Evaluation of Pharmacy Students' Abilities to Provide Pharmaceutical Care

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This paper describes an educational project intended to evaluate pharmacy students' abilities to provide direct patient care utilizing the pharmaceutical care process. Fourteen students enrolled in an elective course and provided care for 18 patients throughout spring quarter 1998. There were a total of 61 drug therapy problems identified in this patient population. The Assurance Patient-Centered Pharmaceutical Care Program (version 1.5.0) offered by Health Outcomes Management, Inc. was utilized to document care provided including the delivery of a Personal Pharmaceutical Care Plan to the patient. Trial compensation claims and carrier invoices were prepared and submitted as part of this project. Student evaluations of the project indicated that this was an important opportunity to draw upon all aspects of their pharmaceutical care curricular preparation to care for actual patients. Students enrolled in this course unanimously recommended that all pharmacy students with an ambulatory care/general practice interest have this patient care experience serve as the focus for their third professional year laboratory instruction. The results of this project indicate that the establishment of student-driven, faculty-observed pharmaceutical care clinics within schools and colleges of pharmacy can help to effectively prepare students for the challenges of an active pharmaceutical care practice.

BACKGROUND

Pharmaceutical care is a practice in which the practitioner takes responsibility for a patient's drug-related needs and is held accountable for this commitment(1). Preparing students to serve society in this capacity will require a conceptual framework different from that used to prepare pharmacists currently in practice. A revised model for pharmaceutical education is needed to meet the challenges of producing graduates who are patient-centered providers of pharmaceutical care.

Significant time and energy will be required to prepare the next generation of pharmacy students to practice pharmaceutical care. A set of assumptions to guide the building of a new framework for the curriculum to prepare students has been proposed in Chapter 9 of *Pharmaceutical Care Practice* by Cipolle, Strand and Morley(2). These assumptions are as follows:

1. The primary objective of the educational program is the preparation of a health care practitioner who can contribute to society in a meaningful, measurable manner, and those responsible for the program are to be held accountable for meeting this objective.
2. The educational program has as its focus a single, specific, professional practice which can be explicitly and clearly articulated. Faculty must understand and teach to the same practice.
3. The specific practice is pharmaceutical care. It must be understood completely and at an intellectually sophisticated level by both faculty and administration. This practice must be agreed to and accepted by fac-

ulty and practitioners as the basic generalist practice, a primary care practice. The specific philosophy of practice, patient care process and practice management system described herein(2).

4. The content of the educational program must reflect practice as described by actual patient care experience and data generated by practitioners providing pharmaceutical care.
5. The education program should be constructed in an orderly, logical, systematic, and comprehensive manner. This is necessary for the program to be internally consistent and externally valid. This also makes it possible for those responsible to be held accountable.
6. To be complete, and to succeed at producing a practitioner who can care for patients, the program must have the following:
   - A clearly defined and consciously constructed culture
   - Relevant and complete content
   - Appropriate teaching/learning methods designed for the specific content of the program
   - An appraisal process that holds all participants accountable

Although forming a consensus on these assumptions and acting to implement them in academe may represent different challenges, the profession's mandate to reduce and prevent drug-induced morbidity and mortality suggests that the care of patients should serve as a focus for the students' curricular preparation.

Pharmaceutical educators and colleges of pharmacy have been actively scanning the health care environment to identify, analyze, and predict those changes likely to profoundly influence pharmacy practice, pharmacy education and research(3). The University of Minnesota College of Pharmacy is one institution that has been preparing for changes in the health care environment. The pioneer class of 1999, starting in the fall of 1996, commenced a revised entry level Pharm.D. curriculum geared toward enabling students to practice pharmaceutical care well into the future. First professional year students begin their education with formal pharmaceutical care coursework. The material taught in other didactic courses is then integrated through simulated, real-life practice experiences in a newly designed, renovated, and state-of-the-art Pharmaceutical Care Laboratory.

The new curriculum at the University of Minnesota College of Pharmacy(4) includes:

1. three years of pharmaceutical care laboratory experiences;
2. early exposure to the practice and concepts of phar maceutical care;
3. increased integration of basic science and pharmacotherapy courses;
4. emphasis tracks in the third and fourth years;
5. emphasis on common diseases and drug therapy problems; and
6. pharmaceutical care clerkships.

Students engage in simulated pharmaceutical care interactions as an integral portion of their laboratory experience beginning with first quarter instruction at the University of Minnesota College of Pharmacy. Faculty and teaching assistants serve as the patient for these simulated interactions. Students then review their own performance in the simulated pharmaceutical care interaction with faculty to determine their command of the Pharmacist's Work-up of Drug Therapy(2,5). Simulated pharmaceutical care interactions are intended to provide the student with a frame of reference for progressing toward the development of their own systematic and comprehensive problem-solving process. By the end of the student's second professional year they will have engaged in 15-20 simulated interactions (including at least two videotaped sessions) designed to achieve this goal.

