

INSTRUCTIONAL DESIGN AND ASSESSMENT

A Course Introducing the Principles of Pharmaceutical Care

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Objectives. To develop, implement, and assess a course that introduces students to the process and application of pharmaceutical care.

Design. The course was offered to students in the third semester of the PharmD curriculum. The course's ability outcomes were to integrate and apply scientific and therapeutic knowledge in the delivery of evidence-based pharmaceutical care, and to develop the skills of a professional, lifelong learner.

Assessment. The students successfully applied the information learned in this course to the practice of pharmaceutical care. The 3 components of the course that appeared to be the most challenging were identifying drug-therapy problems, creating compound goals, and creating a care plan.

Conclusion. This course was effective in meeting ability-based outcomes. The assessment data helped the instructors determine what changes should be made to increase the course's success when it is offered again.

Keywords: pharmaceutical care, curriculum, assessment, learner evaluation

INTRODUCTION

Pharmaceutical care is defined as the responsible provision of drug therapy for the purpose of achieving definite outcomes that improve a patient's quality of life.¹ Twenty years have passed since Hepler and Strand offered this definition, yet many would argue that the practice of pharmacy has not caught up yet with this vision.²⁻⁴

Pharmacy educators are given the responsibility to educate future pharmacists so they will be equipped with the required knowledge, skills, and attitudes to practice pharmaceutical care, not only upon graduation, but for a 40-year career. This can be a daunting task because it requires the educator to make predictions about what future practice will be. The 2007 Accreditation Standards and Guidelines from the Accreditation Council for Pharmacy Education (ACPE) addresses these issues.⁵ Standard 9 states that student pharmacists' learning must support current practice and equip the students to advance the profession. It also requires that students are able to identify and implement needed changes in the profession. Standard 11 states the curriculum must produce graduates with matured critical thinking and problem-solving skills and the ability to self-direct their

own learning. Guideline 12.1 emphasizes the importance of understanding the facets of the ability to practice patient-centered care.

To meet these needs, our objective was to develop a course that introduces students to the process and application of pharmaceutical care. Delivered in the first semester of the students' second year in the doctor of pharmacy (PharmD) program at Belmont University, the goals of the course were to encourage the students to begin applying the concepts of pharmaceutical care, promote professionalism, and foster a connection among the pharmaceutical science classes and practice.

At its inception, Belmont University school of pharmacy's faculty members envisioned a program that blended pharmaceutical science and practice at its educational foundation with a complementary philosophy that students would benefit from a focus in 1 of 4 curricular concentrations identified as pharmacotherapy, management, informatics, and missions. This curricular model became known as Pharmacy-PLUS.⁶ (See Table 1 for a brief description of each concentration.) Students are required to declare a concentration at the end of their second year, so this course is timely in meeting their need to learn about career paths. Consistent with the course objectives, exposure to the curricular concentrations was designed to teach students to apply the elements of the pharmaceutical care cycle to case studies exploring the problem-solving skills needed to practice in pharmacotherapy, management, informatics, and missions.

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Table 1. Belmont University School of Pharmacy Concentration Descriptions

Concentration	Description
Pharmacotherapy	In-depth exposure to disease states covered in the core curriculum, exposure to less common disease states not covered in the core curriculum, and an advanced understanding of the practice of clinical pharmacy, and clinical pharmacy service justification
Management	In-depth exposure to management topics covered in the core curriculum (managing personnel, entrepreneurial business, etc) and exposure to advanced management topics that are not covered in the core curriculum
Informatics	Emphasis on the generation, development, use, and integration of data, information, knowledge, technology, and automation in the medication use process
Missions	Emphasis on the provision of population-based care using evidence-based principles and culturally sensitive methods that apply across local, national, and international borders

DESIGN

The instructors wanted to design the course to ensure that student pharmacists would develop the knowledge, skills, and attitudes required to implement pharmaceutical care into their practice upon graduation. Incorporating active-learning strategies into a course is 1 method of ensuring that students apply learned information. Active learning incorporates the students' reading, writing, discussing, or becoming engaged in solving problems.⁷ While active-learning strategies have been proven equivalent to lectures if the goal is to learn content, active learning is superior to lectures if the goal is to promote thinking skills.⁷

