

Implementation and Assessment of an Introductory Pharmacy Practice Course Sequence

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ABSTRACT. This article describes the development, implementation, and assessment of a pharmacy practice course sequence occurring early in the curriculum. The sequence includes three consecutive courses. Material included is meant to build skills such as prescription interpretation/validation, communication, documentation, IV preparation, and compounding. It is meant to be cumulative, to supplement courses running concurrently, and to prepare students for later courses. Student performance is assessed based on laboratory activities/assignments, written examinations, and cumulative laboratory practical examinations. Students' perception of learning is assessed using the School's standard course evaluation form. Feedback was overwhelmingly positive. Further investigation is needed to determine the long-term effects that the redesigned sequence has had. doi:10.1300/J060v14n01_02 [Article copies available for a fee from The Haworth Document Delivery Service: 1-800-HAWORTH. E-mail address: <docdelivery@haworthpress.com> Website: <<http://www.HaworthPress.com>> © 2007 by The Haworth Press, Inc. All rights reserved.]

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INTRODUCTION

The “practice of pharmacy” is defined by each individual state Board of Pharmacy and/or legislature. While traditional definitions focused solely on the preparatory and dispensing roles of the pharmacist (dispensing, compounding, and interpretation and evaluation of prescriptions), current Pharmacy Practice Acts broaden the definition significantly (1). For example, the various Pharmacy Practice Acts define the practice of pharmacy to include a number of services: interpretation and evaluation of prescriptions or drug orders, dispensing medications, drug/device selection, drug administration, drug regimen reviews, performing capillary blood tests and interpreting the results, providing patient counseling, administering medications, and managing drug therapy (2,3). To prepare Doctor of Pharmacy candidates to practice pharmacy according to these definitions, the 2007 Accreditation Council for Pharmacy Education (ACPE) Accreditation Standards and Guidelines simply state that students should be able to provide “patient centered care”(4). There are basic skills that must be mastered prior to moving on to more advanced coursework and practice experiences, and these skills are often not included elsewhere in pharmacy curricula. Working under the 1997 ACPE Accreditation Standards and Guidelines, a course sequence addressing many of the skills identified in Standard 10 as being related to “pharmacy practice” was developed and implemented into the curriculum at a new School of Pharmacy in 2003. These skills include prescription processing, compounding and preparation of dosage forms, including parenteral products, drug distribution and administration, physical assessment, patient evaluation, ordering medications, disease state management, outcomes documentation, and literature evaluation (5).

BACKGROUND AND RATIONALE

An internet search of curricula showed that many colleges and schools of pharmacy offer a course or course sequence related to basic practice skills, with titles such as “Pharmacy Skills,” “Pharmacy/Pharmaceutical Care,” “Pharmacy Practice,” and “Professional Practice.” Syllabi from sixteen such courses were reviewed. All of these courses/sequences are associated with laboratory time, ranging from just a few hours during a semester to over half of the time allotted to the course. A majority of the courses were found to be offered at the end of didactic

coursework as a capstone experience prior to beginning Advanced Pharmacy Practice Experiences (APPE), and incorporated disease state management and complex patient care into the course. For the most part, the laboratory activities reinforced basic skill sets, as opposed to introducing them.

The necessity of early mastery of certain skills for successful completion of core coursework in medicinal chemistry, pharmacology, therapeutics, and the Introductory Pharmacy Practice Experiences (IPPE) was the basis for offering an introductory pharmacy practice course sequence very early in the Pharm.D. curriculum. Colleges and schools of pharmacy that offer this type of early course/sequence incorporate activities addressing topics ranging from basic and pharmaceutical sciences, such as anatomy and physiology, pharmaceutics, medicinal chemistry, and pharmacology to various pharmacy practice skills, such as communication with patients and healthcare providers; dispensing skills, including interpretation and verification of prescriptions; compounding and sterile products preparation, documentation, and drug information.