The laboratory practice facilities at the University of Minnesota College of Pharmacy were rebuilt in 1995. A total of $450,000 was dedicated to design and build a pharmaceutical care laboratory in place of the previous dispensing laboratory facilities. The 2,500 square foot Pharmaceutical Care Laboratory is designed to focus on four skill areas: (*i*) community/ambulatory, (*ii*) hospital inpatient, (*iii*) compounding, and (*iv*) intravenous admixture. The mission of the Pharmaceutical Care Laboratory is to facilitate pharmaceutical care practice through education, research and service. Figure 1 presents the general floor plan for this facility.

Description of the Project

Pharmacy students at the University of Minnesota have generally rated the laboratory component of the curriculum as being beneficial to their education, however, suggestions for improvement include utilizing actual patients to develop students' patient assessment, care planning and evaluation skills. Prior to the initiation of this project there were discussions among faculty of how feasible it would be to have students engage in the entire patient care process from initial assessment through documentation to follow-up evaluation and billing. There was a need to conduct a small study, outside existing laboratory instruction time, to determine how the concept of a student-driven pharmaceutical care clinic at the College of Pharmacy would actually operate. It was at this time that an announcement appeared on the availability of an individual study grant from the District Five National Association of Boards of Pharmacy (NABP) and American Association of Colleges of Pharmacy (AACP), "to study a topic that benefits students, pharmacy education or pharmacy practice."

The research described here originated directly from this District Five NABP/AACP grant. The purpose of this project was to provide third professional year pharmacy students with the opportunity to provide pharmaceutical care directly to patients under observation of experienced faculty at the University of Minnesota College of Pharmacy. No dispensing-related services would be provided and care would be administered in the patient consultation rooms of the Pharmaceutical Care Laboratory at times when there was no other instruction scheduled in these facilities.

The goals of this Pharmaceutical Care Clinic project were to:

1. provide pharmacy students with opportunities to apply their assessment, care planning and evaluation skills to the care of actual patients;
2. prepare and deliver a Personal Pharmaceutical Care

Plan(2) to each patient after the student's follow-up evaluation was completed and documented;
3. create and submit a resource-based relative value scale (RBRVS) trial compensation and billing claim; and
4. evaluate the student's performance using pharmaceutical care process criteria.

One of the driving forces for this educational initiative was to prepare students to make valuable contributions in pharmaceutical care practices. It is envisioned that the student will understand the fundamental components necessary to provide pharmaceutical care if the following educational activities occur: (*i*) conduct comprehensive assessments with actual patients; (*ii*) document care using the Health Outcomes Management, Inc. patient care software program that facilitates assessment; (*iii*) create and implement care plans; (*iv*) complete follow-up evaluations; (*v*) deliver a Personal Pharmaceutical Care Plan to the patient; (*vi*) prepare a patient care billing claim and invoice; and (*vii*) present cases to peers.

The Importance of Patient Care Experiences in a Controlled Setting

It is envisioned that students will be able to care for patients at the highest level possible early in their practice careers. In the text *Pharmaceutical Care Practice* Cipolle and colleagues have defined the 100 percent practice level in terms of a complete and comprehensive pharmaceutical care practice(2). Experiential patient care clerkships and rotations are intended to help achieve this goal, but there are no assurances that the 100 percent level of pharmaceutical care will be provided. Experiential programs are designed so that the student can observe, and then replicate, "practice perfect" when preceptors demonstrate and teach exemplary pharmaceutical care practice without taking short cuts, jumping to conclusions or being less than comprehensive.

It may seem redundant to bring patients into a controlled setting such as this Pharmaceutical Care Clinic when a student could experience patient care in a practice clerkship. The following reasons are presented for adding this Pharmaceutical Care Clinic component to the student's clerkship and rotation experiences. First, the student can experience patient care without the normal interference of practice. This is important when learning the "proper" way to care for a patient. The student needs this uninterrupted opportunity to get comfortable with this new responsibility. In addition, this practice is new and the student must know the practice well enough to be able to shape his/her environment. This takes focus and concentration.

This controlled environment also allows for extensive feedback from the patient and the experienced faculty support preceptor. This is also important when first learning the practice. And finally, just as all other health educators have discovered, if the student is not given a "gold standard" against which to evaluate the real practice environment, the student may accept whatever he or she finds in practice instead of working to change it for the better. Effectiveness is the primary goal when the student is learning to care for patients. The temptation to try and introduce efficiencies of care must be avoided to afford the student an opportunity to establish a therapeutic relationship with each patient, conduct a comprehensive assessment, create a mutually-agreed upon care plan, and evaluate the patient's status and clinical outcomes, all conducted at each student's own learning pace. Providing the student with another "experiential venue" (in addition to clerkship rotations, externships, etc.), through a student-driven pharmaceutical care clinic experience, to provide this "gold standard" of care may prove to be a useful tool in achieving the goal of teaching effectiveness of care. The establishment of a university-based pharmaceutical care clinic could provide this additional, or complementary, experiential venue to prepare students for uncompromised patient care practices.

