Notes

The Early Patient-Oriented Care Program as an Educational Tool and Service

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The Early Patient-Oriented Care (EPOC) program was designed to provide early clinical education for baccalaureate pharmacy students while performing a clinical service for patients. Six students were assigned 12-15 hemodialysis patients to visit monthly under preceptor supervision. Educational activities changed over time as students gained experience. Approach to the patient, medication information retrieval, pharmaceutical care philosophy, and monthly medication reviews were taught in the first semester. Identification of drug related problems (DRPs), targeting on anemia and renal bone disease, were undertaken in the second semester. Resulting interventions identified were ranked for significance and impact on care. A patient satisfaction survey was performed. 105 DRPs were identified over four months. Interventions impacted on care, cost, or both: 41.9 percent, 23.8 percent, 34.3 percent of time, respectively. Eighty-six percent of recommendations were accepted in whole or in part. Over 75 percent of patients, overall, were satisfied with the EPOC program. The EPOC program provided practical and didactic education and a clinical service.

INTRODUCTION

Pharmaceutical care, a widely accepted philosophy of pharmacy practice, describes the performance by pharmacists of more patient-care oriented activities instead of a dispensing role(1-2) The education of students of pharmacy should be conducive to this role Contemporary pharmacy education should incorporate the pharmaceutical care philosophy as early as possible in the curriculum. Early involvement in a student's education may aid the student in learning disease

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states and therapeutics(3) Since one of the fastest growing healthcare arenas is ambulatory care, efforts in the education of pharmacy students should be focused in that direction.

The dialysis patient population represents a unique but small percentage of the total ambulatory population. Regardless, the growth in ambulatory care is reflected in the projected increases of dialysis patients by the year 2000. The United States Renal Data System (USRDS) reports an average annual increase of nine percent(4). With 257,266 reported beneficiaries at the end of 1995, the number would be expected to grow to more than 300,000 by the year 2000(4). This number would be expected to increase substantially if patients with chronic renal failure are initiated on dialysis earlier than what has been traditionally done(5). According to the USRDS 1997 Annual Data Report, there are approximately 3,200 dialysis units, of which only 650 are institutionally based(4) with the remainder as free standing. There are relatively few pharmacists practicing in outpatient hemodialysis units. There are approximately 80 pharmacists who are members of the nephrology practice research network of the American College of Clinical Pharmacy. If each pharmacist from this network practiced in one hemodialysis unit, that leaves the majority without a practicing clinical pharmacist.

Hemodialysis patients are typically prescribed 10 to 12 medications and commonly have multiple co-morbidities either as a result of, or as a cause of, end-stage renal disease(6). Because of the complex nature of the therapeutic regimens, and because of the unique circumstances surrounding hemodialysis patients, this population provides an excellent opportunity for students to learn pharmaceutical care while providing a valuable service to patients and other health care providers. This population is unique in that, although they are ambulatory outpatients, they return to the hemodialysis unit at regular, scheduled times and are in essence, a "captive audience."

At this institution, baccalaureate pharmacy students complete the Professional Experience Program (PEP) during the second semester in the fifth year. This program consists of three five-week rotations (clinical, community, hospital), each a total of 200 experiential hours. Therefore, students are not exposed to clinical pharmacy until the end of their educational program. This is also consistent with the current Doctor of Pharmacy degree where students will rotate at a specific site for a limited amount of time after their didactic sequence. Additionally, the anticipated entry-level Doctor of Pharmacy program will also follow this example.

On the basis of this, we developed a novel educational traineeship, the Early PatientOriented Care (EPOC) program. This program was designed to provide an opportunity for student education at an early stage in their education, while performing a clinical service to patients. We report the results of the first year's experience of students in the EPOC program.

METHODS

All students were approached at the end of their third year and introduced to the concept of the EPOC program, during one of their class lectures. Meetings were then scheduled the following two days for those students who were interested to discuss more details regarding the program. Those students who wanted to participate were asked to fill out an applica-

tion form. Six students were then chosen by agreement between two of the authors. The decision was based subjectively upon academic grades, enthusiasm, experience, professionalism, demeanor, and from feedback from previous faculty members from earlier courses. Students participating in the EPOC program would enter the program at the start of the first semester of the fourth year and gain weekly experience throughout the entire fourth and fifth years (four semesters total).

