

INSTRUCTIONAL DESIGN AND ASSESSMENT

A Clinical Nutrition Course to Improve Pharmacy Students' Skills and Confidence in Counseling Patients

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Objective. To create, implement, and evaluate a PharmD course on primary care nutrition.

Design. A 2-credit hour elective course was offered to second- and third-year pharmacy students. It was informed by the Socratic method using a minimum number of formal lecture presentations and featured problem-based learning exercises, case-based scenarios, and scientific literature to fuel informed debate. A single group posttest design with a retrospective pretest was used to assess students' self-efficacy.

Assessment. There was a significant overall improvement in students' self-efficacy in their ability to practice primary care nutrition.

Conclusion. Completion of a nutrition course improved students' confidence in providing primary care nutrition and empowered them to speak more comfortably about the role of nutrition in the prevention of chronic diseases.

Keywords: nutrition, curriculum, problem-based learning, Socratic method

INTRODUCTION

Healthy People 2010 (HP2010) identified overweight and obesity as 1 of 10 leading health indicators.¹ The overarching goal of this national health agenda is to promote health and reduce chronic diseases associated with overweight and obesity as a result of poor nutrition and physical inactivity. In the United States, there has been a documented increase in overweight and obesity in all population segments.² Poor nutrition combined with physical inactivity is believed to have contributed to over 400,000 US deaths in 2000.^{2,3} Researchers have predicted that if the current trend of poor diet and physical inactivity continues, these will surpass tobacco as the number one causes of preventable death in the United States.³ Another study forecasted a substantial negative impact on the life expectancy of obese young people, estimating up to a 20-year reduction for those who are severely obese.⁴ If effective population-level interventions aimed at reducing obesity are not implemented, the trend of increased chronic disease and greater reduction in life expectancy will become more established.

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Comprehensive lifestyle modification and pharmacological interventions are the cornerstone of primary and secondary prevention of obesity-related health conditions such as cardiovascular diseases and diabetes. Increasing compelling clinical evidence in nutrition science has demonstrated the effectiveness of a well-balanced diet and exercise in health maintenance and disease prevention and treatment. This process is recognized as medical nutrition therapy (MNT).⁵ A number of disease management guidelines include MNT as an important component of their therapeutic plans for disease prevention and management.⁶⁻¹⁰

As members of one of the largest, most accessible, and trusted health care professions, pharmacists can play an even more significant role in disease prevention and health promotion by using MNT when educating patients at the point of care, in both clinical and retail settings. However, to do so they have to be equipped with necessary knowledge and skills. Although there is a pharmacy fellowship pathway in nutritional support research, primary care nutrition and MNT focused courses are missing in current pharmacy professional education.¹¹ An American College of Clinical Pharmacy (ACCP) white paper identified opportunities and voiced a call to action for pharmacists to become integral interdisciplinary health care team members helping to facilitate and accomplish

Healthy People 2010 objectives including those for reducing prevalence rates of overweight and obesity in part through better nutrition.¹² Absent from this ACCP call to action was an acknowledgment that a gap exists in pharmacy education focusing on MNT at point of care.

This paper describes the creation and subsequent evaluation of a PharmD course on primary care nutrition that was created to address the gap we have identified in professional pharmacy practice and education. Others have also identified this gap and struggled to fill it. For example, one article describes the creation of an elective course in nutrition taught in a PharmD program after assessing the need for the course through curricula review and student interest.¹³

The goal of the study was to describe our experiences in conceptualizing, coordinating, and implementing an elective primary care nutrition course for PharmD students and evaluating the association of participation in this course with changes in the levels of students' knowledge of nutrition and students' application of that knowledge to real world situations by using a self-efficacy evaluation tool. We sought to determine whether students' self-efficacy in practicing primary care nutrition improved after taking this course, and whether the degree of improvement was different between male and female students and between students in their second and third years of study. In the next section we describe the course by objectives, teaching approach, content, and assessment criteria. We then describe the evaluation of the course and results of that evaluation.

