	2	3	4	5
12. Most obese patients want to lose weight but feel frustrated and confused about how to do it.	1	2	3	4	5
13. Patients need good tasting alternatives in order to change their eating patterns.	1	2	3	4	5
14. Nutrition counseling should be part of routine care by all physicians, regardless of specialty.	1	2	3	4	5
15. Most physicians are NOT adequately trained to discuss nutrition issues with patients.	1	2	3	4	5
16. Specific advice about how to make dietary changes could help some patients improve their eating habits.	1	2	3	4	5
17. After receiving nutrition counseling, patients with poor eating patterns will make major changes in their eating behavior.	1	2	3	4	5
18. Patients need ongoing counseling following my initial instruction to maintain behavior changes consistent with a healthier diet.	1	2	3	4	5
19. Patients will only change their eating patterns if faced with a significant health problem (ie. a heart attack.)	1	2	3	4	5
20. Most patients will try to change their lifestyle if I advise them to do so.	1	2	3	4	5
21. Physicians can have an effect on a patient's dietary behavior if they take the time to discuss the problem.	1	2	3	4	5
22. Patient motivation is essential to achieving dietary change.	1	2	3	4	5
23. My patient education efforts will be effective in increasing patients' compliance with nutrition recommendations.	1	2	3	4	5
24. Nutrition counseling is <b>NOT</b> an effective use of my time.	1	2	3	4	5
25. Individual physicians can have <b>LITTLE</b> impact on a patient's ability to lose weight.	1	2	3	4	5
26. It is <b>NOT</b> worth my time to counsel patients with poor dietary patterns about nutrition.	1	2	3	4	5
27. For most patients, health education does <b>LITTLE</b> to promote adherence to a healthy lifestyle.	1	2	3	4	5
28. Preventive health care is <b>BORING</b> .	1	2	3	4	5
29. Patients are <b>NOT</b> motivated to change unless they are sick.	1	2	3	4	5
30. After receiving nutrition counseling, patients with poor eating patterns will make moderate changes in their eating behavior.	1	2	3	4	5
31. I feel comfortable with my ability to discuss strategies for osteoporosis prevention and treatment, including nutrition and lifestyle.	1	2	3	4	5
32. I feel comfortable providing nutrition education for a patient recently diagnosed with HIV.	1	2	3	4	5
33. I feel comfortable in assessing the total calories and saturated fat per portion of food by using the food label.	1	2	3	4	5
34. I know how many calories are in a gram of fat, protein, and carbohydrate and their basic metabolic roles.	1	2	3	4	5
35. I am comfortable discussing the overall benefits of exercise on health and well-being.	1	2	3	4	5
36. I feel comfortable assessing fluid needs based on activity level and health.	1	2	3	4	5
37. I know how to calculate body mass index (BMI) and waist-to-hip ratio based on gender.	1	2	3	4	5
38. I am knowledgeable about indications for use of single vitamins (ie: B, C, E) or multivitamin supplements.	1	2	3	4	5
39. I am knowledgeable about the role of omega-3 and omega-6 fatty acids in heart health.	1	2	3	4	5
40. I am knowledgeable about the nutrition concerns of patients with GI intolerances, maldigestion, or malabsorption.	1	2	3	4	5
41. I am knowledgeable about the reported health risks of high protein/high fat diets, such as the Atkins diet.	1	2	3	4	5
42. I am knowledgeable about the role of genetics, diet, and pharmacology (Orlistat, Sibutramine) in weight loss regimens.	1	2	3	4	5
43. I am comfortable providing examples of serving sizes of meat or dairy from the Food Guide Pyramid.	1	2	3	4	5
44. I am knowledgeable about the role of food constituents in health (phytonutrients, dietary fiber, soy, etc.)	1	2	3	4	5
45. I am knowledgeable about the potentially harmful interactions of medication with herbal or botanical supplements.	1	2	3	4	5
46. I am knowledgeable about the definition of moderate alcohol consumption and its role in health and disease.	1	2	3	4	5
47. I am comfortable providing nutrition strategies for patients losing weight due to chronic illness.	1	2	3	4	5
48. I am knowledgeable about recognizing warning signs and symptoms of patients with eating disorders.	1	2	3	4	5
49. I am knowledgeable about indications for enteral and parenteral nutrition.	1	2	3	4	5
50. I am knowledgeable about the role of dietary cholesterol and saturated fat in elevating blood lipids.	1	2	3	4	5