METHODOLOGY

Patient Recruitment and Selection

Due to the fact that other pharmacy educators may want to establish pharmaceutical care clinics to teach effective care, the logistics of designing and implementing a pharmaceutical care clinic are presented in this section. Recruitment of patients was achieved by having a three sentence announcement inserted into a weekly one-page internal bulletin distributed to all faculty and staff within the University of Minnesota system. Any University of Minnesota employee taking at least one continuous use medication or supplement was invited to receive a pharmaceutical care consultation at the College of Pharmacy, at no charge, conducted by a third year professional student in the presence of an experienced faculty member. Patients were offered a Personal Pharmaceutical Care Plan to be delivered after their pharmaceutical care clinic visit and free parking was offered as additional incentives to participate. This announcement ran once on March 25, 1998 in *Brief,* the University of Minnesota publication.

Interested patients were instructed to call the researcher to leave their name and telephone number so that an appointment could be scheduled. Patients were informed that the pharmaceutical care clinic visit could take anywhere from 30-60 minutes depending upon the nature and extent of their drug-related needs. Patients were instructed to compile a complete list of any and all prescription and over-the-counter medicines, herbal remedies and nutritional supplements in use or in their medication storage area at home. If the patient was unable to compile this list, they were instructed to place all of their medications, supplements and remedies into a bag and bring them to the appointment. Patients were also asked to bring in their health insurance card so that trial compensation claims could be submitted.

The Patient Care Experience

Detailed directions to the Pharmaceutical Care Laboratory were distributed to the patient and directional signs were placed at key locations within the College of Pharmacy. When patients arrived for the clinic appointment they were greeted by the faculty member and student and escorted to the patient reception area. A two-page informed consent form, approved administratively by the University of Minnesota's Human Subjects Committee (institutional review board), was reviewed and signed by the patient before proceeding.

After completing and reviewing the informed consent

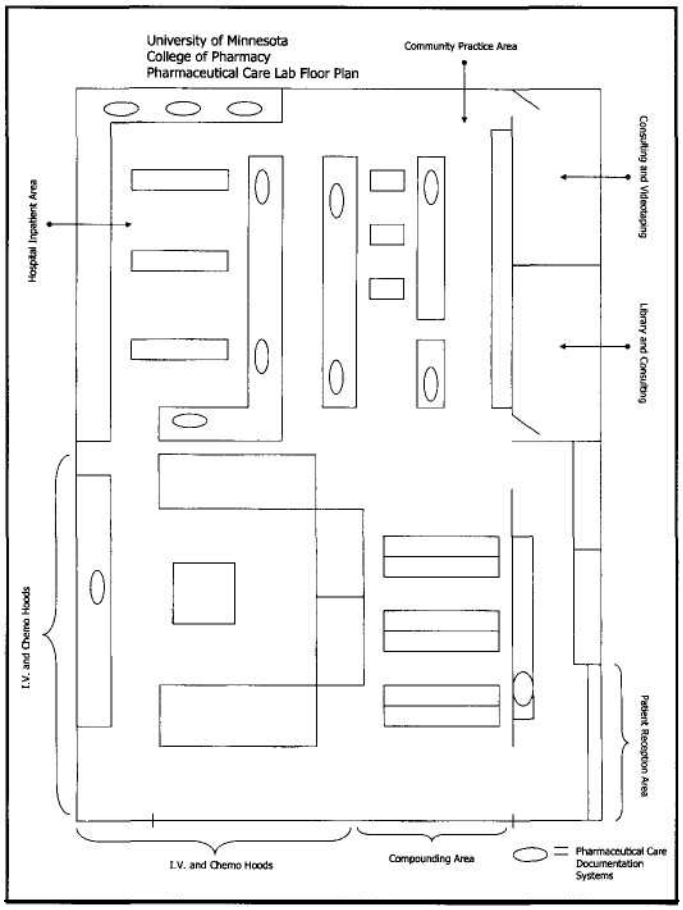

Fig. 1. Pharmaceutical Care Laboratory floor plan.

form, the patient was asked for their medication list or the actual products themselves. The patient's medication list, or cache of products, was given to the student to take to the interview area. The patient then provided basic demographic information to the faculty member including medication allergies and health insurance information using The Pharmaceutical Care Patient Chart(2). The time needed to obtain the patient's demographic and health insurance information permitted the student a few minutes to review the patient's medication list, organize their thoughts and prepare for the patient assessment. Prior to this, the student only knew the patient's name, gender and telephone number.

Care was provided by students to patients in the presence of an experienced clinical faculty member. The clinical faculty member sat off to the side and allowed the student and patient to interact. The faculty members responsibilities were to: (*i*) assist the student during the course of the appointment if clinical support/drug information were requested by the student; (*ii*) probe for any additional drug therapy problems at the conclusion of the student's assessment; and (*iii*) ensure that the student did not make a recommendation that could be detrimental to the patient's health. Patient care took place within the consultation rooms in the Pharmaceutical Care Laboratory (see Figure 1). The consultation rooms in the Pharmaceutical Care Laboratory were originally designed to accommodate simulated patient care interactions between students and faculty/teaching assistants. These consultation rooms offer a comfortable venue for patient care, however,

Indication	Effectiveness	Safety	Convenience
14	10	13	1

Examples of expressed concerns regarding the indication or intended use of medications:
"I don't understand why I am taking this medication."
"Do I need to be taking this medication."
"I have this rash, what should I do."