All students were placed in one dialysis center at the beginning of their fourth year and assigned 12-15 patients by one of the preceptors. They were responsible for taking monthly medication histories (all medications, including those prescribed by nephrologist, dentist, any other practitioner, over-the-counter and herbal remedies and food supplements). All medication regimens were recorded and computer patient medication profiles were generated, and updated on each subsequent visit. Each patient was visited monthly at a pre-arranged time. Patients were instructed to bring in their medications at that time.

At each monthly visit, medication counseling was given to the patient upon patient request or if a change in medication profile was noted by the student. Each interview took approximately 30 minutes. With 12-15 assigned patients and about four patient visits per week, the student was expected to gain approximately three to four hours per week experiential time, which included a one hour weekly meeting with preceptors and time for data collection. Over the course of the 4 semesters (60 weeks, 15 weeks per semester) it was expected that students would complete the required 200 hours of PEP experience.

Students were provided education in therapeutics, pathophysiology, interview skills, ethics, and on issues of confidentiality. Goals and objectives changed over time to incorporate students' knowledge base and experiential activities gained from the EPOC program and concurrent academic coursework. In the first semester, an intensive training program, was provided to students introducing pharmaceutical care philosophy and information gathering. The training program addressed topics such as communication skills, patient confidentiality, professional demeanor, empathy, patient interview and counseling, medication chart review, factors affecting patient understanding of medical regimens and compliance and computer access to data. The topics were taught by several means including lectures, case discussion and reading material. Time was devoted during each weekly meeting to teach these concepts and skills. Following in the second semester, students were given increasing responsibility for provision of service with emphasis on medication counseling. Students were required to work-up and identify drug related problems (DRPs) in at least two patients each week(7). Students collected pertinent lab data (*e.g.*, hematocrit) and vital signs (*i.e.,*. blood pressure) to support interventions. At this point, student interventions began to be recorded. In the last two semesters, students were expected to recognize, interpret, and intervene on DRPs. By the end of the 12 months, students were required to identify DRPs in more patients.

Throughout the program from its initiation, students were involved in a one hour, weekly discussion of ESRD specific diseases, complications, and treatment with two preceptor(s). Particular emphasis was placed on target drugs: those for anemia, bone disease, phosphate binders. Supporting literature was given to each student for each topic

Table I. Patient demographics

	Male mean ± SD (range)	Female mean ± SD (range)
Age	54.9 + 18 (20-77)	51.9 + 16 (23-76)
Race		
Caucasian	12	12
African American	7	9
Other	0	2
ESRD Diagnosis		
Diabetes mellitus	5	9
Hypertension	5	3
Glomerulonephritis	3	3
HIV	2	1
Polycystic Kidney Disease	0	5
Other	4	2
Years on dialysis	3.2 ±2.9 (1-10.5)	4.5 ±4 (0.5-13)
Number of Medications	11.7 ±4.1 (5-20)	11.6 + 3 (7-20)

Table II. Classification of EPOC students' recommendations

Recommendation	Number of recommendations (percent implemented)
Recommend a drug	11 (82)
Recommend a drug change	5 (100)
Discontinue drug	44 (86)
Order a lab test	0
Decrease dose	14 (85)
Increase dose	10 (80)
Change in drug form	4 (100)
Change in route	0
Change in dosing schedule/hold drug/administration technique	7 (100)
Monitoring parameters (not laboratory findings)	5 (100)
Kinetic consultation	0
Drug levels	0
Education - physician/nurse/other	1(100)
Cancel lab test	0
Recommend dose	11 (82)
Other	3(66)

discussed which was discussed. During the weekly meetings students and their preceptor(s) would discuss and review the patient medication histories and identified DRPs. From the DRPs which were identified, a recommendation was formed after group discussion. The recommendation was then given to both the director of nursing and physician by the student. Each student made the appropriate follow-up intervention(s) and subsequently documented each intervention. A previously published form for documentation of interventions was used(8). Each intervention was assigned a significance ranking and impact on patient care by each author of this report(8) The authors include two fellows in nephrology, one professor of pharmacy practice, and the director of nursing at the hemodialysis unit. A consensus was subsequently reached during a group meeting of the authors.

Patient-medication exposures per day were calculated as follows: [(number of patients) x (mean number of medications). Percentage of interventions per patient-medication exposure was calculated as follows: 100 x [(number of interventions recorded) - (patient medication exposures)]. The rate of student interventions per day was calculated as follows: [(number of interventions) (intervention recording time)].