- |   |   |   |   |   |   |
|---|---|---|---|---|---|
| 51. I am comfortable recommending dietary patterns for patients with non-insulin dependent (Type 2) diabetes. | 1 | 2 | 3 | 4 | 5 |
| 52. I am comfortable with recognizing nutrition risk in elderly patients.                                     | 1 | 2 | 3 | 4 | 5 |

**It is important that I:****Circle yes or no**

- |  |   |   |
|--|---|---|
| 53. Address the importance of diet whenever I care for a patient.  | Y | N |
| 54. Assess each patient's intake of vitamin, mineral, and dietary supplements.   | Y | N |
| 55. Counsel patients regarding their use of supplements and emphasize when they are contraindicated.   | Y | N |
| 56. Whenever possible recommend dietary changes prior to initiating drug therapy.  | Y | N |
| 57. Assess each patient's fat, fiber, and fruit and vegetable intake as a preventive strategy.   | Y | N |
| 58. Encourage patients to ask diet-related questions and refer them for additional assistance when warranted.  | Y | N |
| 59. Identify risk factors in patients by assessing diet and energy balance.  | Y | N |
| 60. Request that patients bring a food record or perform another diet assessment measure when they come in for routine visits.   | Y | N |
| 61. Perform at least some level of nutrition assessment with every patient.  | Y | N |
| 62. Follow the National Cholesterol Education Program guidelines for prevention and treatment of high blood cholesterol, including advocating the Step I or Step II diet.      | Y | N |
| 63. Assess each patient's weight status in accordance with the national guidelines (NIH) on the identification, evaluation, and treatment of overweight and obesity in adults. | Y | N |
| 64. Refer patients with diet-related problems to registered dietitians or other qualified nutrition staff.   | Y | N |
| 65. Evaluate patients' alcohol intake as part of their overall nutrition status.   | Y | N |
| 66. Assess each patient's stage of change prior to initiating dietary intervention.  | Y | N |
| 67. Assess dietary sodium, potassium, and calcium intake especially among patients for high risk of hypertension, osteoporosis, and stroke.                                    | Y | N |
| 68. Refer diabetic patients for detailed dietary counseling.   | Y | N |
| 69. Advocate diet and activity balance to promote weight control   | Y | N |
| 70. Assess my patient's ability to read a food label.  | Y | N |
| 71. Advocate a diet for weight control.  | Y | N |

**Nutrition Quiz:****Circle the one best answer below**

72. SD is a 50 year old woman who wants to reduce her caloric intake enough to lose 1 pound per week. By how many calories must she reduce her intake each day to achieve her goal?
- 500 calories
  - 1000 calories
  - 2000 calories
  - 3500 calories
73. The body mass index (BMI) is a useful clinical tool for diagnosing obesity. At what BMI level can the diagnosis of obesity be made?
- BMI  $\geq 18$
  - BMI  $\geq 23$
  - BMI  $\geq 30$
  - None of the above
74. Energy is provided by the oxidation of dietary protein, fat, carbohydrate, and alcohol. How many calories are in a gram of protein?
- 3 calories
  - 4 calories
  - 7 calories
  - 9 calories
75. Metabolism of 150g carbohydrate, 20g fat, and 10g protein yields approximately how many kilocalories?
- 300 kcal
  - 550 kcal
  - 820 kcal
  - 1100 kcal
76. Which of the following medical conditions are associated with obesity?