The course development was guided by D. Fink's integrated course design.⁸ To ensure development of a learner-centered rather than a topic-generated course, the course designers began by determining what the students should achieve in the course. The following were identified:

- Explain Belmont University School of Pharmacy's 4 curricular concentration areas
- Describe the concept of pharmaceutical care
- Apply pharmaceutical care, specifically critical thinking and problem-solving skills, to the understanding and resolution of drug-therapy problems
- Identify drug-related needs of patients

- Collect data using a systematic approach
- Assess collected data and create patient care plans that include monitoring and follow-up
- Demonstrate a commitment to improving patient outcomes

The course's ability outcomes were to integrate and apply scientific and therapeutic knowledge to the delivery of evidence-based pharmaceutical care, and to develop skills of a professional, lifelong learner. Table 2 provides the content (knowledge, skills, and attitudes) to meet each ability outcome.

A second priority was to maintain consistency with Belmont University school of pharmacy's goal to provide a correlated and integrated curriculum. Tables 3 and 4 display the prior and concurrent courses that supported or reinforced the pharmaceutical care course.

Once a clear vision was developed about the components of the course and its fit into Belmont's curriculum, we determined that the 72 students in the class should be divided in 3 sections to limit the class size to approximately 24 students per section, allowing a smaller student-teacher ratio and more meaningful interaction. Each section met once each week for 2 hours. The course was taught by 2 faculty members, with only 1 faculty member usually present

Table 2. Content of Course to Meet Ability Outcomes

Ability Outcome	Knowledge	Skills	Attitudes
Pharmaceutical Care	Drug-therapy problems; Patient needs; Literature/landmark trials; Drug and disease knowledge	Decision-making; Patient assessment; Communication; Triaging problems; Application of pharmaceutical care in different practice settings	Flexibility; Acceptance of ambiguity; Empathy; Patience; Responsibility; Dedication; Persistence
Professional, lifelong learner	Resources to utilize to obtain rapidly changing information	Obtaining quick and reliable information; Responsibility of profession; Accepting and giving performance feedback to peers	Intellectual curiosity; Dedication; Discipline; Respect

Table 3. Prior Courses That Supported or Reinforced the Pharmaceutical Care Course

Course	Overlapping/Supporting Topics
Health Assessment	Interviewing skills Cultural competency
Pharmacodynamics I - II	Central Nervous System medications
Anatomy and Physiology	Relevant anatomy to understand pathology and therefore pathophysiology
Informatics I	Literature retrieval Evidence-based medicine
Pharmaceutics I and II	Dosage form considerations when developing care plans

in class. For consistency, the same material was delivered to each section by the same instructor. Topics were divided between the faculty members based on interest and connected relationship of topics. Two textbooks were adopted as required texts for the course: *A Practical Guide to Pharmaceutical Care: A Clinical Skills Primer* and *Community Pharmacy Practice Case Studies*.^{9,10} An ability-based course requires opportunities for the students to practice the abilities presented. The *Clinical Skills Primer* was used throughout the semester as the students progressed through the pharmaceutical care cycle. The *Case Studies* text provided opportunities for students to practice applying the knowledge they were learning. The practice opportunities were mapped to the Center for Advancement of Pharmacy Education (CAPE) competencies (Table 5).¹¹

Application of learned information can occur through the use of case studies and result in significant learning.⁸ The process of working through a patient case mirrors the approach to problem solving described by Dewey.⁷ First,

Table 4. Concurrent Courses That Supported or Reinforced the Pharmaceutical Care Course

Course	Overlapping/Supporting Topics
Pathophysiology and Therapeutics I	Students assigned patient cases related to central nervous system disease states
Communication and Counseling	Communicating with physicians Providing peer assessments Collecting data during patient interviews
Self-Care Therapeutics	Similar systematic approach Utilized the same student groups for in-class activities Used the same <i>Case Studies</i> textbook

a problem and its cause(s) are defined. Next, solutions are identified and evaluated. This is followed by selecting the solution that is most appropriate for the patient. This process also exposes students to the ambiguity of pharmacy practice because students determine that there is potentially more than 1 correct solution. To increase the significance of learning, the guided design process described by Bonwell was used to require the students to formulate, in greater detail, a care plan that included appropriate monitoring and follow-up to ensure the safety and efficacy of the care plan.⁷

Each student was assigned a case from *Community Pharmacy Case Studies* that included medications that the students had studied in Pharmacodynamics the previous semester and were currently learning in the Pathophysiology and Therapeutics course. To ensure fairness among students, faculty members evaluated the cases based on the number of drug-therapy problems present and the complexity of the cases. Six cases were selected with an average of 4 drug-therapy problems per case. All were considered by the instructors to be equal in complexity.