At the end of the first year, a patient satisfaction survey was conducted by interview by a previously unknown investigator (Appendix A). Only patients who had student exposure completed the survey. Patients were excluded if they have not had any student exposure, if they were no longer on hemodialysis (patient went on to peritoneal dialysis or transplant or death), or declined to cooperate, the survey has been validated in another ambulatory patient population(9).

RESULTS

Six students were selected from the incoming fourth-year class. During the first two semester (seven months) the students gained experience and developed communication skills in counseling and working with other health care providers.

Eighty patients were visited monthly by the students and 560 medication reviews were performed. Each patient was taking 11.6 ± 3.5 (mean ± SD) medications per day; resulting in 928 patient-medication exposures. Student interventions commenced at the start of month four. During these second four months 105 DRPs were identified. Thus DRPs were identified in 11.3 percent of all medication exposures. Over a period of four months, the students made 0.87 interventions per day. In other words, if a student saw patients three times a week, it would be expected to result in approximately six interventions per week. The demographics of the patients whom the DRPs were identified can be seen in Table I. The breakdown of interventions by the assigned rankings and by DRPs are illustrated by Figures 1 and 2, respectively.

Student interventions were perceived to impact on care (41.9 percent), cost (23.8 percent), or both (34.3 percent). Intervention cost to the patient was further categorized into perceived positive (*i.e.*, reduced cost of medication) or negative (*i.e.*, increased cost of medication) impact. Sixty-eight and one-half percent of cost interventions were perceived to have a positive impact and 31.5 percent to have a negative impact. No interventions had a negative impact on care alone. The classification of student recommendations are given in Table II. Ninety-one recommendations (87.5 percent) based upon the identified DRPs made by the students were accepted in whole (85.7 percent) or in part (14.3 percent) by the providers.

The patient satisfaction survey was conducted over a period of two weeks. Of the original 80 patients, 21 patients were unavailable to participate in the survey nine died, three were given a kidney transplant, three moved from the area, four were hospitalized, one changed to peritoneal dialysis, one did not speak English). Of the 59 available patients, six (10.2 percent refused to participate (no interest) in the survey and five (8.5 percent) were unable to be interviewed (noncompliance with treatment, schedule changes). When discussing medical information with the EPOC students, 38 of 48 (79.2 percent) patients felt comfortable, one patient (2.1 percent) felt uncomfortable and nine (18.7 percent) patients felt neutral. The patient who was uncomfortable could not express any particular reason for his uneasiness.
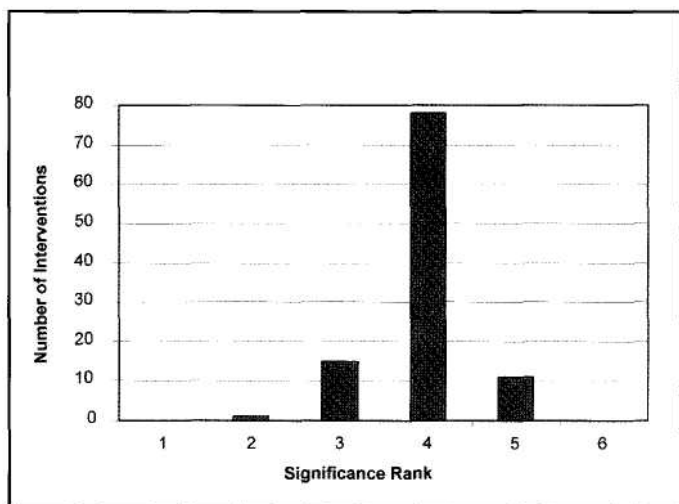
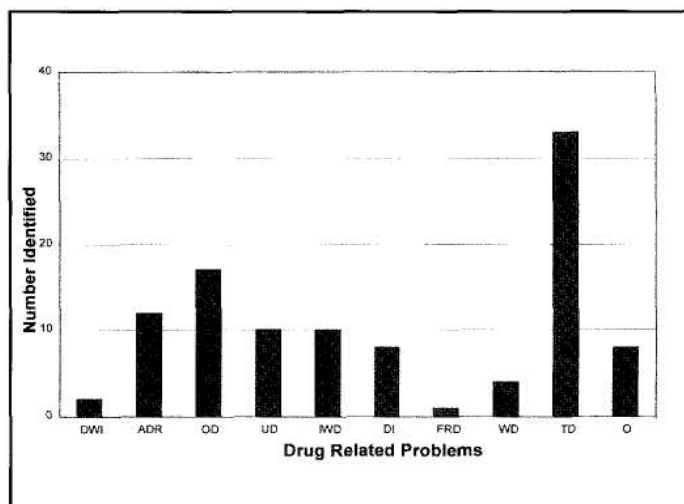Fig. 1. Significance rank of interventions by EPOC students.