- a) Diabetes
  - b) Cardiovascular disease
  - c) Osteoarthritis
  - d) **All of the above**
77. AM is a 54-year-old postmenopausal woman who wants to lose weight. She is 5'6" (168cm) and weighs 190lb (86.4kg). What is her BMI?
- a) BMI = 19kg/m<sup>2</sup>
  - b) BMI = 24kg/m<sup>2</sup>
  - c) **BMI = 31kg/m<sup>2</sup>**
  - d) BMI = 36kg/m<sup>2</sup>
78. What is the major reason why an individual will lose weight on Dr. Atkins New Diet Revolution Program?
- a) Carbohydrates stimulate appetite
  - b) Ketosis allows for the breakdown of fatty tissue
  - c) Protein and fat increase basal metabolic rate
  - d) **Calorie deficit (fewer total calories are eaten)**
79. JD is a 54 year old man who recently underwent cardiac bypass surgery. He comes to the preventive cardiology clinic for an evaluation. According to the National Cholesterol Education Program (NCEP) Step 1 Diet, what percent of his total calories should be coming from saturated fat?
- a) **<7% saturated fat**
  - b) 8–10% saturated fat
  - c) 15% saturated fat
  - d) <30% saturated fat
80. RJ is a 50 year old woman with one risk factor for heart disease. At what LDL cholesterol level should dietary therapy be initiated?
- a) 100 mg/dL
  - b) 130 mg/dL
  - c) **160 mg/dL**
  - d) 190 mg/dL
81. What dietary factor is most responsible for raising serum cholesterol level?
- a) Unsaturated fat
  - b) **Saturated fat**
  - c) Protein
  - d) Simple sugar
82. Listed below are data from four different patients. Which patient has metabolic syndrome according to the NCEP Guideline?
- a) A hypertensive, non-smoking male with HDL: 28mg/dL, triglycerides: 120mg/dL, fasting glucose: 90mg/dL, and waist circumference: 35in.
  - b) A normotensive, smoking female with an HDL: 40mg/dL, triglycerides: 100mg/dL, fasting glucose: 95mg/dL, and waist circumference: 32in.
  - c) **A normotensive, smoking female with an HDL: 35 mg/dL, triglycerides: 155mg/dL, fasting glucose: 90mg/dL, and waist circumference: 36in.**
  - d) A hypertensive, nonsmoking male with HDL: 50mg/dL, triglycerides: 160mg/dL, fasting glucose: 100mg/dL, and waist circumference: 35in.
83. Which of the following statements best describes the relationship between diet and blood pressure in certain individuals?
- a) High-potassium diets may contribute to raising blood pressure
  - b) Low-potassium diets may contribute to reducing blood pressure
  - c) Low-calcium diets may contribute to reducing blood pressure
  - d) **Low-calcium diets may contribute to raising blood pressure**
84. The Dietary Approaches to Stop Hypertension (DASH) sodium diet has been clinically shown to reduce blood pressure levels in moderately hypertensive patients. Which of the following medical nutrition therapies are recommended to reduce hypertension?
- a) Reduce dietary sodium intake
  - b) Increase dietary potassium and calcium intake
  - c) Moderate alcohol intake
  - d) **All of the above**
85. All of the following foods are major sources of monounsaturated fat EXCEPT:

- a) Olives  
**b) Tomatoes**  
 c) Nuts  
 d) Avocados
86. The Joint National Committee on Prevention, Detection, Evaluation, and Treatment of Blood Pressure (JNC VI) recommends limiting sodium intake to 2400mg per day for patients with hypertension. Which of the following foods would be considered low in sodium?  
 a) Canned tuna  
 b) Turkey salami  
**c) Fresh turkey breast**  
 d) Potato chips
87. Which of the following diseases may contribute to the development of hypertension?  
 a) Hepatic steatosis  
 b) Acute pancreatitis  
**c) Obesity**  
 d) None of the above
88. FG, a 31 year old, moderately obese woman, reports gastroesophageal reflux that occurs most often when she is sleeping. All of the following recommendations may help alleviate this condition EXCEPT:  
 a) Reducing alcohol and caffeine intake  
 b) Slightly elevating the head when sleeping  
**c) Increasing consumption of fatty foods**  
 d) Waiting at least 2 hours after eating to lie down
89. RF, a 62-year-old woman hospitalized with gastric cancer, undergoes gastric surgery (subtotal gastrectomy with gastrojejunostomy). Postoperatively, she complains of diarrhea, cramping, flushing after eating, dizziness, diaphoresis, and early satiety. What is the most likely diagnosis?  
 a) Gastritis  
 b) Gastroparesis  
**c) Dumping syndrome**  
 d) Lactose intolerance
90. RP, a 75-year-old man, presents to the Veterans Administration Medical Center with significant peripheral neuropathy. His past medical history is significant for a total gastrectomy performed when he was in his forties, after which he was never placed on vitamin supplements. He rarely drinks alcohol. RP's neuropathy is most likely secondary to malabsorption of which of the following vitamins?  
 a) Folate  
 b) Vitamin A  
 c) Pyridoxine (vitamin B6)  
**d) Vitamin B12**
91. TI is a 65-year-old with chronic liver disease and ascites. What dietary recommendation is appropriate for this patient?  
**a) Low-sodium diet**  
 b) High-protein diet  
 c) Low-fat diet  
 d) Low-fiber diet
92. Which of the following foods would be considered a good source of insoluble fiber?  
 a) White bread  
 b) Mashed potato  
**c) Raisin bran**  
 d) Watermelon
93. Individuals with celiac disease are advised to avoid foods containing rye, wheat, and barley because they are especially sensitive to which of the following proteins?  
 a) Albumin  
**b) Gluten**  
 c) Soy protein  
 d) Casein
94. Individuals with type 1 diabetes have been taught to avoid simple sugars for optimal glucose control. According to the American Diabetes Association, which statement is TRUE regarding simple sugars (sucrose)?