Before the first case assignment was made, the students were provided with the reasons they would complete the pharmaceutical care cycle in steps rather than simultaneously.⁹ By going through 1 step at a time, the students received feedback on their performance before they moved to the next step of the cycle. Table 6 displays the progression of assignments with descriptions of in-class activities used to prepare the students for completion of the assignment. As each assignment was given, the feedback construction model was used to create the grading rubrics.¹² The feedback construction model encouraged student participation in the design of the evaluation tool. In this case, students participated in the process of assigning weight to each criterion in the rubric. Affording students the responsibility of developing aspects of the course transformed the classroom into a learning community, resulting also in student buy-in. Rubrics are available upon request from the primary author.

An additional requirement for the first assignment was a learning journal that documented what the student had referenced to complete the assignment, where they had looked, what additional questions arose, and their plan to find answers. The learning journal was used with the first assignment to help the instructors determine if their expectations were aligned with the students' abilities. After the journals were submitted, the instructors reviewed them. Based on the students' completed coursework, the content and amount of information in the learning journals reflected what the instructors had expected. The learning journal also reflected the principles of a learning agenda and plan of action described by Fink that encourages students to identify

Table 5. Practice Opportunities Mapped to Center for Advancement of Pharmacy Education (CAPE) Competencies

Ability Outcome	Practice Opportunity	CAPE Competency
Pharmaceutical care	Identify drug-therapy problems	I.A.2, I.B.7, I.C.2, I.D.3
	Collect/evaluate data	I.A.1, I.A.2, I.B.1, I.D.3
	Creation of a care plan	I.C.1, I.C.3, I.D.3, I.E.1, I.E.3, I.F.1
	Documentation	IV.I
	Poster presentation	All of the above plus IV.C
Professional, lifelong learning	Peer- and self-assessments; learning journal	V.B, V.C, V.F

knowledge deficiencies and take responsibility for their own learning.⁸

For the documentation assignment, the class voted on a data collection form from their textbook. The adopted form was to be used to document the subjective and objective data from their case.⁹ The next step was to summarize their assessment and plan, resulting in the creation of a subjective, objective, assessment, and plan (SOAP) note. Students were limited to a single-spaced, 1-page summary for this assignment to emphasize the importance of being thorough yet concise when documenting patient care activities.

The final examination for the course was a poster presentation that required integration of all of the information

covered over the course of the semester, demonstrating significant learning.⁸ The poster was intended to illustrate visually the entire pharmaceutical care cycle and its application to the patient. The poster also included a letter to the patient’s physician detailing recommendations and justification for those recommendations. The final component of the poster was a self-assessment reflection essay which included whether their recommendations had been evidence-based and correct as determined by student-specific feedback received from the instructor throughout the semester. Reflection is thought to contribute to significant learning because it allows the learner to “learn how to learn.”⁸ The students were given a handout containing information on preparing

Table 6. Pharmaceutical Care Cycle Assignments With Supporting In-Class Activities to Prepare Students for Completion of Assignment

Identify drug-therapy problems, classify them, and state potential causes of each <ul style="list-style-type: none"> ● Pharmacist’s scope of practice ● The 5 needs of a patient ● The 7 drug-therapy problems ● Proactively monitoring for drug-therapy problems ● Differentiation of actual and potential drug-therapy problems
Collect data and perform an evaluation while determining, for each problem, the significance, potential solutions, and each solution’s anticipated outcome <ul style="list-style-type: none"> ● Developing professional relationships ● Interviewing skills ● Completing the assessment section of a subjective, objective, assessment, and plan (SOAP) note ● Instructor demonstration of the thought process to complete an assessment of data ● In-class practice case
Prioritize problems, create a compound goal for each problem, write a care plan that includes comprehensive monitoring and follow up and provide patient education on execution of the plan <ul style="list-style-type: none"> ● Importance of patient buy-in ● Tailoring plans to specific needs of a patient ● Differentiation between a plan and a goal ● Writing achievable and measurable goals ● Components of a compound goal ● Considerations when formulating a care plan (efficacy, safety, cost, complexity) ● How to determine when to follow up and what specific information should be collected
Document care provided <ul style="list-style-type: none"> ● Common errors when writing subjective, objective, assessment, and plan (SOAP) notes ● What is included in each section of the subjective, objective, assessment, and plan (SOAP) note ● Legal implications of proper documentation