Fig. 2. Classification of DRPs identified by EPOC students. DWI (drug without an indication); ADR (adverse drug reaction); OD (overdose); UD (underdose); IWD (indication without a drug); Dl (drug interaction); FRD (failure to receive drug); WD (indication with wrong drug); TD (therapeutic duplication); O (other).

The majority of patients (40, 83.3 percent) had previous exposure to other healthcare professionals in training. It is unclear how this may have affected this survey's results. Almost all (37, 77.1 percent) patients had no preference talking with either a pharmacist, physician, or nurse about their medications. However, nine (18.7 percent) patients, unsolicited, expressed that the person in whom they discuss their medications should be knowledgeable about drug therapy. Twenty-nine (63 percent) patients thought that the interactions with the students were beneficial whereas four (8.7 percent) patients did not and 13 (28.3 percent) patients were neutral toward the student interactions. The four patients who thought the interactions were not beneficial were also patients who were not aware of the student activities beyond the medication review. Two patients were not able to evaluate whether the interactions were beneficial or not. Patient perception of student impact on care was positive (52.5 percent) or neutral (47.5 percent). No patient thought the students had a negative impact on care and eight patients could not evaluate. The majority (31,64.6 percent) of patients were not aware of what the EPOC students were doing with the information once gathered. Of patients who were aware of what the EPOC students were doing with the information, 14 (66.7 percent) thought the students had a positive impact on their care. The majority of patients (40, 83.3 percent) self-report that their medication compliance was not affected. However, seven (14.6 percent) patients reported that their medication compliance improved since student involvement began. The student encounters were enjoyed by the majority of patients (33, 68.6 percent), disliked by one (2.1 percent) patient and 14 (29.1 percent) patients were neutral. Over all, 37 patients (77.1 percent) were satisfied, one (2.1 percent) was dissatisfied, and 10 (20.8 percent) were neutral towards the student program.

DISCUSSION

New educational processes need to be tested before general application to all students. The early patient-oriented care (EPOC) program was designed to be a pilot program with the goal to provide a novel educational experience along with providing a valuable service. Education of pharmacy students, while providing a service component to patients and other health-care providers, can be successfully done as shown by the results of the first year's experience of the EPOC program.

Students were exposed to a great deal of information using this format as evident by topics covered. Application of knowledge gained is the next step and desired outcome in the education of students. This experiential program runs parallel to the students' clinical pharmacy and therapeutics didactic sequence, potentially reinforcing lectured material. The EPOC format to student education has met the desired goals as evident in the number of drug-related problems (DRPs) identified, the interventions made, and the acceptance rate of subsequent recommendations. (Table II and Figures 1 and 2)

It has been determined that when patients take greater than four medications, twelve or more medication doses, have three or more disease states, or take drugs requiring therapeutic monitoring, they are a great risk of a drug-related adverse outcomes(10). Taking this into consideration, hemodialysis patients are at great risk. They take on average greater than 11 medications a day, often with difficult dosing regimens and requiring therapeutic monitoring, and are plagued with many concomitant disease states. Incorporation of the EPOC program into this patient population has helped to manage drug therapy in an attempt to prevent or solve DRPs while providing a student educational forum of pharmaceutical care. This is a beneficial situation for both patients and the education of pharmacy students.

Although 105 DRPs were identified in this patient population, particular emphasis was placed on the treatment of anemia and renal bone disease. It is expected that as students gain more experience and knowledge, more DRPs in other disease states would be identified. However, the students were initially required to work-up and identify DRPs in only two patients per week increasing as the program continued. Those patients were discussed in detail at the weekly group meeting. Because of the limitations of the academic calendar, drug interventions were not identified in all patients. Only 42 patients' DRPs have been identified and had interventions made by the students. Each weekly meeting would only allow time to discuss a couple of

patients' DRPs. After the patient discussions at the meetings, student intervention(s) were documented and interventions made. Following in the second year of the program and as students gained experience, they were expected to identify and make interventions on the DRPs for all of their assigned patients' medications and concomitant diseases.