DESIGN

Primary Care Clinical Nutrition was offered as a 2-credit hour elective course to second- and third-year pharmacy students at the University of Illinois at Chicago

College of Pharmacy (UIC). The PharmD students at UIC are exposed to cardiovascular disease in the first semester of the second year and diabetes in the second semester of the second year. Hence, third-year students were exposed to both cardiovascular disease and diabetes prior to the course, while second-year students were exposed to only cardiovascular disease. The second-year students also learned about diabetes simultaneous to taking the nutrition course. Eight course objectives focused on what students should be able to accomplish at course completion (Table 1).

The class met for 2 hours once a week for 15 weeks and the course grade was based on class participation and student presentations. We embraced a student-focused perspective, which argued that the best way to learn is through active participation.¹⁴ The class utilized a minimum number of formal lecture presentations and relied heavily on the Socratic method. In addition, the course featured problem-based learning exercises and used case-based scenarios, media examples, journal articles from the lay press, and professional/scientific literature to fuel informed debate. The class size was limited to 25 students.

Much effort was expended to facilitate learner-centered activities and practical real life examples were emphasized in order to bring the teaching objectives alive for students. Each class began with the students and instructor sharing articles and other news germane to the day's topic(s) from the popular press (newspapers, magazines, television, or web sites). During class, students were also afforded time to work within a group or individually on readings/projects and they took turns leading and facilitating class discussion on weekly assigned readings. Nutritional snacks for students to sample were provided during each class with the intention of generating

Table 1. Primary Care Nutrition Course Objectives

Be familiar with multiple current recommended dietary guidelines (USDA, AHA, ADA, ACS) that provide a foundation for nutrition counseling.
Evaluate the evidence supporting various clinical nutritional guidelines.
Distinguish the differences between primary and secondary prevention and develop specific plans for patients with cardiovascular disease using evidence-based prevention strategies.
Evaluate the validity and significance of clinical studies using the patient-oriented vs. disease-oriented approach.
Become familiar with and apply the concepts of different behavior change theories (eg, transtheoretical model or behavior modification model).
Be able to explain to patients in a caring, authoritative manner the myths and misconceptions associated with popular fad diets, weight loss supplements and related medications.
Be able to recognize and integrate some cultural aspects of nutrition when assisting individuals from different ethnic backgrounds with meal planning.
Individualize a meal plan that is affordable and acceptable for patients with specific chronic diseases (eg, hypertension, hyperlipidemia, cancer, diabetes).

discussion on “feeding the soul. . .not just the taste buds.” The weekly course schedule along with reading assignment and class topics are displayed in Appendix 1.

Prior to the first session, students were randomly assigned to 1 of 6 teams consisting of 4-5 students. Students remained in this team and worked on team projects throughout the entire semester. There were also individual projects, for example, each student was required to be a discussion leader for a specific assigned reading during the semester.

Evidence-based methods (EBM) were a substantial focus for the course since clinicians are frequently challenged to apply knowledge gained from clinical studies to individual patient care.¹⁴ To arm students with the tools necessary for translating and applying knowledge from medical literature to the clinical setting, analytic techniques and critical assessment were reviewed with the students to demonstrate the application of EBM (eg, disease-oriented evidence vs. patient-oriented evidence, numbers needed to treat, relative and absolute risk). Internal and external validity concepts used in analyzing clinical trials were incorporated as needed. Students were asked to apply an evidenced-based approach when answering questions posed to them from a patient’s perspective (eg, What is the lifestyle modification for my disease state? How effective is lifestyle modification on my disease state? How long does it take to see the effects of this diet?).

