

Online Doctor of Pharmacy Program for Pharmacy Practitioners: Development and Evaluation of Six Pilot Courses¹

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The goals of this project were to: (i) develop an online PharmD program that prepares practitioners with background and skills to provide pharmaceutical care; and (ii) conduct a preliminary evaluation of the impact of the program on the knowledge of participants, frequency of pharmaceutical care activities, and their perceived preparedness to provide pharmaceutical care. Curriculum for six credits in the 38-credit program was developed. Content areas focused on clinical skills and pharmacotherapy of cardiovascular, endocrine, gastrointestinal, rheumatoid and respiratory patients. Instructional strategies consisted of self-study with Power Point presentations and readings, synchronous chat sessions using FirstClass, Intranet Client, and case-based assignments. The program was evaluated comparing scores of baseline knowledge and self-reported frequency of pharmaceutical care activities and preparedness to scores upon completion of developed curricular content. The participants also completed course evaluations. By the end of spring 1999, 28 students had enrolled in the program. Based on an evaluation of baseline and follow-up surveys, there was significant improvement in test scores and perceived preparedness to provide specialty pharmaceutical care services.

INTRODUCTION

The profession of pharmacy has agreed that its primary mission is providing pharmaceutical care. Success in this endeavor requires practitioners with the necessary skills and competencies. The Commission to Implement Change in Pharmacy Education has identified the needed competencies(1). There have also been numerous recommendations that practitioners be certified based on defined competencies(2). There has also been a call for continuing education to be modified so that it is curricular based. The National Associations of Boards of Pharmacy, American Council on Pharmaceutical Education, American Association of Colleges of Pharmacy, and American Pharmaceutical Association have all endorsed the concept that colleges of pharmacy should provide educational opportunities that prepare practitioners to provide pharmaceutical care.

Duquesne University School of Pharmacy has offered a Doctor of Pharmacy program since 1968. In 1993, a nontraditional track that allowed for part-time completion was introduced. However, many pharmacists were still not able to consider the existing program due to full-time work commitment. In 1995, a group of pharmacists were assembled to discuss the characteristics of a program that they felt would ideally suit the nontraditional student. Their comments and suggestions were utilized to develop a structure for a new, 38-credit nontraditional doctor of pharmacy Program that was approved in 1996. Surveys of our graduates indicated that there was great interest in certificate programs as well as a flexible PharmD program. Additionally, our new entry-level PharmD program created a demand for pharmacy preceptors to role model concepts of pharmaceutical care. Many preceptors felt that they would benefit from a program that would assist them with this task.

The benefits of online self-study and case-based instruction in pharmacy have been documented for single courses(3-

6). Several investigators have described the use of Internet-based technology to deliver individual courses within a nontraditional PharmD program(7-10). Representatives from two other institutions have described the design and implementation of online nontraditional PharmD programs(11-12). Based on a review of published manuscripts to date, there is limited information on the evaluation and impact of such programs.

The objectives of this project were to: (i) develop six initial courses in an online Doctor of Pharmacy program that would provide continuing education credits and prepare practitioners with background and skills to provide pharmaceutical care; and (ii) evaluate the impact of this project on the knowledge of the participants, their perceived preparedness to provide pharmaceutical care, and self-reported frequency of pharmaceutical care activities.

METHODS

Program Development

The program was designed to have the following characteristics: (i) flexible and accessible to allow the pharmacist to remain in his/her practice site; (ii) utilize instructional strategies targeted for adult learners; and (iii) provide options for continuing education credit.

Polyson and colleagues have described several features of a good online course(13). One important component is an online syllabus that may be updated quickly and distributed to the students. Listings of assignments online with links to attachments or other Web-based material is extremely helpful. To keep students abreast of changes in the course, an online

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mechanism for announcements is also important. Interactivity between distance students and the instructor is a key feature to create the learning community. This may be accomplished through group chats, private chats, students' forums, and personal web pages. Integrating content with Web-based media, use of online testing, and good course management are also important. Our program was designed to possess these qualities.