Examples of expressed concerns regarding the effectiveness of medications:
"When I take my sleeping pill I still wake up at 4 a.m."
"My Maalox doesn't seem to be working for my heartburn anymore."
"How effective are my multivitamins in preventing heart disease."

Examples of expressed concerns regarding the safety of medications:
"I am worried that my drugs will interact."
"What are the long term effects of Prilosec."
"Does Cosamin-DS have any side effects."

Example of expressed concern regarding the convenience of medications:
"What is the best way to use my inhalers."

Fig. 2. Patient expressions of their drug-related needs.

scheduling appointments in this facility so that they did not conflict with laboratory instruction was challenging.

Other visitors, or observers, were permitted to sit-in on pharmaceutical care clinic visits upon consent of the patient. Observers included, pharmacists completing certificate preparation as pharmaceutical care practitioners, other students, faculty members, association executives and international dignitaries. Visitors were permitted for the purpose of observing the patient care process.

A common patient care process was utilized by all students(2). The three objectives of this patient care process are to: (*i*) assess the patient's health care and drug-related needs and identify drug therapy problems; (*ii*) assemble resources and construct a care plan to meet those needs; and (*iii*) complete a follow-up evaluation to determine the patient's actual outcomes. Before proceeding to review all of the patient's medications used to treat all active medical conditions, each student commenced the assessment by obtaining the patient's initial expression of their concerns, expectations, and understanding of drug therapy. A typical, initial, open-ended query used by the student to engage the patient in a therapeutic dialogue was, "before we review the medications that you are currently taking, tell me about any health care concerns or questions that you might have today." Initial health care concerns expressed by the patient were addressed by students at the beginning of the assessment. Health care concerns related directly or indirectly to the patient's use of medications were recorded by the faculty observer as drug-related needs explicitly expressed by the patient (Figure 2).

This patient care experience was established as an elective, directed study course at the University of Minnesota College of Pharmacy during spring quarter 1998. The author served as the researcher, as well as, the

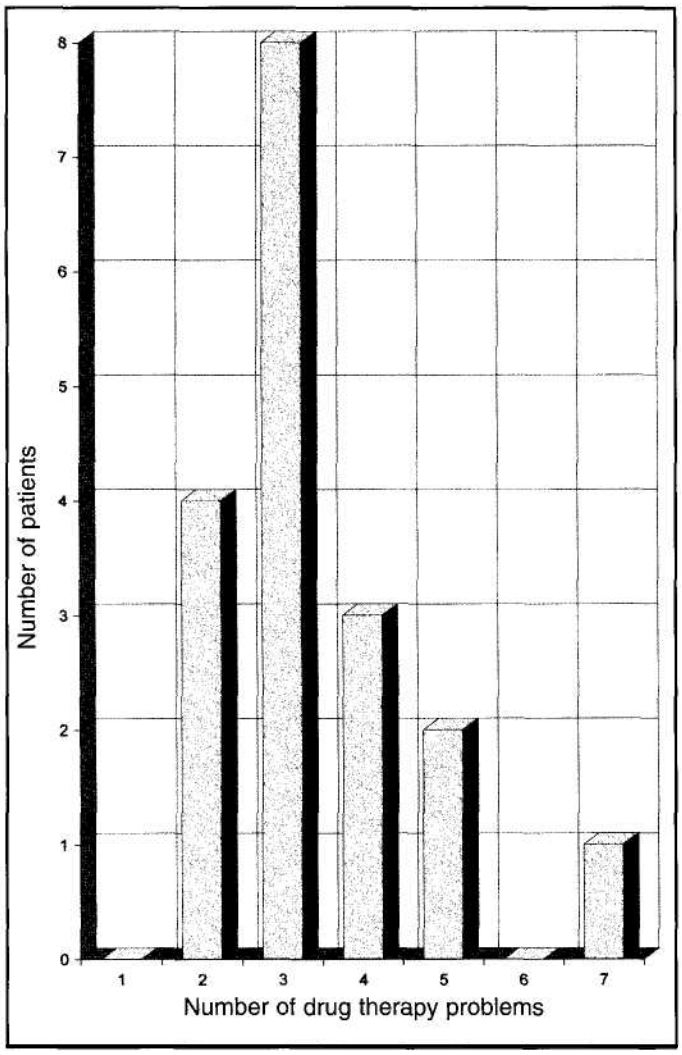

Fig. 3. Distribution of drug therapy problems identified by students.

clinical support faculty for most of the patient assessments. Additional clinical faculty were called upon as needed. Fourteen students cared for 18 patients in this project. Four students cared for two patients each, and ten students each cared for one patient. Student availability guided the assignment of patient appointments.

Evaluation

At the conclusion of the pharmaceutical care clinic visit patients were asked to evaluate and critique the care they received. The patient was asked to comment on aspects of the student's assessment skills that they liked best, and to discuss areas they thought the student could work to improve. It is argued that this approach to teaching (medical) interviewing skills enables students to examine the assumptions they make about the patient and to become aware of their own difficulties in discussing sensitive issues(6,7). Patients then completed a brief, written exit survey intended to obtain input relative to the student's professional demeanor, concern for the patient, general knowledge of medications, the value of care received, and the amount they would be willing to pay for the care received. Appendix A is a copy of the exit survey completed by each patient.

