

# A Required Nutrition and Diet Therapy Course for Pharmacy Students

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## INTRODUCTION

Contemporary practice affords pharmacists a variety of opportunities to become involved in clinical nutrition. As the most accessible health professionals, community pharmacists are frequently called on to answer patient questions about nutrition. The public's desire for information on nutrition has increased as more relationships between disease and nutrition emerge. A more specialized area of practice is nutritional support pharmacy, with pharmacists providing a variety of specialized services to patients receiving parenteral and enteral nutrition in both inpatient and ambulatory settings. The specialized nature of these services was recognized in 1988 when the Board of Pharmaceutical Specialties acted favorably on a petition to make Nutritional Support Pharmacy a recognized pharmaceutical specialty.

In 1985, Mazur and colleagues expressed concern that nutrition education in most colleges of pharmacy had not kept pace with the knowledge level necessary for contemporary practice (1). Their conclusion was based on the results of a national survey that reported on the curricular content of 45 entry-level programs (five-

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year B.S. and six-year Pharm.D.) and 15 postbaccalaureate Pharm.D. programs. Of the 60 programs, 23 reported offering at least 1 course with a primary nutrition emphasis, but 75% of these courses were offered as electives. Researchers estimated that the typical entry-level program provided no more than four to ten lecture hours on nutrition-related topics. While the instructors surveyed thought that more lecture time should be devoted to nutrition, they generally indicated that their colleges had little interest in adding nutrition-related curricular content.

There are few reports in the literature about didactic courses for pharmacy students that are solely devoted to nutrition. Lasswell and colleagues reported on a nutrition course offered to fourth-year pharmacy students in a five-year baccalaureate program (2). A report by Muller described two courses that were offered to postbaccalaureate Pharm.D. students and Master of Science students in clinical pharmacy (3). The first course covered basic human nutrition, and the course that followed focused exclusively on total parenteral nutrition. Both papers described courses that were offered on an elective basis. In this report, we describe a required human nutrition course offered during the second professional year of an entry-level Pharm.D. curriculum.

### ***HISTORICAL OVERVIEW***

The present "Introduction to Nutrition and Diet Therapy" course was developed to provide students with an overview of the basic science and clinical principles of human nutrition. In planning for a required nutrition course, the College of Pharmacy assessed the nutrition courses available on the University of Nebraska Medical Center (UNMC) campus. When an acceptable course could not be identified, the college decided to revise and reinstitute a course that had previously been available to students as an elective but had not been offered for several years.

"Introduction to Nutrition and Diet Therapy" was first offered as a required course during the spring 1988 semester. This initial offering involved many faculty members from various disciplines at UNMC. Student evaluations indicated that the large number of faculty members resulted in a lack of coordination in the material pre-

sented and in presentation of conflicting information. When the course was offered in 1989, there was significant revision in the course and a reduction in the number of faculty teaching. A description of the revised course follows.

### ***COURSE DESCRIPTION***

“Introduction to Nutrition and Diet Therapy” for pharmacy students is a two-credit-hour, required course presented during the second semester of the second year of an entry-level Pharm.D. curriculum. Two faculty members, one from the pharmaceutical sciences department and one from the pharmacy practice department, serve as course coordinators and principal lecturers. In addition, five dietitians and two pharmacists with specialized expertise provide guest lectures to discuss nutrition therapy for specific clinical conditions. The course interrelates basic nutritional information on carbohydrates, proteins, lipids, vitamins, electrolytes, and trace elements. Dietary requirements and clinical applications are stressed.

The course is divided into five sections: (1) principles of metabolism and nutrition; (2) age, exercise, and nutritional assessment; (3) relationship of nutrition to selected disease states; (4) nutritional management in selected disease states; and (5) nutrition and the pharmacist. Table 1 is the schedule of lectures.