The movie *Super Size Me*¹⁵ was shown to the class in the ninth week to generate debate. The formal debate topics focused on obesity in America and whether: (1) it is an individual or corporate responsibility, (2) it is a public health issue or a free market society issue, and (3) it was portrayed in a manipulative or non-manipulative way in the movie. These 3 topics constituted at least 6 debatable positions that were randomly assigned to student teams (eg, one team was assigned to argue that obesity was an individual responsibility, while another team was assigned to argue the corporate responsibility half of the debate). Each team was charged to research and defend their topic assignment with rational arguments. To complete the debate, 15 minutes were allotted to each team and structured in the following manner: 5 minutes for the opening argument, 5 minutes for rebuttal, and 5 minutes for closing arguments. Each team had the liberty to use any format it wanted to defend its topic as long the students stayed within the timeframe.

Each class session focused on a different chronic disease and readings were assigned from the scientific literature that presented an array of findings on the impact of nutritional interventions on chronic disease prevention and treatment (Appendix 1). The purpose of using multiple sources of reading materials was to enable students to

grasp the problem of obesity from a multifaceted perspective (ie, cultural, policy making, environment, personal) and to apply EBM concepts in evaluating the literature. The novel *Fast Food Nation* was also assigned reading. Specific chapters from the novel were assigned for weekly discussion. A modified discussion guide on the novel was used to facilitate class discussion.¹⁶

There were 4 required *class projects*: (1) what are you eating, (2) what are fad diets, (3) the cultural aspect of dietary planning, and (4) nutritional policy making. The first project was an individual project while the remaining 3 were team projects. A description of the projects and its goals are presented in Table 2. Students were assessed according to the following criteria: attending class and participating in discussions (40%); completion and presentation of individual student projects (20%); submission/completion of short, verbal, and written critiques of journal articles (20%); and completion and presentations of group projects (20%).

A single group posttest design with a retrospective pretest was used to assess students’ self-efficacy.⁷⁻¹⁹ A 3-part survey instrument developed by the course instructors was administered at the end of the course. The survey instrument addressed the specific objectives of the course. Part 1 (Table 3) included 14 items asking students to rate their nutrition knowledge and skills before and after completing the course. A 4-point scale (weak, fair, good, and very good) was used. Part 2 of the survey instrument (Table 4) measured students’ perceptions of the effectiveness of the teaching format used. For this the following rating scale was employed: disagree, tend to disagree, tend to agree, agree. Part 3 of the survey instrument was used to collect demographic information.

Since the items used in the questionnaire were rated on an ordinal scale, the Rasch rating scale model was used to convert the raw scores to an interval scale measure.^{20,21} The Rasch rating scale model is an item response theory model for polytomous items and assumes a common rating scale structure across all items.²²⁻²⁵ The rating scale model produces measures of persons’ latent trait on the same scale with measures of item difficulty. The latent trait of interest in this course evaluation was students’ self-efficacy in practicing primary care nutrition. Students with higher measures had higher ratings, indicating higher levels of self-efficacy. On the other hand, items with high difficulty were the areas where most students gave themselves low ratings, indicating that these were difficult skills or knowledge for students.

We first evaluated the fit of the data to the Rasch rating scale model with standardized infit and outfit mean-square values. Outfit mean-square values are unweighted mean square residuals (ie, the differences

Table 2. Individual and Group Projects Completed by Pharmacy Students as Part of a Clinical Nutrition Course