layout and design, font size, illustrations, and content. To limit costs, the students were allowed to use a trifold board with printed PowerPoint slides.

To emphasize the importance of integrating knowledge from other courses, the instructors wanted the students to reflect on previous and concurrent courses, and identify the knowledge they had that was required to complete each assignment in the pharmaceutical care cycle. To help them begin to purposefully make those connections, a few examples were provided in class, including relying on *pharmacodynamics* to understand the mechanism and clinical significance of a drug interaction. Examples of connections provided by the students were: *informatics* to know where to find information and the validity of resources, *pharmaceutics* for the effect of dosage forms on the body, and *anatomy and physiology* for an understanding of neurotransmitters.

The posters were presented in sections of 24 students in a room on campus set up with tables to accommodate the event. Students were encouraged to wear their white coats, and other faculty members were invited to see the students' work completed over the semester. The posters were graded with a rubric weighted most heavily in the areas on which the students had not been evaluated throughout the semester, such as presentation style, connections among coursework, and the reflective self-assessment. Both instructors for the course were present at all 3 sections' presentations, and each graded half of the posters.

Peer teaching as an active-learning strategy is thought to enhance individual student performance.⁷ Therefore, after several in-class activities, students were required to perform either a self-assessment or a peer-assessment. By the end of the semester, each student had completed 2 self-assessments and 2 peer-assessments. For these activities, the following performance expectations were stated: (1) objectively evaluate the work based on the performance criteria provided for the assignment; (2) provide evidence for your evaluation; (3) approach the activity in good faith; and (4) be clear and concise. During the self-assessment activity, students were asked to reflect and complete a rubric that addressed thoroughness, accuracy, and professionalism. The rankings were distinguished, proficient, intermediate, or novice. When providing peer feedback, students commented on what was successful and why; what could be improved and how to make those improvements; and whether the assignment was coherent, complete, concise, and correct. After completion of each of these activities, the students were given feedback from the instructors about their self- or peer-assessment. The feedback included how valuable the self- or peer-assessment was to making improvements in the future, if evidence was provided, and if it was constructive. The feedback which students received

on the peer- and self-assessment activities accounted for 10% of their overall course grade, with each of the 4 activities weighted equally.

Cooperative learning as an active-learning strategy is a useful tool because it promotes the development of social skills.⁷ This strategy was used while students were exploring the 4 curricular concentration areas. Case studies for each concentration area were developed suggesting problems or conflicting opinions on various topics. As a group assignment, students were asked to choose from a set of problems to work on as an in-class activity. The group's objective was to evaluate the problem and formulate a solution based on evidence from the literature. Each group presented their unique case stating reasons for the problem and what they proposed as a solution. The instructor facilitated class discussion on the validity of the solution and its application to current pharmacy practice. In addition, the instructor led a discussion on opportunities available in each area of concentration and what professional development planning students should perform prior to seeking employment in that field. The "path to practice" included recommendations for gaining knowledge and experience while in pharmacy school and after graduation. For example, for the pharmacotherapy concentration, various residency programs were presented that offered postgraduate experience in clinical practice.

To further develop the concept of lifelong learning, students were given the names and contact information of several organizations that support pharmacists who specialize in each of the concentrations to investigate further. The National Community Pharmacists Association was acknowledged for their independent pharmacy ownership materials, and Christian Pharmacists Fellowship International was acknowledged for their handbook for pharmacists on short-term missions.¹³⁻¹⁴ Several organizations that are not pharmacy-specific were also identified. Healthcare Information and Management Systems Society was discussed for those interested in informatics, and Christian Medical and Dental Associations was mentioned for health care workers who wish to pursue mission work.^{15,16} Students were encouraged to use these resources as well as their own research to develop their interest in a curricular concentration.