### ***EXPECTED COMPETENCIES FROM OTHER COURSES***

The nutrition course builds on the competencies students should have gained from other required courses in the curriculum; namely, biochemistry, physiology, and biopharmaceutics. The competencies expected from those courses are:

*Biochemistry:* Descriptive information about proteins/amino acids, carbohydrates, lipids, and vitamins (coenzymes); fundamental information about carbohydrate, lipid, and amino acid/protein metabolism; preferred fuels of individual tissues (e.g., brain, RBC, liver, skeletal muscle, kidney, cardiac muscle, intestine); effects of hormones and commonly encountered physiological stresses on metabolic processes (e.g., starvation, cold); integration and interre-

TABLE 1. Lecture Schedule and Topics

Lecture	Topic
<u>Principles of Metabolism and Nutrition</u>	
1	Introduction and Pretest
2	Nutritional Standards; Introduction to the Major Nutrients
3	Nutritional Aspects of Carbohydrates and Lipids
4	Nutritional Aspects of Amino Acids and Proteins
5	Metabolic Interrelationships of Carbohydrates, Lipids, and Proteins and Relationship to Nutrition
6	Energy Metabolism and Calculations of Caloric Requirements
7	Vitamins
8	Water and Electrolytes
9	Macro- and Microminerals: Part I (G)
10	Macro- and Microminerals: Part II (G)
<u>Age, Exercise, and Nutritional Assessment</u>	
11	Pregnancy and Lactation
12	Infants, Toddlers, Children, and Adolescents
13	The Elderly
14	Strenuous Exercise and Athletics (G)
15	Diabetes and Diet (G)
<u>Relationship of Nutrition to Selected Disease States</u>	
16	Food Allergies
17	Obesity and Weight Control (G)
18	Eating Disorders (G)
19	Influence of Nutrition on Cardiovascular Disease (G)
20	Relation of Nutrition to Cancer: Current Status (G)
<u>Nutritional Management in Disease States</u>	
21	Hospital Diets
22	Enteral Alimentation
23	Total Parenteral Nutrition (TPN): Part I
24	Total Parenteral Nutrition (TPN): Part II
25	Severe Metabolic Stress
26	Nutritional Considerations in Liver and Gall Bladder Diseases
27	Nutritional Considerations in Renal Diseases
28	Nutritional Considerations in Premature Neonates (G)
<u>Nutrition and the Pharmacist</u>	
29	Commonly Encountered Drug-Food Interactions (G)
30	OTC Nutritional Supplements and Patient Counseling

(G) = Guest lecturer

lationship of metabolic processes, (e.g., the effect of meals and/or starvation on gluconeogenesis, glycogenolysis, fatty acid synthesis, fatty acid oxidation, protein anabolism/catabolism, and ketogenesis).

*Physiology:* Alimentary tract functioning (digestion, absorption, motility, secretions, enterohepatic circulation, excretion); placental

nutrient transport; lactation; and cell growth (regulatory mechanisms, hormonal interrelationships).

*Biopharmaceutics:* Concepts of gastric emptying as related to absorption, concepts of protein binding, the first-pass effect, and other concepts that may relate to the effects of nutrients on drug disposition and drug action.

### ***COURSE OBJECTIVES***

At the completion of this course, students are expected to be able to:

1. Describe and discuss the nutritional aspects of carbohydrates, lipids, and proteins with respect to their significance, requirements, and therapeutic uses;
2. Describe and discuss energy metabolism and the nutritional and metabolic interrelationships of carbohydrate, lipid, and protein metabolism;
3. Calculate their individual caloric requirements, personal metabolic output, percentage of caloric intake from carbohydrate, lipid, and protein sources and relate this to recommended dietary allowances for their age group and to suggested recommendations from the American Heart Association and the American Cancer Society;
4. Describe and discuss macro- and microminerals, electrolytes, and vitamins with respect to their functions, sources, requirements, and therapeutic applications;
5. Discuss and provide information and recommendations on specific nutritional requirements for patients with specific physiological or medical situations, such as premature infants, eating disorders, strenuous exercise, advanced age, diabetes mellitus, renal disease, gastrointestinal disease, heart disease, liver disease, and cancer;
6. Discuss the basic principles of total parenteral nutrition;
7. Select and recommend appropriate enteral and parenteral products;
8. Recognize and discuss commonly encountered drug-food interactions; and

9. Provide patient counseling concerning OTC nutritional supplements.

## **REQUIREMENTS**

### ***Required Text***

The textbook *Nutrition and Diet Therapy* by Sue Redwell Williams (6th ed., 1989) is required for the course. This text was selected for its excellent and current presentation of basic nutritional information and for its introduction to enteral and parenteral nutrition. The text is supplemented during lectures with a more complex biochemical presentation that builds on knowledge students have acquired during the biochemistry course required in the preceding year. Accentuated are biochemical and metabolic events occurring during postprandial, starvation, and intermediate states. Lectures are also used to provide information in the areas of enteral and parenteral nutrition (TPN) and in nutrition for selected, commonly encountered disease states in which specific nutritional therapy is usually necessary. Lectures are also devoted to commonly encountered drug-food interactions and information about OTC nutritional supplements, subjects we believe are important for pharmacists but not covered in the required text.