Projects	Description and Goal
Food Diary	<i>Description:</i> This project involved keeping a food diary for one weekend day and 2 week days. It also involved a shopping trip to a local grocery store to identify nutritional values on foods. <i>Goal:</i> Increase awareness of the nutritional value of ones own daily food consumption in comparison to recommended USDA nutritional needs.
Fad Diets	<i>Description:</i> This project involved student teams identifying a fad diet and researching what it entailed and how it compared to the recommended USDA nutritional guidelines. The teams were required to evaluate critically and present clinical evidence supporting their fad diet of choice's health benefit claims. <i>Goal:</i> Become familiar with popular fad diets and apply EBM concepts championed in class.
Cultural Aspects of Nutrition	<i>Description:</i> Each student team was given a clinical case that included a patient suffering from a chronic disease and seeking help from the pharmacist about nutritional intake. The patient's current nutritional intake information along with information about the patient's social, financial, culture, and family circumstances. The teams were instructed to provide a plan taking all of factors into consideration and were challenged to work with the family to assess and modify, if necessary, meals for better health. <i>Goal:</i> Individualized patient meal planning and to walk into the shoes of individuals with chronic disease and the potential barriers to making healthy choices on a meal basis
Policy Making to Improve Nutrition	<i>Description:</i> Teams were asked to use population-based public health concepts for nutrition-related policy making. Student teams were randomly assigned to be one of a local health department, school district, state, or federal agency working to improve health using nutrition for primary and secondary prevention of disease. <i>Goal:</i> Students were encouraged to understand that improving nutrition is a multifaceted phenomena involving multiple levels from grass root to congressional level.

between observed and expected scores). These summarize how much the observed scores are different from the model expectation.^{25,26} Infit and outfit mean-square values have an expected value of 1 and can range from 0 to infinity. To assist with distribution-based interpretation of fit statistics, we transformed the mean-square fit statistics into standardized values (infit and outfit ZSTDs) that have an approximate unit normal distribution. The acceptable range of standardized fit statistics is -2 to 2 .²⁷

We evaluated the quality of questionnaire items in differentiating levels of self-efficacy of students using the student separation reliability (analogous to the Cronbach alpha) and the student separation ratio. Student separation reliability is the ratio of true variance to observed variance and represents the proportion of variance that is not due to error.^{25,28} Its value can range from 0 to 1. Higher values indicate more internally consistent data. However, because separation reliability can sometimes suffer from ceiling effects, we also used the student separation ratio. The student separation ratio is an index of the spread of student measures relative to their measurement error. Its value can range from 0 to infinity.^{25,28}

To demonstrate the improvement of self-efficacy in abilities to practice primary care nutrition, we compared students' measures of self-efficacy before and after taking

the course.^{28,29} Using z scores the actual change in self-efficacy was assessed for each student by examining the standardized difference between the estimates from the 2 time points. A z score value between -2 and 2 indicated no statistically significant change in these measures as a result of the course. A z score value equal to or greater than 2 indicated a significant increase in a student's self-efficacy, while a value equal to or lesser than -2 indicated a significant decrease in a student's self-efficacy. We also assessed whether the level of self-efficacy of the class as a whole changed significantly after taking the course using a paired-samples t test analysis.

ANCOVA was also used to examine the difference in self-efficacy changes between first- and second-year students. The Facets computer program and SPSS 15.0 (SPSS, Inc, Chicago, IL) were used to conduct all of the analyses presented here. For all statistical tests, alpha was set at 0.05. This study received human subjects' approval from the Institutional Review Board at the University of Illinois-Chicago.

ASSESSMENT

Twenty-five students (18 female and 7 male) enrolled in the course. Fifteen were second-year pharmacy students and 10 were third-year pharmacy students.

Table 3. Summary of Part One of an Evaluation Survey Administered to Pharmacy Students After Completing a Clinical Nutrition Course