DESIGN

In early 2004, a committee was assigned to evaluate and redesign South University's Professional Practice sequence. The sequence had been offered only once before in the first three quarters of the first professional year. This curricular change was sparked by the completion of the School of Pharmacy's building, making more classroom and laboratory space available for instruction of the course. Based upon review of other practice skills course, it was decided that this sequence should remain at the beginning of the curriculum as there is another sequence, Applied Pharmaceutical Care I & II, that serves as capstone courses later in the curriculum. In addition, individual preceptors were questioned regarding what skills they felt were imperative for a practicing pharmacist to have. The purpose of the redesigned Professional Practice sequence was to introduce students to the skill sets necessary to provide comprehensive pharmaceutical care. These skill sets might not be covered in detail elsewhere in the curriculum, and yet are still vital in completing other coursework.

The committee became concerned that the Professional Practice sequence would become a dumping ground for material where there was not time to cover elsewhere in the curriculum. Therefore, course objec-

tives were selected from the School of Pharmacy's *Educational Outcomes Assessment* document. A rational sequencing of topics was implemented based upon the course objectives, as well as how topics were ordered in similar courses at other programs. Additionally, while the three courses in the introductory sequence were designed to build upon each other, the somewhat independent sequencing of topics allows students to remediate one course while being enrolled in the subsequent course. This was necessary due to accelerated three-year program at South University's School of Pharmacy.

The purpose of this article is to describe the redesigned sequence and its implementation, and to assess its strengths and weaknesses. Though created under the auspices of the 1997 ACPE Standards, this sequence should meet the guidance provided in ACPE's *Standards 2007*.

DESCRIPTION OF THE INTRODUCTORY PROFESSIONAL PRACTICE SEQUENCE

Professional Practice I & Informatics (PPI)

Prior to the curricular change, Professional Practice I existed as its own 1.5 quarter-hour course in the first quarter of the first professional year. Introduction to Informatics was offered in the third quarter of the same year. It was quickly evident through student evaluations and activities that the skills and concepts introduced in Introduction to Informatics were needed by the students earlier in the curriculum. The 1.5 hours Introduction to Informative was incorporated into the Professional Practice sequence, and the first course in the sequence was renamed (PPI).

The course objectives for PPI are described in Table 1. Each week students have two hours of didactic lecture and one hour (3 contact hours) of laboratory. Lectures and laboratory activities are designed to reinforce these objectives. The course schedule for PPI is described in Table 2. The first half of the course deals specifically with general skills necessary prior to introducing more advanced pharmaceutical care, such as using computer technology (including Microsoft Office applications, e-mail, and web-based means of communicating), interpreting prescriptions and medication orders, medication errors, documentation and history taking, and patient counseling techniques. The second half of the course introduces students to the various literature sources and the proper use of each. Many of the skills and concepts introduced at this time are reinforced repeatedly later in the sequence and in the gen-

TABLE 1. Course Objectives

Professional Practice I and Informatics
<ol style="list-style-type: none"> 1. Accurately and legally process drug orders: interpret and evaluate prescriptions, compound, prepare, package, and dispense medications. 2. Communicate with patients and provide counseling regarding the purposes, uses, and effects of medications, related therapy, and general health promotion. 3. Manage and utilize systems, technology and personnel to support, build and enhance the practice of pharmacy including storage, preparation, dispensing and administration of medicines. 4. Collaborate with other health professionals in patient care, scholarship, and service. 5. Evaluate and document interventions and pharmaceutical care outcomes. 6. Retrieve, evaluate, manage and communicate professional information and literature.
Professional Practice II
<ol style="list-style-type: none"> 1. Communicate with patients and provide counseling regarding the purposes, uses, and effects of medications, related therapy, and general health promotion. 2. Collaborate with other health professionals in patient care, scholarship, and service. 3. Retrieve, evaluate, manage and communicate professional information and literature.
Professional Practice III
<ol style="list-style-type: none"> 1. Accurately and legally process drug orders: interpret and evaluate prescriptions, compound, prepare, package, and dispense medications. 2. Communicate with patients and provide counseling regarding the purposes, uses, and effects of medications, related therapy, and general health promotion. 3. Manage and utilize systems, technology and personnel to support, build and enhance the practice of pharmacy including storage, preparation, dispensing and administration of medicines. 4. Collaborate with other health professionals in patient care, scholarship, and service.

eral curriculum, such as prescription interpretation, patient counseling, documentation, and the informatics topics. In addition, students are introduced to medical terminology through self-study materials and exercises.