This course utilized the "learn process"¹⁷ which promotes establishing a team in an education environment with the goal of locating opportunities for improvement, assessing current processes, researching causes of any problems identified, and proposing solutions. Four students volunteered to serve on the course's learn team, with the responsibility of identifying components of the course that were working well and those that were not. For the areas determined to need improvement, the learn team

had to identify potential solutions. The learn team also developed a survey instrument that was sent to the class.

EVALUATION AND ASSESSMENT

The teaching strategies used throughout the semester were evidence-based, promoting student learning and retention of material. Because this course was offered early in the 4-year curriculum and simultaneously with the first therapeutics course, the instructors believed the in-class preparation consisting of discussions and demonstrations contributed to the students' ability to perform the assignments, particularly collecting and evaluating data.

The poster presentations were considered the capstone project of the semester. The instructors believed achieving at least an 80% signified appropriate competence for second-year students. The mean grade of the poster presentations was 89.4%.

The results of students' performance on the pharmaceutical care assignments and peer- and self-assessments are presented in Table 7. Student performance data was collected from graded assignments after the conclusion of the course.

Regarding the concentration case studies, informal peer evaluation of the group presentations and comments accompanying the assignments were positive and demonstrated more detailed understanding of the career opportunities in the 4 concentration areas. Several students declared their concentration in the semester following completion of the course and started elective study in those areas.

Forty-seven percent ($n = 34$) of the students enrolled in the course completed the anonymous survey instrument that was administered near midterm. Sixty-five percent of the students felt they had adequate time to complete each of the assignments. When each assignment was given, the assignment sheet contained how the assignment mapped to the CAPE Competencies. Fifty-nine percent of the students felt this was helpful. The other forty-one percent felt that the assignment sheet was overly complicated. Seventy-one percent of the students preferred to complete additional case studies during in-class activities. Eighty-five percent of the students understood how this class related to the other classes they were taking.

Ninety percent ($n = 65$) of the students enrolled in the course's 3 sections completed the university's online course evaluations at the conclusion of the semester. The following summary statements reflect the most frequently provided comments:

- Having to directly apply skills/knowledge learned from other courses to fulfill this course's requirements was a good challenge.
- The instructors were accessible and willing to give me feedback on my assignments before I

submitted them. This helped me develop as a professional.

- This course was an important learning process and will be helpful on rotations.
- Completing the pharmaceutical care cycle gave me an idea of how I am going to have to think when I am a pharmacist.
- I learned a lot about my patient and their case, but I would have rather worked on at least 2 cases throughout the semester so I could have had more practice.
- Completing the entire pharmaceutical care cycle in class on a case would have been helpful to do before we were given our assigned cases.

DISCUSSION

The course's success can be attributed to several components. First, during the design phase the instructors spent substantial time ensuring that the course was developed to meet ability outcomes. A second important component was teaching the course in sections. Addressing a group of 24 students allowed each section to be more involved and interactive, and the instructors believe this made the in-class activities more meaningful. For example, the in-class activities surrounding the assignment to collect and evaluate data proved useful to the students based on their feedback. Common comments included that they had "never had to think like a pharmacist" and these activities helped them model that behavior.

The instructors' goal was that at least 70% of the students enrolled in the course's 3 sections would achieve "excellent" or "good" on the grading rubric for the assignments listed in Table 7. The 3 components of the course that did not meet this goal were identifying drug-therapy problems, creating compound goals, and creating a care plan. According to the grading rubric scale, the percent of students performing at the "fair" or "poor" performance level in the 3 sections were 36%, 35%, and 38%, respectively. The struggles with identifying drug-therapy problems seemed to stem from the differentiation of active versus potential problems, and identifying what could become a problem. Creating compound goals presented a challenge because it required the students to think beyond the implementation of their care plan to those drug-therapy problems that could arise because of that plan. The most common reasons students did not perform well creating care plans were the monitoring and follow-up methods they chose. During class, methods to use for monitoring and follow-up were stressed to include both subjective and objective data to ensure safety and efficacy.