Students participating in this program have the benefit of following patients over an extended time (two years). Traditionally, in our institution's professional experience program (PEP), students would follow their assigned patients over five weeks only. With the benefit of following patients longer, EPOC students are potentially exposed to more patient problems and can thus potentially gain more experience dealing with those problems. Another benefit of following patients over an extended time is for the students to be able to see the results of their individual interventions. In the outpatient ambulatory setting, responses to interventions usually do not occur at the same rate as in an acute inpatient setting. A common complaint of students when they spend only five weeks at a clerkship site is that they often do not see the results of their intervention(s). When comparing the EPOC students to the PEP students, EPOC students are able to see more results based upon their intervention(s).

The patient satisfaction survey provided interesting results. In a previous investigation(9), a random selection of 199 patients in a general internal medicine ambulatory clinic were surveyed on their attitudes towards medical students. Of the 194 patients who completed the survey 76 percent felt comfortable disclosing medical information to the students. Consistent with Simons *et at.,* the majority of patients were comfortable with discussing medical information with students. (9) We contribute this to the majority (83.3 percent) of patients who had previous exposure to health care professionals in training and the patients (79.2 percent) ease in talking about their medications.

Unfortunately, almost half of the patients (47.5 percent) felt that their care was not affected by student involvement. This is in contrast to the perceived impact on care by the authors (76.2 percent). A potential reason for this discrepancy was that 31(64.6 percent) patients were not aware of what the students were doing with the information gathered. Thus, the majority of patients were not aware that the students were evaluating the medication profiles for not only accuracy but also DRPs, which may impact on their care. Those patients (66.7 percent) who were aware of what the students were doing with the information gathered thought that the students had a positive impact on care. A breakdown in communication to the patients about the EPOC program is a potential reason for the majority of patients not knowing what the EPOC students were doing with the information gathered on a monthly basis. This issue was rectified by having students inform the patients of their efforts and activities each month.

Despite this, 33 patients (68.6 percent) did enjoy the student involvement and 29 (63 percent) patients thought the interactions were beneficial. The patient satisfaction survey is planned to be repeated every year to document patient response to the EPOC program and to identify potential areas of improvement. It is hoped that with continued experience with this program, a benefit in patient care can be perceived by not only the authors but also the patients.

The pharmacy student educational and service process is an ongoing program. The students completing the first year will finish the program in another year and six more students from the fourth year class will begin. Due to the impressive patient and participating hemodialysis center acceptance and requests, the program is expanding to other hemodialysis centers. This educational process is also being incorporated by other faculty members to be used in other patient populations.

Other health-care providers have benefited from the introduction of this program. Monthly maintenance of an accurate patient medication profile is one of the many responsibilities of hemodialysis nurses. Provision of this student service has relieved the nurses of that responsibility. The constant presence of pharmacy students has also provided an avenue in which drug information requests could be entertained. Students have routinely answered these questions from nurses and prescribers, however these were poorly documented. As shown in the results the one documented educational intervention was a situation where the student recognized the deficiency and acted upon it, rather than providing drug information on questions posed to them directly. The poor documentation of these interventions may be addressed by the use of palm-top computers. Ultimately, by providing this service, the care of patients may have improved.

We recognize that this program is a novel approach to the education of baccalaureate pharmacy students. Unfortunately, there are no data on the quality of student learning by this method of education when compared to our institution's traditional methods (PEP program) although this will be planned at the end of both programs. A survey of the students on their perception of the EPOC program would be useful as they complete the second year. On an intermittent basis and informal manner we ask for the students to give feedback on the program and incorporate those comments to improve the experience. Additionally, we have no data on nursing and prescriber perceptions of the program. As this program grows, we look forward to answering these questions.

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APPENDIX A.

Patient Satisfaction Survey[a]

1. Your are_____in discussing medical information with students
    _____comfortable _____uncomfortable _____neutral

2. Your previous exposure to health care professionals in training has been to
    _____pharmacy students _____medical students
    _____nursing students _____other_____none

3. You have a preference to a_____when discussing your medications
    _____pharmacist _____physician _____nurse
    _____any one ____no one ____other

4. You feel that the interactions with the pharmacy students have been
    _____beneficial _____not beneficial _____neither

5. Do you think that the pharmacy students interactions have had a
    ____positive impact on care
    ____negative impact on care
    ____no impact on care

6. Encounters with the pharmacy students has ____your medication compliance
    _____increased _____decreased _____had no effect on

7. Encounters with the pharmacy student were
    _____enjoyed _____disliked _____neutral

8. Over all, you are_____with the pharmacy students
    _____satisfied _____dissatisfied _____neutral

9. Do you know what happens with the information that the students gather?
    _____yes _____no

[a] Adapted from reference 17.