Students are assigned a grade for this course based upon a number of factors. Two written examinations were given over the didactic portion of the course as well as the first 60 of the Top 100 drugs, accounting for 40% of the course grade. Weekly written laboratory activities account for 20% of the course grade, as do in-class assignments given during the lecture periods. Ten percent of the course grade is from the Lab Practical Exam. The final 10% of the course grade stems from professional behavior, which is assessed through active participation in class and laboratory, and also includes punctuality, proper dress, and general attitude. The medical terminology portion of the course involves self-study, and an exam is given mid-quarter, which is pass/fail.

Professional Practice II (PPII)

This one-hour laboratory course allows students the opportunity to interact with patients in the form of community screening events. Lab

activities prior to the screenings introduce students to some of the major disease states that they will encounter in practice, along with the devices associated with the diseases. The course schedule is detailed in Table 2. Patient counseling is once again stressed through the Top 100 drug list, and as students learn to check blood pressure, blood glucose, lipids, and peak expiratory flow, and to use various dosing devices (nasal sprays, inhalers, patches, auto-injectors, ophthalmic products, otic products). The objectives for the course, as stated in the syllabus detailed in Table 1.

This course runs concomitantly with the Communications for Pharmacists course. PPII, through use of patient screenings, reinforces many of the theories presented in the Communications course, through the Communications course assignments require students to analyze their encounters with patients at the screening events.

Sixty percent of the grade for PPII stems from weekly written laboratory assignments targeted to relate the topic to course objectives. Twenty percent of the grade comes from active participation in the assigned community screenings, and the remaining twenty percent is from the Lab Practical Exam.

Professional Practice III (PPIII)

This one quarter hour laboratory course incorporates knowledge gained in the previous two quarters, as well as topics covered in Pharmaceutics I and II, to introduce students to extemporaneous compounding and sterile product/IV preparation. The course schedule is detailed in Table 2. The topics covered in this course are carefully timed with the topic schedule for Pharmaceutics II, to ensure that the material is reinforcing, and not introducing, the material therein. Each week, students are given two to three prescriptions or orders for drugs that must be prepared or compounded. Each prescription/order then must be interpreted (including all relevant calculations), prepared, labeled, and dispensed, and the "patient" (usually a faculty member) must be counseled on both the drug(s) and the dosage form(s). The drugs used are on the Top 100 list, and the formulations are basic and relatively common, based upon surveys of local pharmacy employees. The objectives for the course, as stated in the course syllabus, are detailed in Table 1. The grade for this course is assigned based upon pre-lab assignments (40%), lab products (pharmaceutical elegance, proper labeling, etc.; 25%), Lab Practical exam (30%), and professional participation (5%).