- a) Simple sugars do not need to be restricted because they do not cause a significant rise in postprandial blood glucose levels  
 b) Simple sugars can be consumed between meals  
 c) **Simple sugars can be consumed in moderation as part of the total daily carbohydrate intake**  
 d) Simple sugars should be restricted since they raise postprandial blood glucose significantly more than starches
95. TR is a 60-year-old woman with type 2 diabetes mellitus [height = 5'3" (1.58cm), weight = 155lb (70kg), body mass index (BMI) = 27.5 kg/m<sup>2</sup>]. TR questions her doctor about the benefits of exercise. Which statement is correct concerning her benefits of exercise for individuals with type 2 diabetes mellitus?  
 a) Exercise improves blood glucose levels by decreasing insulin sensitivity  
 b) **Exercise improves blood glucose levels by increasing peripheral glucose uptake**  
 c) Exercise may increase serum low-density lipoprotein (LDL) levels  
 d) Exercise cause ketone body production
96. What is considered an optimal hemoglobin A1C (HgbA1C) for patients with diabetes mellitus?  
 a) **HbA1C less than 7%**  
 b) HbA1C less than 8%  
 c) HbA1C less than 9%  
 d) None of the above
97. What is the target range for the premeal glucose values for nonpregnant adults with diabetes?  
 a) **90–130 mg/dL**  
 b) 100–140 mg/dL  
 c) 150–180 mg/dL  
 d) 180–200 mg/dL
98. SK, a 68-year-old man of Italian descent with a 5-year history of type 2 diabetes, is presently being treated by diet alone. He is 5'7" (170cm) tall and weighs 180lb (81.6kg). His BMI is 28kg/m<sup>2</sup>. Current laboratory data reveal a fasting blood glucose of 183mg/dL. SK loves olive oil and asks the doctor whether he may use it as much as he wants because it is high in monounsaturated fats. Considering his current status, which of the following responses is the best?  
 a) Olive oil may be consumed in unlimited amounts since it is cardioprotective  
 b) **Olive oil should be limited because it is calorically dense and may lead to weight gain**  
 c) Olive oil should be avoided because SK has diabetes  
 d) None of the responses is correct
99. One serving of carbohydrate is equivalent to how many grams of carbohydrate?  
 a) 5g  
 b) 10g  
 c) **15g**  
 d) 20g
100. The Diabetes Prevention Program, a national study comparing lifestyle to medication, demonstrated that lifestyle changes can have a significant impact on delaying or preventing the onset of type 2 diabetes. In this study how much weight loss was associated with improvement in glycemic control in patients with type 2 diabetes mellitus?  
 a) Less than 3% weight loss  
 b) **5% to 7% weight loss**  
 c) 10% to 15% weight loss  
 d) 20% weight loss
101. Individuals who are at increased risk for insulin resistance include which of the following?  
 a) Patients with a history of hypercholesterolemia  
 b) Patients with a "pear-shaped" body  
 c) **Patients with a first-degree relative with type 2 diabetes**  
 d) Patients with a first-degree relative with hypertension
102. Medical nutrition therapy for patients with obstructive sleep apnea syndrome (OSA) should focus on which of the following?  
 a) **Weight reduction**  
 b) Protein repletion  
 c) Vitamin and mineral deficiencies  
 d) Fluid repletion
103. Long-term prednisone treatment is often used after lung transplantation. Which of the following is a common complication of prednisone therapy that may require nutritional intervention?