After the patient departed, faculty reviewed the student's performance. The three aspects that were reviewed by the faculty and student at this time were the patient's evaluations, the student's performance relative to patient care process criteria, and the student's self-evaluation of their own performance. Evaluation of the student's documentation occurred after follow-up evaluation but before the Personal Pharmaceutical Care Plan was sent to the patient.

Written and oral course evaluations were completed by students at the conclusion of the course. Student evaluations of this educational experience were elicited to discover what the students learned, determine the utility of the project for future students, and to find out what could be done to improve the experience. Students also submitted a final paper (5-6 pages) describing any aspect of the learning experience as it related to the care they delivered to their patient.

One other notable component of this patient care experience was a requirement for the students to present their patient cases to their peers at the weekly class meetings using a patient-centered, pharmaceutical care case presentation format. The case presentation format utilized in this educational project is the same one used in the practitioner preparation and certificate program by the Peters Institute of Pharmaceutical Care at the University of Minnesota(8). The intent of this educational component is to establish a collegial network that would assist students in developing a life-long support system for improving drug therapy problem identification, resolution and prevention skills.

RESULTS

The patient care process was the focus for evaluating the individual student's ability to provide pharmaceutical care. Criteria utilized to evaluate the student's patient care process included: (*i*) ascertaining and documenting the patient's understanding, concerns and expectations about their drug-related needs; (*ii*) linking each of the patient's active medications/remedies to an appropriate medical indication; (*iii*) determining the goals of therapy for each of the patient's medical conditions (*iv*) assessing the patient for the presence of drug therapy problems related to the indication, effectiveness, safety and convenience of medications; (*v*) probing for additional drug therapy problems through a review of systems; (*vi*) establishing a mutually agreed-upon care plan; and (*vii*) following-up with an evaluation for every patient. At the conclusion of each pharmaceutical care clinic visit the clinical faculty support person provided immediate feedback to the student relative to these criteria.

Twenty-one individuals responded to the initial call for patients. Eighteen patients consented to participate in this educational project. The patients participating in this project included 16 women and two men ranging in age from 30 to 86 (median age = 54). The average number of active medical conditions among the 18 patients was 7.2 (range = 4-11) and patients were consuming on average 10.2 active medications, remedies or supplements (range = 6-18).

Results of this project are reported using indicators of the student's patient care process. Indicators reported in this project are categorized within the patient care process

Table I. Causes of drug therapy problems identified by students

Type of DPT	Occurrence	Type of DPT	Occurrence
Dose too low	11	Needs additional drug therapy	15
Duration inappropriate	8	Albuterol MDI	1
Vitamin C	3	Medroxprogesterone	1
Claritin-D 12 hr	1	Aspirin	2
Aerobid MDI	1	Cranberry Juice	1
Albuterol MDI	1	Antibiotic prophylaxis	1
Allegra 60 mg	1	Nasalcrom Nasal Spray	1
Sudafed 30 mg	1	Naproxen	2
Non-compliance	2	*H. pylori* treatment	1
Albuterol MDI	1	Sporonox	2
Prilosec 20 mg	1	Antioxidants	2
Drug interaction	1	Saline Nasal Spray	1
Synthroid with Carafate	1		
		Untreated indication	9
Dose too high	6	St. John's Wort	1
Multivitamin	1	Calcium Supplements	5
Vitamin C	1	Prilosec 20 mg	1
Echnichea	1	Acetaminophen 500 mg	1
Aspirin 325 mg	1	Prostatitis	1
Folic Acid	1		
Trazadone	1	No indication present	2
Tagamet	2		
Undesirable effect	9		
Wellbutrin 75 mg	1	More effective drug available	6
Claritin-D 12 hr	1	Lipitor 10 mg	1
Calcium Supplement	1	Maalox liquid	1
Benadryl 25 mg	1	Sudafed 30 mg	1
Allegra 60 mg	1	Zoloft 100 mg	1
Medroxprogesterone	1	Benadryl 25 mg	1
Prednisone	1	Glucosamine chondroitin	1
Naproxen	1		
Darvocet	1	Ineffective treatment	1
		Kenalog cream	1
Dosing schedule inappropriate	1	Needs additional nonpharmacologic therapy	1
Kenalog cream	1	Exercise	1

[a]Total number of patients = 18; Total number of drug therapy problems (DTP) = 61;
[b]Average number of DTP's per patient = 3.4; range 2-7; SD = 1.3.

consisting of assessment, care planning, and evaluation. These indicators include: ascertaining the patient's expression of their health care concerns, identification of drug therapy problems and complexity of care (assessment), assembling resources on the patient's behalf and delivering a Personal Pharmaceutical Care Plan to the patient (care planning), patient status on follow-up, and patient willingness to pay for pharmaceutical care (evaluation).

Student Performance in Assessment of Patient Drug-Related Needs

Health care concerns of the patient related to drug therapy were recorded as the patient's expression of their drug-related needs. The number of drug-related needs explicitly expressed by the 18 patients in this project totaled 38. These patient expressions of their drug-related needs are presented in Figure 2. The ability of the student to identify the patient's drug-related needs was used as an indicator of the student's ability to demonstrate concern for the well-being of another person, a prerequisite to establishing a therapeutic relationship(2).