### ***Pretest***

An examination to evaluate general nutritional knowledge that might be expected from health professionals is administered to the class during the introductory session. For the 1988-89 school year, the average for the examination was 55% (Range = 40%-68%). We believe these results are indicative of a lack of general nutritional knowledge in our pharmacy students and substantiate the need for a nutrition course.

### ***Calculation of Caloric Requirements and Personal Metabolic Output***

During the semester, students are required to calculate their daily energy input and output values and protein utilization over a three-

day period. Following this, they are required to compare their personal results and the class averages for males and females with the recommended dietary allowances (RDA) for their age group (23-50 years). These results for the 1988-89 class are summarized in Table 2. These data sheets are collected with the first examination and, in 1988-89, counted for 15% of the possible points on the examination.

### Physical Fitness Assessment

A physical fitness assessment is required for each student. The physical assessment is performed by the UNMC Fitness Center at no cost. This is an ungraded requirement, but students are assigned a grade of incomplete if they do not visit the Fitness Center. The

TABLE 2. Nutrition Assessment Results

	Males (n = 20)		Females (n = 32)	
	Class Avg.	Nat'l Avg./ RDA	Class Avg.	Nat'l Avg./ RDA
Height (in.)	71	70	65	64
Weight (lbs.)	168	154	124	120
Protein intake (g/day)	108	56	67	44
Caloric intake (Kcal/day)	2,395	2,700	1,597	2,000
Caloric output* (Kcal/day)	2,639	----	1,763	----

\*Estimated based on the guidelines given in: Williams SR. Nutrition and diet therapy. 6th ed. St. Louis: Mirror/Mosby College Publishing, 1989.

$$\text{Total Energy Output} = \text{BMR} + \text{Physical Activity} + \text{SDA}$$

where BMR (basal metabolic rate) is calculated from:

$$\text{Men: } 1 \text{ kcal/kg/hr} \times \text{wt in kg} \times 24 \text{ hrs}$$

$$\text{Women: } 0.9 \text{ kcal/kg/hr} \times \text{wt in kg} \times 24 \text{ hrs}$$

$$\text{Physical Activity} = \text{BMR} \times \text{Energy Cost (\% of BMR)}$$

% of BMR estimated from:

Sedentary	20%
Very light	30%
Moderate	40%
Heavy	50%

SDA (specific dynamic action) or dietary thermogenesis (energy required for digestion, absorption, and transport of ingested food):

$$\text{SDA} = 10\% \text{ of total calories of daily food intake}$$

reason for this requirement is that the course coordinators believe that nutrition and fitness are inextricably intertwined (a wellness doctrine). The purpose of the requirement is to make this association very personal to the students and to attempt to make students learn facts for life in addition to facts for tests. The results of the composite class fitness evaluation are presented in Table 3. Table 4 lists the rating system used to assess the students' age group. For this class, the female students attained a higher fitness rating in most categories than the male students. For most categories, female students, on average, achieved a ranking of good, whereas male students were rated average.

### ***Nutrition File***

During 1988-89, each student was required to collect a nutrition file—a file of nutrition articles collected from the popular press (newspapers, news magazines, *Family Circle*, *Ladies' Home Journal*, etc.). The purpose of this assignment was to acquaint the students with the array of nutrition information and misinformation printed in the popular press.

## ***COURSE EVALUATION***

At present, the course is in a state of evolution. Our plan is to make subsequent changes in the course based on student evaluations.

The cooperation between the basic science and clinical departments in presenting the course facilitates the opportunity to interrelate clinical applicability and basic science information. The limitation on the number of guest lecturers has made it possible to better coordinate the material presented to the students. However, the guest pharmacists and dieticians provide excellent presentations to the students in areas where the two course coordinators do not possess high levels of expertise.

