Notes

Evaluation of Peer Teaching in a Pharmaceutical Care Laboratory

Shelley L. Chambers, Janet Schmittgen and Carolyn R. Allan
College of Pharmacy, Washington State University, PO Box 646534, Pullman, WA 99164-6534

We designed a pharmaceutical care lab facility to model an ambulatory pharmaceutical care practice site. In addition to an idealized physical layout, we developed record keeping procedures and a personnel structure intended to maximize pharmacist time for patient care activities. Students in the first-year of the pharmaceutical care laboratory were trained by second-year students in the technical aspects of drug distribution such as computer data entry, preparation of patient profiles, dispensing and packaging of medications, and aseptic preparation of drugs. Students in the second year of the laboratory sequence were cultivated in the pharmaceutical care role: patient evaluation, interpretation of medication history and profile information, identification, solving and documentation of drug-related problems, and patient counseling. Students were grouped during laboratory exercises such that two first-year students provided technical support to a more advanced student who demonstrated techniques, provided coaching and then checked the technical competence of the first-year students. The levels of competency of peer-teacher-trained students and the validity of checklist evaluations by the peer teachers were assessed by the Pharmaceutical Care Lab faculty after completion of each of three technical skills units. This paper describes the training of first-year students in technical skills by students in the second year of the laboratory course as well as the exercises, logistical management and competency assessment tools used in the technical training. We conclude that peer teaching is a very useful teaching method for reinforcing technical skills and providing better instructor:student ratios in the laboratory.

INTRODUCTION
The Pharmaceutical Care Laboratory at Washington State University has been designed to provide students with the opportunity to apply information from lecture courses to practice-related activities. The six-semester sequence over three academic years, is competency-based, hierarchically structured, and utilizes active learning methods. The first-year of the laboratory emphasizes technical skills such as compounding, aseptic technique, and prescription filling. The second level of the laboratory focuses on patient care skills such as communications, assessment, identification of drug-related problems, planning and monitoring drug therapy, and documentation. The third year of the laboratory sequence emphasizes population or community health care management: drug utilization review, policy and procedure development, formulary management, and quality improvement. Because of the hierarchical nature of the laboratory, we reasoned that involving students at all three levels of the laboratory in peer teacher-student groups would provide an interesting model of the technician-pharmacist-(expert) patient paradigm. Other educators have reported that peer teaching enhances the ability to organize and communicate information, improves retention(1), and facilitates the learning of complex skills(2–4). Our initial experience with peer teaching in the Model Pharmacy unit of the Pharmaceutical Care Laboratory demonstrated that the method was feasible and well accepted by students. In our second year

Am. J. Pharm. Educ., 64, 283-288(2000); received 2/2/00, accepted 6/15/00.
of experience with peer teaching we were interested in determining how peer teacher scoring of performance-based checklists compared to that of faculty scoring. The purposes of the peer teaching experience in the Pharmaceutical Care Laboratory at Washington State University are:

1. to develop technical competence in first-year pharmacy students,
2. to develop basic patient care skills in second-year pharmacy students,
3. to reinforce the technical skills of second-year students by placing them in the role of teacher/evaluator,
4. to model personnel structure and record keeping procedures that maximize pharmacist time for patient care activities,
5. to improve the teacher to student ratio in the professional laboratory.

**METHODS**

All students in the second year of the Pharmaceutical Care Laboratory at Washington State University participate as peer teachers for first-year students in the technical skills level of the same laboratory sequence. Skills presented by peer teachers fall into three areas: (i) aseptic technique; (ii) drug distribution procedures and computer data entry; and (iii) patient counseling on prescription and over the counter medications. Peer teachers demonstrate, coach and then evaluate aseptic techniques, computer data entry and drug distribution procedures using a scored checklist. These exercises are structured to mimic the working relationships of pharmacists (second-year students) and technicians (first-year students). Patient counseling and advising on over the counter drugs are taught using role playing exercises with first-year students playing the pharmacist role and second-year students playing the patient role (Table 1).