1. My general practical knowledge in nutrition.
2. My knowledge about a well-balanced meal.
3. My ability to evaluate the quality of my own daily food intake.
4. My awareness of the role that nutrition play in health promotion, disease prevention, and treatment.
5. My ability to explain the role of the effectiveness of a “DASH” or low sodium diet on hypertension in comparison to current pharmacological interventions.
6. My ability to explain the role of the effectiveness of a high fiber, low fat, and well-balanced diet on diabetes control in comparison to current pharmacological interventions.
7. My confidence in providing guidance and recommendations on an appropriate well-balanced meal for patients with chronic diseases such as hypertension, hyperlipidemia, obesity, or diabetes.
8. My ability to evaluate the current medical literature using an evidence-based approach, i.e. “separating facts from fiction.”
9. My critical skills in evaluating the validity of a clinical study using the disease-oriented vs. patient-oriented approach.
10. My critical skills in evaluating the significance of a clinical study using the disease-oriented vs. patient-oriented approach.
11. My skill to apply clinical research into “real world” clinical practice.
12. My understanding of the role that culture, e.g. environment, ethnicity, plays when providing meal planning for individuals with different cultural backgrounds.
13. My ability to apply the theoretical perspective of behavior change theories into “real world” clinical nutrition practice.
14. My ability to take a reliable food history from the patient during an interviewing session.

Comparing student measures before and after taking the course, the course was associated with improved student self-efficacy and a reduction in the variance of self-efficacy measures. When examining the changes in self-efficacy of the whole class using a paired-samples *t* test, we found that students’ self-efficacy measures after taking the course were significantly higher than their self-efficacy measures before taking the course ($t(24) = 10.94$, $p < 0.05$).

Part 2 of the survey instrument included questions assessing the effectiveness of the class structure to empower students on both applying nutritional issues and on becoming effective communicators as well as being able to lead a group discussion (Table 4). For all statements, the mean score was higher than 3 (lowest score = 3.1)

with 3 of the statements having a mean rating of 3.6; 1 a mean rating of 3.4; and 1 a rating of 3.1.

DISCUSSION

There was a significant improvement in students’ self-efficacy in their ability to practice primary care clinical nutrition. No significant differences were detected by gender or educational level of the students (second- vs. third-year students).

One of the surprising findings was the responses for item number 2 regarding knowledge about a well-balanced meal. Students found the current food pyramid recommendations difficult to translate into real-life settings. This difficulty was revealed when the students were instructed to self-evaluate their personal nutritional intake.

Table 4. Pharmacy Students Responses to Survey Questions on Empowerment After Completing a Clinical Nutrition Course

Questions on Empowerment	Mean Response ^a
As a result of this course, given an unfamiliar clinical situation, my ability to identify the key nutritional issues as a result of the skills acquired in this class has increased.	3.6
As a result of this course, given an unfamiliar clinical situation, after I have identified the key nutritional issues, my ability to evaluate, synthesize, and apply the information that I have acquired in this class has increased	3.6
As a result of this course, my ability to communicate orally with my classmates has increased.	3.6
As a result of this course, my confidence in my ability to communicate orally with my classmates has increased.	3.4
As a result of this course, my ability to lead an in-class discussion has increased.	3.12

^aMeasurement Scale: 1=Disagree, 2=Tend to Disagree, 3=Tend to Agree, 4=Agree

Students struggled with not knowing how many calories were needed per day and how to translate the breakdown of daily macronutrients, eg, carbohydrate, fat, protein, into the make-up of a meal. Students identified this difficulty when asked to list the most difficult/unclear topics covered in the course during the midsemester verbal evaluation.

It was easier for the students to endorse question 11 (application of clinical research into real world clinical practice), 12 (my understanding of the role that culture plays when providing meal planning for individuals with different cultural backgrounds), and 14 (ability to take a reliable food history) after completion of the course. Perhaps the course readings and 2 of the projects (food diary, cultural aspect of dietary planning) helped facilitate student's self-efficacy in these domains. For example, the hands-on activity of having students help a chronic disease patient with meal planning illustrated the importance of identifying a patient's food intake as well as the difficulties involved in making daily healthy food choices.

Although not significant, the skill for which students rated themselves the lowest at the beginning of the course was question 9 (critical skills in evaluating the validity of a clinical study). Given that 60% of the enrolled students were in their second year of study and had not completed the required statistics course, this was not surprising. Likewise, students also rated themselves low in response to question 10 (critical skills in evaluating the significance of a clinical study using the disease-oriented vs. patient-oriented approach). Students' ratings on these 2 items suggest that at this point in their studies, they were unable to critically evaluate a clinical study. Most likely, students' critical evaluation skills improve in the third year, and are solidified during the fourth year when students are engaged in clinical advanced pharmacy practice experiences.