Utilizing the original credit structure approved in 1996, the initial six pilot courses in the program were developed by faculty assigned to the subject area in cooperation with the investigators. The courses were designed utilizing selected pharmacy practice competencies initially developed for the entry-level PharmD program at our school. These practice functions included: participate in the drug use process; monitor patients to maximize compliance; monitor patients with regard to the therapeutic objectives; monitor patients to prevent adverse drug reactions and interactions; document the pharmaceutical care process; and participate in health promotion and wellness initiatives.

With the assistance of the investigators, faculty converted their existing course material so that it could be delivered online. A template was designed so that course structure was consistent. Course content was delivered via Power-Point presentations and self-study outlines which were accessible online and available for download. Case discussions were conducted via synchronous chat with the group. Homework assignments were also posted online.

The initial courses included four Pharmacotherapy/Disease Management modules and two clinical skills courses. The disease states identified were those that have tremendous potential for noncompliance, therapeutic monitoring and pharmacists' involvement in primary care. Pharmacotherapy courses and associated topics included: (i) cardiovascular - hypertension, hyperlipidemia, cholesterol screening, smoking cessation; (ii) endocrinology - diabetes, osteoporosis, blood glucose monitoring; (iii) respiratory - asthma, COPD, respiratory infections, otitis media, peak flow monitoring; and (iv) GI/rheumatology - arthritis, peptic ulcer disease, GERD, helicobacter screening. Each one-credit module was completed over a five-week period.

The clinical skills courses were designed to expose the student to the basic process of drug therapy assessment. Clinical Skills II focused on such topics as creation of a working database, identification of drug-therapy problems, care planning and monitoring. Students were required to demonstrate proficiency in the drug assessment process through standardized cases and actual patient from their own practice site. Clinical Skills III involved case studies in the interpretation of laboratory values. Students also completed self-study readings from the ASHP Clinical Skills Modules(14).

Participants completed an orientation session that provided them with program expectations and an introduction to FirstClass[®] a course management software package.² Additionally each participant was assigned a mentor from the program faculty. The role of the mentor was to serve as an advisor as well as a preceptor for any rotations completed at the participant's own practice site.

Instructional Strategies

A main focus of the project was to ensure program flexibility and allow participants to maintain fulltime employment. To this end, the didactic portion of program was conducted pri-

marily online. While the initial six courses did not require the participant to come to campus, limited one-day workshops are required for other courses such as communication and physical assessment.

Instructional strategies that were utilized included self-study readings, case-based assignments, both standard and site-specific cases, and synchronous online chat session. This was accomplished primarily with the use of First Class[®] Intranet Client software by SoftArc Inc. First Class[®] is a secure integrative e-mail system that allows for interactive keyboard chat and exchange of information. Either the instructor or the student may post documents. In general, a one-credit module would include two chat sessions (twohours/each), four case-based assignments and self-study material. Online exams were administered utilizing WebCT[®].³ Students electing to earn continuing education credits received 1.5 CEU for each one credit module.

Selection of Participants

Program participants were required to be pharmacy practitioners in institutional, chain, or independent settings. Participants were selected on the basis of willingness to participate in the project and their acceptance into the PharmD program. Individuals initially were selected in Spring 1998 for the first offering and then at each enrollment period in Summer 1998, Fall 1998, and Winter 1999.

Evaluation

The impact of the project was evaluated in two ways. Upon entry into the program, participants completed a 70-item pretest of knowledge that reflected the content areas covered in the first six courses. Questions were similar to those used in the traditional PharmD program and had been validated by the instructors via test-retest reliability. Participants also completed a survey of their current pharmaceutical care activities and self-reported preparedness to provide specialty pharmaceutical care activities. This survey assessed the frequency of activities such as obtaining patient medication histories, screening for drug-related problems, and care planning. Perceived preparedness to provide specialty services such as blood pressure screening, blood glucose assessment, smoking cessation, and peak flow monitoring was also assessed. A copy of the survey is provided in Appendix A. The survey was used previously and pilot tested(15). A follow-up evaluation was conducted approximately six to twelve months after entry into the program due to rolling admissions. Pre-tests and post-test scores of knowledge were compared using a paired t-test. Responses to the survey were assigned a ranked score. Changes in baseline and follow-up survey scores of pharmaceutical care activities and perceived preparedness were evaluated using a Wilcoxon Signed Rank Test. StatView[®] was utilized for the statistical analyses.⁴

Participants were asked to complete course evaluations that utilized a five-point Likert scale. Statements to assess the students' perceptions of online teaching were included in this evaluation. These were completed online utilizing WebCT.