The pharmaceutical care lab facility is designed to model an ambulatory pharmaceutical care practice site. The “Model Pharmacy” serves a varied ambulatory population as well as a nursing home population. The laboratory facility is equipped with six computer workstations with retail and nursing home dispensing software, laminar flow hoods, drugs, dispensing supplies, counseling desks and reference books and software. Five weeks of the spring semester in the first year of the pharmaceutical care laboratory are devoted to practicing community pharmacy dispensing and patient counseling. Other weeks are devoted to patient profile review, drug-related problem identification, problem solving, patient counseling and documentation. The second-year students are given two patient profiles with one or two new prescriptions and existing drug therapies. The profile will contain one or more drug-related problems. The second-year student completes a drug use review on the profile, makes any necessary adjustments in the patient’s drug therapy, documents the problem identified and the action taken on a drug use review competency checklist that is turned in after lab for grading. During the lab session, the second-year peer teacher demonstrates the technical skill of the week for two first-year students and provides written prescriptions for them to fill. The first-year student enters the patient and prescription data into the computer, prepares and packages the medications and files the prescription and profile. The second-year student checks the accuracy of prescription filling, documents the drug use review on the profile, and evaluates their students’ mastery of the skill using a checklist. In the two final weeks of the drug distribution unit, a patient counseling component is added.

---

**Table I. The peer teaching experience**

<table>
<thead>
<tr>
<th>Elements</th>
<th>Skills taught by peer teachers</th>
<th>Skills learned by peer teachers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Includes all students in the second year of the entry level PharmD</td>
<td>Processing prescriptions through a computer system, record keeping</td>
<td>Review of technical skills</td>
</tr>
<tr>
<td>Teach every other week</td>
<td>Drug dispensing procedures and evaluation of pharmacy procedures</td>
<td>Demonstration, coaching</td>
</tr>
<tr>
<td>Peer teacher:student ratio 1:2</td>
<td>Aseptic technique</td>
<td>Case-based drug use review</td>
</tr>
<tr>
<td>Peer teacher demonstrates, coaches and then evaluates by checklist</td>
<td>Handling of chemotherapy drugs</td>
<td></td>
</tr>
<tr>
<td>Lab exercises simulate pharmacist-technician relationship</td>
<td>Patient counseling: basic OBRA counseling and advising patients on OTC drugs</td>
<td></td>
</tr>
</tbody>
</table>

---

between one and six prescriptions filled at the Model Pharmacy over the course of the semester (Appendix A). Peer teachers in the second year of the laboratory sequence act as demonstrators, coaches and evaluators. Their students are evaluated using scored checklists which are included in their laboratory manuals to focus them on the skills to be learned (Appendix B). The first week of the laboratory was used to provide an introduction to drug distribution law for the first-year students and an orientation to peer teaching for the second-year students.

The first-year students are divided into six lab sections of 12 students each. Each section of the second-year class is divided into two groups; each group acts as peer teachers every other week providing a student to peer teacher ratio of 2:1 (and a total lab section size of 18). The second-year students also have a separate meeting time during the week to focus on learning patient care skills.

During the three weeks of aseptic technique training, peer teachers demonstrate the skill to be learned, provide coaching during the practice runs and evaluate their students’ competency using an aseptic technique checklist. First-year students learn aseptic transfer of drugs from vials and ampules and handling techniques for antineoplastic drugs. In addition, second-year students identify and solve stability problems or admixture incompatibilities in medication orders.

In the community pharmacy unit, students in the first year of the laboratory sequence are trained in the technical skills relating to ambulatory or nursing home drug distribution: computer data entry, drug preparation and packaging, preparation of patient profiles, and filing. Students in the second year of the laboratory learn patient profile review, drug-related problem identification, problem solving, patient counseling and documentation. The second-year students are given two patient profiles with one or two new prescriptions and existing drug therapies. The profile will contain one or more drug-related problems. The second-year student completes a drug use review on the profile, makes any necessary adjustments in the patient’s drug therapy, documents the problem identified and the action taken on a drug use review competency checklist that is turned in after lab for grading. During the lab session, the second-year peer teacher demonstrates the technical skill of the week for two first-year students and provides written prescriptions for them to fill. The first-year student enters the patient and prescription data into the computer, prepares and packages the medications and files the prescription and profile. The second-year student checks the accuracy of prescription filling, documents the drug use review on the profile, and evaluates their students’ mastery of the skill using a checklist. In the two final weeks of the drug distribution unit, a patient counseling component is added.
Role playing exercises are used in the patient care with OTC drugs unit. Each first-year student is assigned a role as a pharmacist and each second-year student a role as a patient. First-year students receive a pharmacist role in which they are to consult with a patient with a specified condition treatable with an OTC drug (i.e. a patient with bursitis). The first-year, student pharmacists prepare for the exercise by reading the relevant chapter in Handbook of Nonprescription Drugs before coming to class. In addition they are allowed to refer to any books, electronic references or drug labeling during the role play that would be available to a community pharmacist. They must be prepared to ask their patients appropriate questions about the condition and the patient’s medical and drug treatments as well as advise them on the appropriate OTC treatment. The peer teachers receive a profile of the patient role that they are to play for each of their first-year students. They must be prepared to initiate the patient-pharmacist interaction and provide information relating to the patient’s history and drug therapy. In addition they should know enough about the condition and its OTC drug treatment to evaluate the appropriateness of the advice given by their students using the checklist provided (Appendix C).