The students identified at least one drug therapy problem in every patient in this project. A total of 61 drug therapy problems were identified in the eighteen patients receiving care in this project. Figure 3 presents the distribution of drug therapy problems in this patient population, and Table I categorizes the cause or nature of these 61 drug therapy problems. The ability of the student to identify drug therapy problems was used in this study as an indicator of the student's technical dimension of decision-making.

The average length of time for the pharmaceutical care clinic visit was 53.5 minutes. The time required to complete computerized patient care documentation and conduct follow-up evaluations were not recorded.

A measure of the level of complexity of care provided to patients in this project was based on the pharmaceutical care resource-based relative value scale (RBRVS)(2). Assignment within the five levels of the RBRVS defaulted to the lowest denominator among three parameters; number of active medications/remedies, number of medical conditions, and number of drug therapy problems. Figure 4 presents the RBRVS distribution of cases within this project. All of these patients presented with complex drug-related needs. Complexity of care was used as an indicator in this project of the student's depth and breadth of assessment.

Table II. Drug information resources utilized by students to develop pharmaceutical care plans for patients

Resource	Number of queries
General Medline database search	12
Kastrup, E.K. (edit.), *Facts and Comparisons*, Facts and Comparisons, Inc., St. Louis MO (1998)	7
Micromedex Clinical Information System, General Drugdex Database Search	6
American Pharmaceutical Association, *Drug Information Handbook*, American Pharmaceutical Association, Washington DC (1998)	5
Pharmaceutical Industry Inquiry	5
Pharmacotherapy: A Pathophysiologic Approach, 3rd Ed., (edits., DiPiro, J.T., Talbert, R.L., Hayes, P.E. *et al*), Elsevier, New York NY (1998)	5
Class notes from previous pharmacy school classes	4
General Internet search	3
Tyler, V.E., *The Honest Herbal*, 3rd Ed., Pharmaceutical Products Press, New York NY (1993)	2
Handbook of Nonprescription Drugs, 11th Ed., American Pharmaceutical Association, Washington DC (1996)	2
General fibromyalgia patient support group materials	1
USP-DI 1998: Volume 1. Drug Information for the Health Care Provider, United States Pharmacopoeial Convention, Inc., Rockville MD (1998)	1
Pharmaceutical Care Software Program, Version 1.5.0, Health Outcomes Management, Inc., Minneapolis MN (1998)	1

Table III. Distribution of medical outcomes at follow-up evaluation

Status and number of medical conditions:							
Resolved	Stable	Partially improved	Improved	Unimproved	Worsened	Failed	Expired
4	86	23	11	6	0	0	0

	Level of care				
	1	2	3	4	5
Number of cases	0	0	5	6	7

Components of the Resource-based Relative Value Scale — Pharmaceutical Care Reimbursement Grid(2).

Level 1 = 1-2 active medications, 0 drug therapy problems, 1 medical problem.

Level 2 = 1-2 active medications, 1-2 drug therapy problems, 1-2 medical problems.

Level 3 = 3-4 active medications, 2-3 drug therapy problems, 2-3 medical problems.

Level 4 = 5-8 active medications, 3 drug therapy problems, 3 medical problems.

Level 5 = > 8 active medications, > 3 drug therapy problems, > 3 medical problems.

Fig. 4. Resource-based relative value scale distribution of cases.

Student Performance in Care Planning

All students came to a mutual agreement with each of the 18 patients in this project to develop plans designed to resolve drug therapy problems, achieve therapeutic goals, and prevent any potential drug therapy problems. A detailed schedule outlining the student's and the patient's activities and responsibilities were documented. A Personal Pharmaceutical Care Plan was mailed to each patient after the pharmaceutical care clinic visit explicitly describing these activities and responsibilities.

In order to develop a care plan that fully addressed all of the patient's drug-related needs, 13 of the 14 students (representing care delivered to 17 of 18 patients) found it necessary to conduct research or obtain additional drug information on the patient's behalf. Table II presents the drug information/clinical research topics that the students reviewed in order to fulfill patients' drug-related needs and conduct follow-up evaluations in this project.

Student Performance in Evaluation of Patient Outcomes

Evaluation is the practitioner's determination, at planned intervals, of the patient's outcome and current status(2). An evaluation is conducted initially and at

mutually-agreed upon follow-up intervals. The purpose of interacting with the patient at planned intervals is to: evaluate patient progress toward achieving therapeutic goals, determine if drug therapy problems have been resolved, and assess whether new drug therapy problems have developed. Eleven of the patients cared for in this project required more than one follow-up contact to evaluate progress toward achieving therapeutic goals, outcomes, and resolution of drug therapy problems.

The 18 patients cared for in this educational project had 130 medical conditions for which they were utilizing drug therapy. On follow-up evaluation, students made a determination of the patient's outcome status relative to each medical condition. These medical condition outcome statuses include; resolved, stable, improved, partially improved, unimproved, worsened, failed, and expired(2). Table III presents the distribution of medical outcomes at follow-up evaluation.