²FirstClass[®] Version. 5.506, SoftArc Inc, 1998

³WebCT[®] Version 1.31, Web CT Educational Technologies, Vancouver, BC, 1998.

⁴Stat View[®] Version 5.01, SAS Institute Inc, 1992-1998.

Table I. Comparison of knowledge test scores

Topic area	n	Pre-test mean (SD)	Post-test mean (SD)	<i>p</i> ^a
Cardiovascular	24	6.6(1.6)	8.3(1.16)	0.0005
Endocrine	15	3.3 (2.0)	8.0(1.1)	0.0001
Respiratory	16	4.4(1.5)	7.2(1.1)	0.0002
GI/Rheumatology	13	3.5 (0.83)	6.5 (1.8)	0.0001
Clinical Skills II	28	14.1 (2.1)	17.8(1.5)	0.0001
Clinical Skills III	15	5.3 (0.90)	8.9(1.4)	0.0001

^a Paired t-test.

Table II. Comparison of participants' preparedness to provide specialty pharmaceutical care services.

Specialty services	n	Baseline mean (SD)	Follow-up score (SD)	<i>p</i> ^a
Cardiovascular	24	11.6(3.3)	14.5 (3.5)	0.01
Endocrine	24	7.0(1.9)	10.5 (1.8)	0.0015
Respiratory	24	3.9(1.5)	6.4(1.5)	0.0015
GI/Rheumatology	24	1.5 (0.89)	2.5 (1.3)	0.005

^a Wilcoxon Signed Rank Test.

RESULTS

Eleven students completed the pilot course, Clinical Skills II, during the spring of 1998. By Spring of 1999, twenty-eight students enrolled in the program. Three individuals withdrew during the pilot citing personal, technology and financial reasons. Sixty-eight percent were female; thirty-two percent were male. Sixty-one percent practiced in institutional or hospital settings, while 21 percent and 19 percent were employed by chain and independent pharmacies, respectively.

Twenty-four students who completed one to six courses and submitted both a baseline and follow-up test and survey were included in the data analysis. Only students completing a course were included in the data analysis for that particular course.

The results of the pre-test and post-test scores of knowledge in the six topic areas are presented in Table I. There was significant improvement in tests scores in all six courses compared to baseline ($P=0.0001$). A passing score was considered 70 percent, which would be a total raw score of 49 correct out of a possible 70.

Baseline and follow-up survey results describing the frequency of pharmaceutical care activities and perceived preparedness to provide specialty pharmaceutical care services are shown in Tables II and III. Analysis of the results revealed significant improvement in participants' perception of their preparedness to provide specialty services ($P < 0.01$). No significant changes were observed in the perceived frequency of activities such as obtaining history, identifying drug-related problems, or designing care plans among this group after completion of their coursework.

Students were asked to complete online course evaluations following completion of a module. Table IV presents a representative sample of the results from three of the six pilot courses. Students rated the course favorably with most responses between a score of 4 to 5, indicating they agree to strongly agree with the teaching techniques utilized in the online courses.

DISCUSSION

When embarking on a new technology it is important not forget about teaching goals and techniques. We recruited the assistance of our university computer and technology services to assist with Internet access, equipment recommendations for

faculty and students and converting some material to online instruction. This allowed the faculty to focus on teaching. Our program was developed to incorporate several learning paradigms. Online courses are very conducive to personalized learning. The structure of the courses permitted students to complete the required content in a timely manner. Collaborative learning was achieved through synchronous as well as asynchronous interactive chats. Use of the online format allowed course material to be as up to date as possible and presented in a variety of media to potentially enhance student learning.

It is a widely accepted view that distance learners are older than the typical undergraduate, female, likely to be employed full time, and married(16). This sample population was similar to the typical distance learner in they were primarily female and employed full-time.