At the completion of each of the units described above (aseptic technique, community drug distribution, and patient care with OTC drugs) the students at the technical level are evaluated by their peer teachers as well as the pharmaceutical care lab faculty to ascertain their level of competency. The second-year students are evaluated on their patient care skills by checklists and their teaching skills by checklist and their teaching skills using the form in Appendix D.

We evaluated the peer teacher experience in two ways. First we compared the peer teachers’ grading with that of experienced instructors for each of the exercises taught by the second-year students. Pearson’s product moment correlation was used to evaluate the degree of consensus between the two groups of raters.(5)

In addition, we surveyed the students and the peer teachers to ascertain their opinions about the success of the experience. The survey was conducted at the end of the semester both on a written form and as an open discussion format (Appendix E). Student opinion evaluations are conducted the week before the final week of the semester during the lab sections. Students are given a set of topics for discussion relating to the content and methods of the course in the Pharmaceutical Care Laboratory Manual. During the laboratory sections, students are divided into groups of six, instructed to discuss the topics as a group, prepare a short summary of responses and present the summary to the assembled section. Faculty act as facilitators and recorders during the assembled presentations.

RESULTS

We compared the peer teachers’ checklist scoring with that of pharmaceutical care lab faculty. We were interested in learning two things from this study: first, what level of competency do the first-year students develop and second, how does grading by peer teachers compare with that by experienced instructors. These duplicate evaluations were conducted at the completion of each unit. Scores on skills checklists ranged between 82 and 100 percent whether scored by instructors or by peer teachers indicating students did learn the technical skill evaluated by the checklist. The peer teachers’ scores were compared to instructors’ scores using Pearson’s product moment correlation (r = 0.997) indicating that there was significant consensus between peer teacher and faculty scoring. Peer teachers scored slightly though not significantly higher than faculty on four out of five of the exercises.

The results of the student course evaluations are summarized in Table II. Peer teaching is well received by both peer teachers and students. Problems identified by either the students or the peer teachers were addressed by making changes in the lab the following year (reducing section size, providing a key to scoring, reviewing the computer system).

DISCUSSION

Peer teaching was adopted in the Pharmaceutical Care Laboratory for two reasons. First we were impressed with published evidence that this is an effective method for helping students learn and retain complex skills(2-4). The second reason is more practical; peer teaching has the potential to be less instructor-time intensive than other methods. During the 1995-1996 academic year, we experimented with the use of reciprocal peer teaching (peer teaching at the same professional level) as well as peer teaching by more advanced students. The use of pairs of students from the same professional level was less successful in shaping technique than student pairs from two different professional levels. Students within a professional level charged with providing feedback and checking a peer’s technique were more likely to have signed off on a peer who was not ready for the final evaluation by the instructor. We approached this problem the next year in three ways. First the role of the peer teacher as evaluator was addressed explicitly and emphatically in the introductory lab session. Peer teachers were instructed to coach their students through the procedure but not sign off on the competency checklist until the student could complete the procedure without coaching. Second, students from two different professional levels were scheduled into the same lab sections to create a disparity between the educational level of the peer teacher and the student. The teaching function came quite natu-

Table II. Summary of responses to the peer teaching evaluation

<table>
<thead>
<tr>
<th>Peer teachers responses</th>
<th>Student responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Found it helpful to review material learned last year by teaching it to first-year students</td>
<td>Needed a review of the computer system</td>
</tr>
<tr>
<td>Best part was getting to know students in another class</td>
<td>Need more direction on grading</td>
</tr>
<tr>
<td>Pleasantly surprised at how much they knew</td>
<td>Lab too crowded</td>
</tr>
</tbody>
</table>
rally in pairing of a first-year with a more advanced student. Third, the instructors checked student competency at the same point in the training as the peer teachers rather than after the peer teachers to validate peer teacher scoring.