Patients were willing to pay $42.30, on average, for the care they received in this project. Trial compensation claims were prepared using the HCFA 1500 Claim Form and sent via facsimile transmission to the patient's medical care fiscal intermediary. Trial compensation claims were not adjudicated. Using the same $35.00 base rate as that being employed in the Iowa Pharmacists Association/Iowa-Blue Cross Blue Shield program, trial compensation claims averaged $87.50 per claim.

DISCUSSION

Assessment of Performance

A learning pyramid, or hierarchical framework for assessing clinical performance skills has been described by Miller in *Academic Medicine*(9). This learning pyramid moves progressively from the knowledge level (achieving a minimum score on a written examination) up to competence (describing how to care for a patient), to performance (showing how to care for a patient), and then to action assessment at the highest level possible (successfully providing patient care by integrating complex clinical functions into a practice).

Using this hierarchical framework, a strategy for evaluating pharmacy student experiential performance has been advanced by Beck and colleagues(10). This strategy posits that action evaluation methods should be weighted the most when assessing the pharmacy student's patient care performance in experiential settings. Observation-based ratings, peer assessment, and chart audits are cited as evaluation methods that have attributes and deficiencies important to the practical implementation of this strategy. As discussed in the Results Section above, the central focus of this educational project was assessment of the student's patient care process. Nevertheless, the evaluation strategy advanced by Beck and colleagues could also be applied to a college of pharmacy-based, student-driven, pharmaceutical care clinic.

All three evaluation methods described by Beck *et al.* could be applied, to varying degrees, in an educational project of this nature. Observation ratings utilized in this project can be classified as nominal scale, binomial (*i.e.*, either yes or no) based on patient care process criteria. On a larger scale, this type of rating system could improve inter-rater reliability but provides minimal objective information to the student on how well they did within a particular criterion. Peer assessment occurs when fellow classmates respond to each student's case presentation. This provides the student primarily with subjective feedback on how to help the patient achieve therapeutic goals and resolve drug therapy problems. Chart review evaluation occurs after the student documents care and before the Personal Pharmaceutical Care Plan is delivered to the patient. A nominal scale, binomial rating system can also be used in chart reviews to determine if there is evidence of; a therapeutic relationship, assessment of all of a patient's drug-related needs, statements of intended goals of all drug therapies, description of interventions taken, listing of care plan responsibilities, outcome results, and claims invoicing.

The Clinic Experience

Although the patients participating in this educational project were self-selected, they were generally healthy, ambulatory, university employees (secretarial support staff through to full professors). It can be speculated that a differing demographic profile of patient's receiving care could alter the clinical results achieved in this or similar educational projects. Devoid of a well-controlled clinical trial, it can reasonably be argued that caring for patients of a differing socioeconomic status as those served in this project could be expected to achieve at least comparable clinical results in terms of numbers of drug therapy problems identified, resolved and prevented. The fact that pharmacy students identified 61 drug therapy problems in the 18 patients cared for in this project is evidence of the students' technical dimension of caring for patients.

Complexity of care, duration of the interview, and ability to ascertain the patient's health care concerns demonstrate caring through the development of a therapeutic relationship. The University of Minnesota College of Pharmacy students who participated in this directed study, patient care experience unanimously agreed that all third professional year pharmacy students with an ambulatory care/general practice career emphasis should have the care of actual patients serve as a focus for their third year laboratory instruction. This type of experiential education provides the student and patient with an opportunity to progress through the patient care process at a pace comfortable to the student. Patients seemed to understand the implicit assumption that effectiveness, rather than efficiency, of care was the primary purpose of the project.

Transforming a College of Pharmacy Laboratory into a Pharmaceutical Care Clinic

Other health care professions utilize a student-driven, faculty observed patient care clinic experience to prepare students. Similar work done in dentistry suggests three advantages of caring for patients in an actual clinic instead of a laboratory setting: (*i*) the clinic environment is more realistic, comfortable, and convenient, thus increasing productivity; (*ii*) working in the actual clinic is good preparation for patient treatment; and (*iii*) the student performs better in the real clinic setting(11). Studies conducted within dentistry offer evidence that students perform better in a clinic, as opposed to a laboratory, setting. Although the intent of this educational project was not to reproduce this result in pharmacy, students participating in this pharmaceutical care clinic noted that they were much more at ease caring for "actual patients," rather than securing grade

points in lab for conducting simulated interviews with faculty posing as patients.

There have been attempts to incorporate problem-solving and decision-making exercises into laboratory instruction in U.S. colleges of pharmacy. In 1990, Newton, *et al.* discussed the development of an integrated pharmacy practice laboratory where problem-solving, decision-making, and communication skills are woven in among several different units of instruction(12). A national study of pharmacy practice experiential laboratories noted that pharmaceutical care has stimulated many changes in topics and types of challenges presented to students where "counseling" patients is an integral part of this type of course(13). In some instances actual patients are brought into experiential laboratories to assist in counseling exercises, while other patient interaction activities transpire using simulated patients or interactive computer programs.