Dropout rates from online programs have been estimated to range from 0 percent to 50 percent.⁵ This program had an attrition rate of 11 percent. One individual withdrew due to technology fears, one for financial reasons, and another due to personal work commitments. Reasons for the high retention rate among participants may be attributed to the structured, but personally flexible format of the program. The program provided a variety of learners' supports. Granger and Benke have stated that learner supports are very important to the success of online instruction(17). Support must be provided within the program and its delivery, and by the faculty.

Learner supports within the delivery of our program included a simple, standardized process for all courses. An orientation session prior to the start of coursework provided the student with an opportunity to use the software. Guidelines for hardware requirements were provided to standardize student and faculty computers and minimize compatibility problems. All pharmacotherapy courses followed a standard template for the syllabus and general course structure. This aided the participants in their approach to study the material. Exams and chats were scheduled to allow for advance planning. The use of FirstClass[®] course management software allowed for posting announcements and instructions, e-mail between faculty and participants, chat rooms, and posting of course material and

⁵Personal communication with Lynda Barner-West, Executive Director of Center of Academic Technology, Duquesne University, Pittsburgh, PA, May 1999.

Table III. Comparison of frequency of pharmaceutical care activities and attitudes

Activity	n	Baseline mean (SD)	Follow-up score (SD)	p ^a
Medication History	24	22.6 (6.9)	23.0 (5.9)	0.52
Assess Drug-Related Problems	24	28.9 (6.8)	29.5 (6.6)	0.86
Care Planning	24	9.8 (5.3)	10.5 (7.5)	0.78

^a Wilcoxon Signed Rank Test.

Table IV. Mean scores: Student evaluation of online courses^a

Evaluation criteria	Rheumatoid/GI n=8	Respiratory n=13	Clinical skills II n=24
The course objectives were satisfactorily accomplished	4.75	4.31	4.58
In general, the instructional methods employed in this course were appropriate	4.75	4.38	4.17
The chat sessions helped me to get the most from this class	4.63	4.38	4.08
The assignments helped me to get most from this class.	4.00	4.38	4.46
The design of this course let me learn at my own pace.	4.75	4.31	4.44
The assigned readings contributed to learning	4.50	4.54	4.44

^a 5= Strongly agree; 4= Agree; 3=No strong feeling; 2=Disagree; 1=Strongly disagree.

assignments. The history feature of this software allowed instructors to track students' access to course folders. In many cases this allowed instructors to identify students that may be having difficulty with the technology or material. Students were routinely provided with instructions in case of technology failure.

Learner supports were also provided within the content of the course. Use of the student own site-specific cases allowed for increased application of course material to the real world. Based on student comments, we feel this enhanced student's motivation and confidence by building on relevant personal experiences. In order to create a sense of community, students were encouraged to communicate with each other online using private chat or the open forum of FirstClass[®].

Faculty support for the students was provided through the use of immediate feedback via e-mail, a mentoring program, and online office hours. A special chat session with the dean also provided a sense of community. To assure that faculty members were equally prepared for online teaching, they were required to attend an orientation session regarding the use of online instruction and FirstClass[®]. Additionally the program administrator met with all faculty members involved in the project to assure compliance with the proposed structure of the program and assisted them with the conversion of their course material to an online format.

Based on the preliminary results of our pilot project, we demonstrated that this type of program was successful in enhancing knowledge and participants' perceived preparedness to provide specialty pharmaceutical care services. However, this does not necessarily correlate with the ability to perform such services. Ideally direct observation of proficiency would be the ultimate marker of success. Test scores of knowledge improved significantly after completion of the courses. By the end of the project, participants felt they were very well prepared to provide cardiovascular services such as blood pressure monitoring and conduct smoking cessation programs, had fair to good preparations for blood glucose, cholesterol and peak flow monitoring, and fair preparation for H. pylori screening.

However, there was no significant change in the frequency of pharmaceutical care provided as a result of the first six courses in the program. Many factors are involved in changing the behavior of pharmacists with respect to pharmaceutical care. First, the evaluation was obtained six to twelve months after beginning the program. This may be too short a time peri-

od to detect any significant changes. Recently, Barner and Bennett have described time as a one of the major barriers of actual implementation of pharmaceutical care into practice(18). External factors such as workflow issues, staffing, reimbursement, attitudes of managerial staff, and restriction of the work environment may play a role. Unfortunately these were beyond the control of the project. Future studies should focus on long-term follow-up to assess the impact of such programs on practice.