TABLE 2. Sequence of Topics

Professional Practice I & Informatics	
<i>Lectures</i>	<i>Corresponding Labs</i>
<ul style="list-style-type: none"> • Introduction to Professionalism and the Course 	<ul style="list-style-type: none"> • Meet Your Computer
<ul style="list-style-type: none"> • Introduction to Pharmaceutical Care 	<ul style="list-style-type: none"> • N/A
<ul style="list-style-type: none"> • What is a prescription? • What is a medication order? 	<ul style="list-style-type: none"> • Medical and Prescription Abbreviations Game • What is a Prescription/Medication Order?
<ul style="list-style-type: none"> • Medication Errors 	<ul style="list-style-type: none"> • N/A
<ul style="list-style-type: none"> • Blood-borne pathogens and OSHA requirements 	<ul style="list-style-type: none"> • N/A
<ul style="list-style-type: none"> • Patient Counseling/Communication • Medication History • Documentation: Reading Medical Charts • Documentation: SOAP notes 	<ul style="list-style-type: none"> • History Taking, Patient Counseling, and Documentation
<ul style="list-style-type: none"> • Informatics—Introduction to Informatics • Informatics—Tertiary Literature • Informatics—Secondary Literature 	<ul style="list-style-type: none"> • Using Tertiary and Secondary Literature
<ul style="list-style-type: none"> • Informatics—Basic Study Design • Informatics—Basic Biostatistics • Informatics—Internet Resources 	<ul style="list-style-type: none"> • Using Primary Literature and Internet Resources
Professional Practice II	
<i>Labs</i>	<i>Community Screenings</i>
<ul style="list-style-type: none"> • Hypertension • Hyperlipidemia 	<ul style="list-style-type: none"> • Healthy Heart Screening
<ul style="list-style-type: none"> • Asthma 	<ul style="list-style-type: none"> • N/A
<ul style="list-style-type: none"> • Diabetes 	<ul style="list-style-type: none"> • Diabetes Risk Assessment and Glucose Screenings
<ul style="list-style-type: none"> • Introduction to the Business of Pharmacy 	<ul style="list-style-type: none"> • N/A
<ul style="list-style-type: none"> • Miscellaneous Dosing Devices 	<ul style="list-style-type: none"> • N/A
Professional Practice III	
<i>Labs</i>	<i>Product(s)</i>
<ul style="list-style-type: none"> • Introduction to Compounding Lab Facilities, Equipment, and Techniques 	<ul style="list-style-type: none"> • N/A
<ul style="list-style-type: none"> • Sterile Technique and chemotherapy (inc. 1-hour introductory lecture) 	<ul style="list-style-type: none"> • IV Admixtures
<ul style="list-style-type: none"> • TPN (inc. 1-hour introductory lecture) 	<ul style="list-style-type: none"> • Pediatric TPN (manual)
<ul style="list-style-type: none"> • Liquid Dosage Form 	<ul style="list-style-type: none"> • Oral suspension • Topical lotion • Elixir • O/W Emulsion
<ul style="list-style-type: none"> • Topical Semisolids (Gels, Ointments, Creams, and Pastes) 	<ul style="list-style-type: none"> • PLO gel • Paste • Ointment
<ul style="list-style-type: none"> • Suppositories and Powders 	<ul style="list-style-type: none"> • Rectal suppositories • Urethral suppositories • Powder charts

Lab Practical Examinations

Each quarter a practical final exam is given. This exam is cumulative over material covered in prior quarters, thus building on skills gained earlier in the course. The exam is built into the grade for each individual course. The exam in PPI involves four primary skill sets:

1. Prescription interpretation, validation, and labeling. A series of “prescriptions” is displayed to students. They must interpret the prescription directions, perform a necessary calculation, determine its legitimacy, and prepare a proper label.
2. Documentation. Students are asked to locate certain facts in a medical chart or medical history form. The exam also includes scenarios that they must document in the form of a short SOAP note.
3. Informatics. Students are presented with specific questions, the answers to which they are directed to find using a provided reference.
4. Patient counseling. Students must counsel a faculty member on one of the first sixty of the Top 100 Drugs list (chosen randomly by faculty member).

The exam in PPII also involves the four skill sets listed above, with students counseling on drugs 61-80 from the Top 100 Drugs list. In addition, students must show proficiency in checking blood pressure and blood glucose, and must counsel a faculty member on two dosing devices chosen at random by the faculty member. The exam in PPIII involves students being given an order for an IV medication and a prescription for a compounded medication, both of which must be interpreted, calculated, properly prepared and labeled. The student must then counsel the faculty member on each product. The drugs used in these formulations are from 81-100 of the Top 100 Drugs list.