In general, the student response to the course has been quite positive, although, as expected, negative comments have been received on some aspects. Constructive critical comments from the



TABLE 3. Fitness Evaluation Results for Class of 1988-89

	Average	Males	Females
Class age	25	27	24
Class weight (lbs.)	142	164	127
(Range)	(126-207)	(96-155)	
Percentage fat	15%	24%	
(Range)	(6-31%)	(16-33%)	

Skin Fold Test Results

	Tricep	Chest	Abdominal	Thigh	Total
Males	11 mm	11 mm	25 mm	14 mm	50 mm
(Range)	(5-26)	(5-29)	(10-54)	(5-30)	(22-113)
					(Chest, Abdominal, Thigh)
	Tricep	Iliac	Thigh		Total
Females	18 mm	16 mm	28 mm		63 mm
(Range)	(10-32)	(7-26)	(17-23)		(40-96)
					(Tricep, Iliac, Thigh)

	Sit-Up Results*	Push-Up Results†	Sit and Reach Flexibility‡	VO <sub>2</sub> Max. Estimates
Males	39	28	-1/4 in.	43 ml O <sub>2</sub> /min-kg
(Range)	(22-53)	(7-50)		
Females	36	29	+1.25 in.	39 ml O <sub>2</sub> /min-kg
(Range)	(17-51)	(9-60)		

\*The number of sit-ups a student can perform in one minute

†The number of push-ups a student can perform in one minute

‡In a sitting position with legs extended together, the distance from the subject's toes (A negative value indicates the subject could not touch toes and the distance from the toes; a positive value indicates the distance beyond the toes a subject could reach.)

TABLE 4. Standards for Fitness Evaluations (Age Group 20-29 Years)

Push-Up Muscular Endurance Test Standards\*

Rating	Males	Females
Excellent	≥ 55	≥ 49
Good	45-54	34-48
Average	35-44	17-33
Fair	20-34	6-16
Poor	0-19	0-5

Sit-Up Muscular Endurance Test Standards\*

Rating	Males	Females
Excellent	≥ 48	≥ 44
Good	43-47	39-43
Average	37-42	33-38
Fair	33-36	29-32
Poor	0-32	0-28

Sit and Reach Flexibility Standards\*

Rating	Inches
Excellent	≥ 8
Good	5-7
Realistic goal	0-4
Needs work	-2 to -1
Poor	≤ -3

Aerobics Fitness (VO<sub>2</sub>Max in ml/kg/min) Classifications

Rating	Males	Females
Superior	> 52.5	> 41
Excellent	46.5-52.4	37-40.9
Good	42.5-46.4	33-36.9
Fair	36.5-40.9	29-32.9
Poor	33-36.4	23.6-28.9
Very poor	< 33	<23.6

\*Pollock W, Wilmore J, Fox III S. Health and fitness through physical fitness. New York: Wiley, 1978.

<sup>†</sup>Data from the Cooper Clinic, Dallas, TX

1988-89 class have formed the basis for changes that are being implemented for the 1989-90 class.

Students reported the calculation of caloric requirements and personal metabolic output to be a particularly valuable exercise. Furthermore, some suggested that it would have been interesting to include a calculation of a percentage breakdown of the caloric intake from carbohydrates, protein, and lipids and to compare these values with those recommended by the American Heart Association

and the American Cancer Society. We have followed their suggestion and have incorporated this feature for the 1989-90 class. Because more information and calculations are necessary, this assignment has been increased to 25% of the points on the first examination.

The fitness evaluation was the most controversial aspect of the course. In the opinion of one student, "The fitness evaluation was a joke and unnecessary. By the time students have entered the College of Pharmacy, their attitudes have already developed about exercise." It was the expectation of the course instructors that this attitude could be attenuated.

The nutrition file portion of the course received mixed reviews from the students. Reactions varied from, "The article collecting was a waste of time," to, "Collecting articles was interesting and something different and unique." In response to these comments, we have altered the assignment for 1989-90. Each student is required to write an article on a topic that relates nutrition to the practice of pharmacy. The article should emphasize the role of the pharmacist as an information specialist. The article could be aimed at the general public or fellow health practitioners. The purpose of this requirement is to give students the opportunity to make judgments about nutrition information as it applies to a practice setting.

Our present grading scheme is based on the results of three examinations and the nutrition article; each counts for one-fourth of the student's grade.

To our knowledge, this is the first report of a required course in a college of pharmacy that is devoted solely to nutrition. Inclusion of a required nutrition course in the curriculum creates a situation in which all students are exposed to necessary nutritional information in a logical and coordinated sequence. Nutrition-related information formerly presented in several other courses has been removed from those courses and incorporated into our required nutrition course. We believe that other colleges of pharmacy should consider a required nutrition course, such as ours, as an appropriate means of providing their students with an essential background in human nutrition.

## REFERENCES

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