The task at hand is development of the educational program preparing students to provide pharmaceutical care. A higher education paradigm shift moving from an "Instruction Paradigm" to a "Learning Paradigm" has been described(14). The focus of this shifting paradigm is to produce learning by whatever means work best. In teaching pharmacy students to become pharmaceutical care practitioners it seems self-evident that learning will be aided by engaging the student in as many good-quality, well-structured, patient care opportunities as possible. Having patient care serve as a focus for laboratory instruction, under faculty observation, would provide pharmacy students with valuable experience in a controlled, fail-safe environment.

The preparation of pharmacy graduates who will contribute to society in a unique and meaningful way may require a new level of commitment from pharmacy educators. If pharmaceutical care is the focus of a curriculum, and not simply another topic to be taught in the classroom, then it must be understood completely, both at an intellectually sophisticated level and at a visceral or hands-on level, by all faculty and administrators involved in delivering the program. The academe triumvirate of teaching, research and service may be reshaped by the provision of care where: (*i*) patient care practice serves as a uniting force between the faculty's research and teaching; and (*ii*) research and teaching provide tools with which to provide and continually improve care.

To set up a pharmaceutical care clinic it is recognized that an appointment scheduling and patient recruitment infrastructure needs to be in place. Experienced faculty should also be present during the course of the student's initial interaction with the patient (although faculty would not necessarily need to be present at the time of the student's follow-up telephone call to the patient). It is also germane to discuss the amount of time required for experienced faculty to be present for pharmaceutical care clinic appointments should a college of pharmacy decide to employ this educational strategy for an entire class of 75-90 pharmacy students. It can be expected that anywhere from 55-80 total hours of experienced faculty time would be required. Should eight faculty members be utilized to meet this demand (including adjunct faculty practitioners) this would result in a 6-10 hour time commitment per faculty member over the course of an academic year.

Pharmaceutical Care Clinics as For-profit Enterprises

Health care professions routinely employ practice clinics as part of a student's professional education. Although schools and colleges of pharmacy utilize clinical rotations, clerkships, externships and hospital rounds for students to observe patient interactions, the establishment of a student-driven pharmaceutical care clinic within a college of pharmacy may represent an evolutionary step in the preparation of pharmaceutical care practitioners.

One example of a patient care clinic is at The Ohio State University where patients can receive dispensing and/or patient care services(15). This particular clinic is designed as a for-profit enterprise where education of the student has been structured as a clerkship rotation. The use of a student-driven, pharmaceutical care clinic experience can be expected to complement clerkship rotations where effectiveness of care (*i.e.*, practicing at the 100 percent level) is the goal.

Establishment of a college of pharmacy pharmaceutical care clinic as an economic enterprise is worthy of discussion as it relates to advancing or impeding the preparation of students to assume advanced patient care roles. Drawbacks of operating a college of pharmacy-based pharmaceutical care clinic as a for-profit enterprise include the loss of patients, and business, from existing pharmaceutical care practice sites (many of which serve the college as clinical rotation sites) and compromising patient care principles under time and resource allocation constraints. The values and priorities of each college and university will guide the resolution of this decision if the care of patients is to serve as an organizing force for educating pharmacy students.

CONCLUSIONS

The results of this project suggest that pharmacy educators should examine the establishment of pharmaceutical care clinics within colleges of pharmacy as a viable and effective means to prepare practitioners for the challenges of an active pharmaceutical care practice. A changing educational paradigm coupled with shifting faculty priorities will most likely be needed to enact this suggestion. Faculty will need to discuss the merits of such a shift in focus and understand the commitment and energy needed to have the care of patients in a pharmaceutical care clinic serve as a focus for students' educational experiences.

It is encouraging to observe third year pharmacy students draw upon all aspects of their curricular preparation to provide a full spectrum of pharmaceutical care services to patients. The level of care provided to the 18 patients participating in this project, some of whom may not have had their drug therapy problems discovered, presents a strong argument in favor of utilizing this educational strategy to help students establish their own "gold standard" for practicing pharmaceutical care.

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APPENDIX A. EVALUATION OF PHARMACY STUDENTS ABILITIES TO PROVIDE PHARMACEUTICAL CARE AND SUBMIT TRIAL CLAIMS

Participant Exit Survey

Thank you for taking time out of your busy day to help our third professional year pharmacy students practice their patient interaction skills and provide you with pharmaceutical care services. Please complete the exit survey to help us evaluate the student's ability to provide care and obtain your perceived value of this service.

Please use the following five-point scale to base your responses to Questions 1-6 below.

Strongly disagree = 1; Disagree = 2; Neutral Opinion -= 3; Agree = 4; Strongly Agree = 5

1. The student conducted the interview in a professional manner. ___
2. The student expressed genuine concern about my health care needs. ___
3. The student appears knowledgeable about medications in general. ___
4. I would feel comfortable seeking health care advice from this person as a pharmacist. ___
5. If pharmaceutical care were available at a local pharmacy, I would recommend that a close personal friend utilize these services. ___
6. Pharmaceutical care services should be included in my health insurance coverage. ___
7. If this service were covered by a health insurance company, I would expect the pharmacist to be paid $_____for these services.
8. If I could purchase this service, I would be willing to pay $_____

Comments