Another possible reason why no significant changes were observed in perceived pharmaceutical care activities involves characteristics of the sample. It is possible that this sample was a select motivated group who believed they were already performing many aspects of pharmaceutical care. This is evident by the relatively high baseline scores for pharmaceutical care activity. At baseline, participants felt that they obtained medication histories and evaluated drug-related problems for 50 percent to 75 percent of their patients and developed care plans for 25 percent of the patients.

In addition to the previously mentioned limitations of the program evaluation, there are weaknesses to the use of self-report in the survey as a method of assessment of pharmaceutical care activities. Thus, the survey reflects the perception of participants. Direct observation of student performance is a generally a more reliable measurement of attainment of practice-based competencies. Case based questions were utilized in the pre-tests and post-tests of knowledge. As stated previously, student performance in each course was also evaluated by participation in chat and completion of care plans, but only pre-test and post-test scores were feasible for the overall project evaluation.

Students' comments from the course evaluations were very favorable about the program and its structure. Participants felt that online learning was a much richer and efficient way of learning. They felt that the instructional methods increased their problem-solving abilities and improved how they approached patients.

Faculty members that were involved in the program were solicited for comments regarding their online teaching experiences. Most faculty members felt that online teaching was a fun way to teach. They enjoyed the dynamic nature of online chats, but felt that two-hour chats were initially physically and mentally exhausting for the instructor. The overall perception, based on previous student performance, was that students were

learning as well as face -to-face students. However, no formal comparison was made. The greatest fear from a few faculty members was conversion of their existing material to a Web-based format, but these were dispelled as they became involved in the program.

As with anything innovative and new, there are hurdles that must be overcome. From our experience, strong support from the Dean, a program administrator, computer training for students and faculty, and a back-up plan for technology failures make these hurdles easier to cross.

CONCLUSION

The first six courses of this online program were successful in increasing the knowledge and perceived preparedness of participants to provide pharmaceutical care. However, they did not begin to integrate these activities into their workplace during the six-month evaluation period. The success of these six courses provided the stimulus for the development of the entire online Doctor of Pharmacy program. Most students who participated in this project would not have access to the degree if an online option were not available. Participants felt that the online program facilitated more active and enhanced learning and met their needs as adult distance learners.

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APPENDIX A. SURVEY OF PHARMACEUTICAL CARE ACTIVITIES

Type of Pharmacy

- a. Chain
- b. Independent/community
- c. Hospital/institutional

Pharmaceutical Care Activities

Indicate the percentage of patients for which you complete the following

	100%	75%	50%	25%	0%
Rank	5	4	3	2	1

Perform a patient history to obtain information on:

- a. current prescription drugs
- b. OTC medications
- c. Age
- d. disease states
- e. allergies or adverse reactions
- f. medication effective

Screen for drug-related needs or problems such as:

- a. needs additional therapy
- b. unnecessary drug therapy
- c. inappropriate dose, route, schedule or dosage form
- d. adverse drug reaction
- e. inappropriate drug for the patient's condition
- f. noncompliance
- g. drug-drug interactions/drug-food interactions
- h. not responding to medications

Design and document a patient care plan which:

- a. documents drug therapy problems
- b. establishes therapeutic outcomes for each problem
- c. solution to each problem
- d. includes a monitoring plan
- e. outline patient follow-up

Preparedness to Provide Specialty Services

Using the following scale, describe how well prepared you feel to provide the following services:

	Very Well	Good	Fair	Poor	Not at all
	5	4	3	2	1

Cardiovascular

1. Pharmacy performed blood pressure screening
2. Pharmacy performed blood pressure monitoring and follow-up
3. Blood cholesterol assessment
4. Smoking cessation program

Endocrine

5. Blood glucose assessment
6. Bone density measurement
7. Other diabetes care services

Respiratory

8. Peak flow monitoring
9. Other asthma management services

GI/Rheumatology

10. *H. pylori* screening