- a) **Hyperglycemia**
  - b) Anorexia that may lead to weight loss
  - c) Hypoglycemia
  - d) Hyponatremia
104. A patient who is receiving mechanical ventilation for more than 7 days, whose gastrointestinal (GI) tract is functioning normally, should be fed in which of the following ways?
- a) Peripheral parenteral nutritional support
  - b) **Enteral nutrition support via a nasogastric tube**
  - c) Parenteral nutrition via a central line
  - d) It is not necessary to feed patients receiving respiratory support
105. The goal of medical nutrition therapy for patients with nephrolithiasis (kidney stones) is to eliminate the diet-related risk factors for stone formation. Which of the following recommendations is most critical for patients with a history of kidney stones?
- a) **Increasing fluid intake**
  - b) Increasing oxalate intake
  - c) Decreasing calcium intake
  - d) Decreasing magnesium intake
106. The glomerular filtration rate (GFR) is used to determine whether protein restriction should be initiated in patients with acute renal failure. At what GFR level should an ARF patient be prescribed a low protein diet?
- a) GFR > 60 mL/min
  - b) GFR > 30 mL/min
  - c) GFR > 20 mL/min
  - d) **GFR > 10 mL/min**
107. The kidney plays an essential role in metabolism of which of the following vitamins?
- a) Vitamin A
  - b) Vitamin B12
  - c) Vitamin B6
  - d) **Vitamin D**
108. GN is a 46-year-old woman receiving hemodialysis (HD). She is 5'3" (160cm) and weighs 110lb (50kg). Considering the GN is receiving HD three times per week, how much protein should be consuming daily?
- a) Less than 50g protein per day
  - b) **55-70g protein per day**
  - c) 75-90g protein per day
  - d) More than 90g protein per day
109. Many commercial foods are higher in sodium than consumers would expect. Which of the following foods have a high sodium content (>400mg per serving)?
- a) Tomato juice
  - b) Ham
  - c) Soy sauce
  - d) **All of the above**
110. SP is a 50-year-old man with CRF. SP's glomerular filtration rate (GFR) has begun to fall below 50mL per minute. Phosphorus is not being excreted normally, and its intake must be restricted. Medical nutrition therapy was suggested to improve his condition. Which of the following foods contains the highest amount of phosphorus?
- a) **Yogurt**
  - b) Apples
  - c) Bacon
  - d) Waffles
111. KJ is a 52-year-old man who is admitted to the hospital with chronic renal failure secondary to diabetic nephropathy. He complains of fatigue and weakness, and his blood pressure is elevated. Laboratory values indicated a serum potassium of 4.0mEq/L. Which of the following diets is most appropriate for KJ at this time?
- a) 2-3g sodium
  - b) No concentrated sweets
  - c) 2-3g potassium
  - d) **All of the above**

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Table 1

Characteristics of Respondents

Personal Characteristics	Current Interns (n = 37)	Incoming Interns (n = 24)	Combined Data (n = 61)
Prior coursework in nutrition (undergraduate classes, nutrition major in college, masters in nutrition)	7 (19%)	2 (8%)	9 (15%)
Nutrition education in medical school*	19 (51%)	19 (79%)	38 (62%)
Nutrition elective offered at your medical school?	10 (27%)	9 (38%)	19 (31%)
• If yes, did you take it?	1 (3%)	1 (4%)	2 (3%)
Attended Nutrition Academic Award medical school?	4 (11%)	6 (25%)	10 (16%)
Personal health problems related to nutrition (diabetes, IBS, etc)	15 (41%)	9 (38%)	24 (39%)

\* Denotes p < 0.05 (calculated using the  $\chi^2$  test).

**Table 2**

## Mean Knowledge Scores for Each Topic\*

<b>Nutrition Knowledge Topic</b>	<b>Mean % Correct n = 61</b>
Nutrition Assessment/Obesity (9 items)	62%
Endocrine Disease (6 items)	64%
Cardiovascular Disease (9 items)	58%
Gastrointestinal Disease (6 items)	83%
Renal Disease (7 items)	58%
Pulmonary Disease (3 items)	87%
All Topics (40 items)	66%

## Physician Efficacy Items

Question	Interns		P value
	WITH Prior Nutrition Exposure	WITHOUT Prior Nutrition Exposure	
Most patients will try to change their lifestyle if I advise them to do so	% Agree 19%	% Agree 26%	0.51
Physicians can have an effect on a patient's dietary behavior if they take the time to discuss the problem.	78%	87%	0.40
For most patients, health education does little to promote adherence to a healthy lifestyle. <sup>†</sup>	62%	65%	0.81
After receiving nutrition counseling, patient with poor habits will make major changes in their eating behavior.	16%	35%	0.09
My patient-education efforts will be effective in increasing patients' compliance with nutritional recommendations.	58%	87%	0.02
After receiving nutritional counseling, patients with poor eating habits will make moderate changes in their eating behavior.	49%	70%	0.11
Average percent agree for entire physician efficacy subscale	48%	62%	0.03

Response scale to each item: 1 = strongly disagree, 2 = disagree, 3 = uncertain, 4 = agree, 5 = strongly agree.

"Percent agree" was calculated by adding the number of respondents who answered 4 or 5.

P values were calculated using the  $\chi^2$  test.

<sup>†</sup>Reverse scored, 5 = 1, 4 = 2, 2 = 4, 1 = 5.