Resources Needed

Resources, in the form of faculty time and supplies, must be planned well in advance to avoid shortages of either. At South University’s School of Pharmacy there were approximately seventy students per class, resulting in two three-hour lab sections each week. Therefore, in PPI, there are 2 lecture hours each week and 6 hours of lab time that must be covered by faculty. There are also six lab hours each week in

both PPII and PPIII. It is optimal to have at least two faculty members present for all lab activities, and four faculty members are necessary for administration of the lab practical exam. Planning and set-up of lab activities require approximately two hours each week, and evaluation/grading of lab assignments requires another two to three hours weekly. Furthermore, one or two “practice sessions” are provided to the students each quarter, prior to the lab practical examination. These sessions allow students added exposure to all lab activities that were completed over the quarter, and to the equipment and procedures used. With such a large requirement of faculty time, involvement of the administration was necessary to ensure a fair and balanced allocation of time that participating faculty members spent on the course.

Supplies must also be budgeted and obtained, including the medical and dosing devices used in both the labs and screenings in PPII, as well as the ingredients and hardware necessary in PPIII. Many of the supplies used in PPII are available as demonstrations or samples from the manufacturers, including blood glucose monitoring supplies, peak flow meters, and the various dosing devices. However, manufacturers must be contacted with adequate time in advance to allow the supplies to be shipped to the school. It is ideal to work with the Pharmaceutics department when considering ingredients and supplies for PPIII, so that no duplication occurs.

ASSESSMENT

Student Performance and Perceptions

Student performance for each course is evaluated based upon examinations and laboratory and in-class activities. The Professional Practice sequence has been offered twice since the redesign. The students evaluated the course based upon ten “Course Core Items” that are applied to every course at the School of Pharmacy, and upon the educational outcomes, as presented in the course syllabi (Table 1). The results of these evaluations have been overwhelmingly positive. A vast majority of students (>90%) agree or strongly agree that the Core Items and individual course objectives were adequately met each quarter. Student comments reflect an appreciation for both the practical nature of the didactic material (in PPI) and for the hands-on application of the laboratory activities throughout the sequence. They also expressed gratitude for coordinator

and instructor accessibility and for defined learning objectives for each lecture and laboratory activity.

Several suggestions for improvements made by students were implemented after the first time through the sequence. These involved the timing and sequencing of topics and examinations. For example, it was requested that course coordinators provide medical terminology resources to the students as early as the summer prior to matriculation to allow those who desire more time to prepare for that portion of PPI. The screening events in PPII have been restructured to only take place twice during the quarter, as there were originally four screening days, which the students felt was overwhelming. In place of the screenings, more lab activities were added to the course, such as asthma, dosing devices, and an introduction to pharmacy business. Lastly, only the Lab Practical is administered in PPII and PPIII, as opposed to an additional written final exam, as was initially required.

Faculty Feedback

The majority of the Pharmacy Practice Department at the School of Pharmacy has taken part in some aspect of the redesigned sequence, including offering lectures, designing and facilitating laboratory activities, and serving as either a proctor or “patient” for labs and Lab Practical examinations. The different practice settings and levels of experience of the faculty helps to ensure that skills included in the course are relevant for all practitioners. One faculty member who has worked in both internal medicine and primary care believes that the hands-on experience is valuable for students, and that it serves to help them know what to expect later in their careers. Some of the participating faculty did feel, however, that the time requirement for the course could be somewhat overwhelming for them, as “teaching” just one topic in the course involved at least one hour of lecture time and six hours of lab (2 lab sections of 3 hours each). A benefit of this investment of faculty time, however, is that it allows faculty to interact closely with the new students at a time in the curriculum where they might not have a lot of exposure to Pharmacy Practice faculty.