This course was instrumental in developing the thought processes for identifying and resolving drug-therapy

Table 7. Results of Students' Performance on Pharmaceutical Care Assignments and Peer- and Self-Assessments

Assignment and Performance Criteria	Percentage Achieving Stated Criteria, Mean (SD)
Identifying Drug-Therapy Problems	
Identified all drug-therapy problems	12.6 (9)
Identified a majority of the drug-therapy problems with few errors/omissions	51.4 (37)
Identified few of the drug-therapy problems with frequent errors/omissions	27.7 (20)
Unable to identify any drug-therapy problems	8.3 (6)
Classifying Drug-Therapy Problems	
Classified all drug-therapy problems appropriately	40.3 (29)
Classified most drug-therapy problems appropriately	47.2 (34)
Classified half of the drug-therapy problems appropriately	8.3 (6)
Unable to classify any of the drug-therapy problems	4.2 (3)
Data Collection and Evaluation	
Thorough data collection, accurate assessment, and evidence of a systematic approach	15.3 (11)
Thorough with few errors and omissions, evidence of a systematic approach	55.6 (40)
Missed data during the collection phase; unclear if a systematic approach was used	22.2 (16)
Incomplete data and lack of an assessment	6.9 (5)
Assigning Priority Levels	
Appropriately assigned all priority levels based on severity and acuity	55.6 (40)
Incorrectly prioritized 1 problem	25 (18)
Incorrectly prioritized 2 problems	12.5 (9)
Incorrectly prioritized greater than or equal to 3 problems	6.9 (5)
Creating Compound Goals	
Wrote appropriate compound goals that addressed all drug-therapy problems	44.4 (32)
Wrote appropriate compound goals for all but 1 drug-therapy problem	20.8 (15)
Wrote appropriate compound goals for all but 2 drug-therapy problems	11.1 (8)
Did not write appropriate compound goals for greater than or equal to 3 of the drug-therapy problems	23.7 (17)
Creating a Care Plan	
Plan was appropriate and defensible	15.3 (11)
Plan was appropriate and defensible for all but 1 recommendation	47.2 (34)
2 elements of the care plan were not appropriate or defensible	25 (18)
Greater than or equal to 3 elements of the care plan were not appropriate or defensible	12.5 (9)
Providing Patient Education	
Patient education was thorough	69.4 (50)
Patient education was missing 1 key point	16.8 (12)
Patient education was missing 2 to 3 key points	6.9 (5)
Patient education was missing greater than or equal to 4 key points	6.9 (5)
Charting Interventions	
The correct information was documented in the correct place; medical terminology and abbreviations used appropriately	45.8 (33)
Documented information in the correct area of the chart; used medical terminology and abbreviations appropriately for the most part	54.2 (39)
Placed most information in the incorrect area of the chart; rarely used medical terminology or abbreviations appropriately	0 (0)
Completeness of Documentation	
Documentation was complete and concise	22.2 (16)
Documentation was mostly complete but not necessarily concise	55.5 (40)
Documentation was missing some information or contained non-applicable details	18.1 (13)
Documentation was missing a majority of information that demonstrated the care provided to the patient	4.2 (3)
Peer/Self-Assessment	
Peer/self feedback was constructive and potentially helpful for future improvement	65.2 (47)
Peer/self feedback was less useful than expected	29.2 (21)
Peer/self feedback was inappropriate or meaningless	4.2 (3)
Did not participate in the peer/self feedback process	1.4 (1)

problems. Due to its placement in the curriculum, the course facilitated early development of the skills and habits necessary for designing an effective care plan. Conversely, the students had limited exposure to therapeutics and evidence-based medicine. This obstacle was overcome by selecting patient cases that pertained to disease states covered in the current semester's Pathophysiology and Therapeutics course and performing in-class activities to identify primary literature and guidelines to common disease states.

CONCLUSION

The Pharmaceutical Care course met its goals to introduce the students to the application of pharmaceutical care and the processes pharmacists use to achieve effectiveness. In the future, the instructors plan to incorporate additional practice opportunities by increasing the number of cases. A case will be completed in class as a group to demonstrate the application of material and the thought processes students must develop as future pharmacists. The students will then complete individually up to 2 patient cases over the semester. In-class activity time will be allocated for students to work on these assignments so they can ask questions as they progress. This also affords the opportunity to use the active-learning activity of student-generated questions with the instructor providing recurrent feedback.⁷

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