Although not significant, the course did increase the students' self-efficacy in their awareness of the role that nutrition plays in health promotion, disease prevention, and treatment outcomes (question 4). Indeed, nutrition is an integral component of effective patient care for many chronic illnesses (diabetes, hypertension, and hyperlipidemia). This may also explain why the students' responses to question 5 were positive (ability to explain the role of the effectiveness of a DASH or low sodium diet on hypertension in comparison to current pharmacological interventions) even though the outcome was not statistically significant.

An assessment of questions 15 and 16, demonstrated that the majority of the class tended to agree that they had enhanced their abilities to identify key nutritional issues as a result of skill attainment in the course. Further, given

an unfamiliar clinical nutrition situation, the students believed they could identify the key nutritional issues and evaluate, synthesize, and apply nutritional concepts learned. In terms of performance-based skills (question 17), the entire class tended to agree that their ability to communicate with their fellow classmates had increased. This was probably due to students having to take an active role in the course.

There were a number of limitations to this study. First, was the small class size. It remains unknown whether this teaching format would be effective with a larger class. Second, because the course was offered as an elective, a selection bias may have occurred in that the course might have only attracted students with interest in primary care clinical nutrition. The possible selection bias might have resulted in an overestimation of the effectiveness of the course. Third, this study employed a retrospective pretest/posttest format. This method of assessment was used because the traditional pretest was not thought to be an effective tool and, predictably, would provide inflated responses to the items at the beginning of the course. When one can reflectively think back on the experience/intervention, one is more apt to be able to discern between then and now. Further, administering the traditional pretest risks negatively impacting the effectiveness of the intervention by introducing terms and concepts unknown to students before they encounter them (eg, DASH). Fourth, because the retrospective pretest method was used for evaluation, students may have felt a need to demonstrate a learning effect. However, participating students were instructed to be honest and forthright in their completion of the self-efficacy questionnaire. Fifth, memory recall, history, and regression to the mean may have introduced threats to the validity of the study findings. Finally, the evaluations may reflect true flaws in the make up of the course itself. These may include flaws in the teaching methods or style, ineffective presentation of course content, or poorly chosen reading assignments. Nevertheless, these were not items mentioned by students when they were given options to articulate any of their dissatisfactions with the course. Those students who did articulate comments when solicited to do so by open-ended questions wrote that they found the course to be stimulating, the readings interesting, and the teaching style refreshing. The only complaint voiced was a sense of feeling overwhelmed with the amount of reading assigned.

The course has been taught twice and accepted as a permanent elective in the PharmD curriculum that is offered annually. In the next iteration of the course, the reading materials will be updated and the amount of required reading reduced. The course instructors have

decided to open the course to more students and to test whether the current format is applicable to a larger venue. Furthermore, the IRB at UIC has approved a follow-up evaluation with former students in order to assess how well or if they apply the materials learned in the course to their everyday pharmacy practice.

In addition, the course evaluation methodology will be modified to include an evaluation of the impact the course has on a student's critical thinking abilities. This will be accomplished by including additional statements on the course evaluation. Finally, a pre- and post-knowledge test focused on MNT will be used in the next evaluation format for the course. This will help ascertain the students' actual knowledge level before and after completion of the course.

SUMMARY

Students enrolled in a clinical nutrition course improved their confidence in providing primary care clinical nutrition and were empowered to speak more comfortably about the role of nutrition in the primary and secondary prevention of chronic diseases. The course appears to have increased their ability to evaluate, synthesize, and apply nutritional information at the point of care, which is one of the most important places where the objectives of Healthy People 2010 can be accomplished.

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