DISCUSSION

Sequence Outcomes

While student course evaluations and faculty feedback were positive, we do not yet know the overall impact that the changes have had. The

first class to participate in the redesigned sequence began their Advanced Pharmacy Practice Experiences (APPE) in October 2006, and the second class began their Introductory Pharmacy Practice Experiences (IPPE) in August 2006. The course sequence did address most of the areas identified in a survey by Cherson et al. that preceptors stated were important skills in practice: patient counseling, interpretation and verification of prescriptions, drug information skills, communication with health care professionals, prescription processing, and documentation of interventions (6). Many of these areas, namely the technical, traditional aspects of pharmacy practice, are among those identified as deficient by IPPE preceptors for the class of students prior to the revision. It will be necessary to compare the preceptors' perceptions of the students' skills in the provision of pharmaceutical care to those of the previous class, to determine what impact, if any, the redesigned sequence had overall. The two later classes both reflect a higher retention rate than their predecessors, but this can not be attributed to any one factor. However, it is possible that the redesigned introductory material of the Professional Practice sequence may have helped better prepare them for their later coursework.

Limitations

One of the biggest limitations of this course is its introductory nature. By definition, this means that it falls early in the curriculum, prior to the students building a strong knowledge base. Designing effective activities that are of the appropriate depth is very challenging. Students with significant work experience often get frustrated at the "basic" nature of some of the exercises, while those with no experience feel that too much is being asked of them at such an early point in their education. One suggestion that has been made is to assign laboratory partners based upon their amount of pharmacy experience, allowing those with more to help those with less.

While many of the skills involving the distributive functions of a pharmacist are covered during the sequence, this course could not take the place of a "dispensing laboratory," where the students are given access to computers with pharmacy software, patient profiles, and actual drugs. There is not sufficient time in this sequence to incorporate these skills.

Lastly, although it is a Pharmacy Practice course, the support of the other departments at the School is vital to its success. There were many instances where overlap was able to occur (such as with Communica-

tion for Pharmacists and the Pharmaceutics courses), but such opportunities were not actively sought by either department.

Where Do We Go From Here?

After the first time through the redesigned Professional Practice sequence, the School's Curriculum Committee further compared many aspects of the curriculum with that of other schools and colleges of pharmacy. It was determined that there still was not enough focus in the School's curriculum on the more traditional aspects of pharmacy practice: prescription interpretation, verification, and processing. Furthermore, it was decided that, with an integrated curriculum when it came to medicinal chemistry, pharmacology, and therapeutics, and in accordance with the 2007 ACPE Accreditation Standards and Guidelines, an attempt should be made to also integrate the earlier coursework and laboratory activities (4). A new course, Integrated Pharmacy Skills Lab, has been designed and was implemented in Fall 2006 with the matriculating class. This new lab will involve a longitudinal lab experience to span the entire curriculum, integrating and reinforcing aspects from all courses in the curriculum. It will expand many of the activities previously covered in the Professional Practice sequence, and will also incorporate activities in pharmaceutics, pharmaceutical analysis, pharmacokinetics, and pharmacoeconomics. It is being designed to offer students a very "real life" experience in the School's mock pharmacy and/or clean room, where they are presented each lab day with a scenario that will require the use of many of the skills necessary in various practice setting, including the actual dispensing of drugs, which has been lacking until now. As the students gain a larger base of knowledge regarding drugs and patient care, the scenarios will become more complex.

CONCLUSION

A majority of Schools and Colleges of Pharmacy offer a course or course sequence that addresses most of the topics that were covered in the Professional Practice sequence described here. However, the rational sequencing of topics and design of supporting activities is imperative for student learning and retention of the material, and definite objectives for the course must be decided upon prior to implementation. According to students who have completed this Sequence, the predetermined objectives were all achieved. The faculty who did participate are

happy with the structure of the courses, although the actual outcomes of the sequence will not be seen until the students who were enrolled complete their Introductory and Advanced Pharmacy Practice Experiences. For successful implementation of such a sequence, a large number of faculty from all departments should participate or have input into the course(s). In addition, careful consideration of supplies to be ordered must occur well before the implementation of the course. Lastly, it is important that, like any course in a dynamic curriculum, a course or sequence such as the one described here be adaptable to new ideas and requirements, while still maintaining the overall objectives set forth.

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