In the 1997-1998 academic year we piloted a modest peer teaching experiment in the evaluation of patient care skills with third year students as peer teachers and second-year students as learners. This latter experience presented us with new questions about the usefulness of peer teachers. Based on our experience with checklist scoring of technical and patient care skills, we found that technical skills are uniformly mastered by pharmacy students at a high level while the range of competence in patient care skills is much larger. To some extent this may be related to our lesser ability to define the patient care skills in concrete or specific terms in the creation of a checklist evaluation tool. Students rise to meet well-articulated expectations. However, it seems very likely that the observed differences between mastery of technical and patient care skills are related at least in part to differences in pharmaceutical knowledge base. Problem solving in the clinical arena appears to be highly knowledge-dependent(6). We found that use of peer teachers at this level required considerable quality assurance efforts on the part of faculty involved in the course. Thus while the use of peer teachers in the teaching and learning of patient care skills appears to increase rather than decrease faculty workload, it may be worthwhile to reinforce the acquisition of clinical skills by the peer teachers.

CONCLUSIONS

The use of peer teachers provides a good teacher: student ratio in a pharmaceutical care laboratory intended to develop technical competence in first-year pharmacy students. Peer teacher scoring using a skills checklist is similar to instructor scoring such that instructor evaluation of technical skills is now conducted as a final skills challenge in the last week of the semester. The faculty instructor of the course is involved in the weekly laboratory sessions as a facilitator. Students learn from their peer teachers, enjoy the contact with peers from the class ahead of them and find the peer teachers accessible and easy to ask questions. Peer teachers benefited from reviewing the technical material that they had learned the previous year as they prepared for their peer teaching. The use of peer teachers can be successfully employed in the teaching and reinforcement of technical skills.

Acknowledgement. We would like to thank Safeway and Thrifty-PayLess Drug Stores whose donation of computers and software to the College of Pharmacy made this work possible.

References

APPENDIX A. PATIENT INFORMATION PROFILE
Name: Molly Stratton Date first seen: 3/99
Address: Terrace Apts, #19 Phone: 334 2315
DOB: 092479 Insurance: _______ Group No.: _______
Weight: 115 lbs Height: 64 in SCr Est Cr Cl
Medical History:

- Arthritis
- Asthma/COPD
- Cancer
- Glaucoma
- Angina
- Thyroid Condition
- Ulcers/Intestinal Dis
- Visually impaired
- Smoker

- Diabetes
- Irreg Heart Beat
- Kidney Disease
- High Blood Pressure
- Seizures
- Prostate Condition
- Stroke
- Parkinsons Disease
- Hearing impaired
- X Social Drinker

Prior or Current Prescription Medications:
Natalins 1 qd

Allergies/Adverse Drug Reactions (Please Describe):

Current Non-Prescription Medications
Drug Dose Frequency Date
Ibuprofen 200 mg 1 qid for headache As needed

Prescription Medication Profile
Drug/Strength/ Rx#/Date Sig Quantity Refills Compute

Per cocet 325/5 1 qid pm pain 12 0 sticker
Restoril 7.5 mg 1 hs 7 0

Pharmacist Notes
Date RPh

APPENDIX B. AMBULATORY DRUG DISTRIBUTION CHECKLIST

Student_________________________ Checker________

2 1 0 1. Read and analyze prescription information. Has the student resolved all missing information: patient information, date, valid prescriber, drug, dosage, quantity, instructions, refill instructions? And has it been entered into the computer: allergies, weight if known. Are the chronic conditions and OTC drugs in the comment field?

2 1 0 2. Prescription laid out for checking: Original order, original container, label rubber banded to dispensing container, sticker with prescription number on the face of the original prescription, CGRx on the back of the prescription, profile filed in folder, DUR messages noted in pharmacist’s notes.

2 1 0 3. Correct patient: check name and DOB Check CGRx* against the original order and DOB against who is picking up the order.

2 1 0 4. Correct drug and strength/unit dose Check CGRx against the order.

2 1 0 5. Correct drug and strength/unit dose Check the NDC on the CGRX against the original container selected from the shelf.
course of action, 4) state any contraindications to or reasons for caution (assume that unless you ask questions you have no information other than there is a patient who wants to buy a product for a cold, cough URI), 2) any questions necessary to confirm or rule out the diagnosis of an upper respiratory condition (see below). You need to know the information on this profile so that you can answer questions that the PharP 572 students may ask. You will need to describe the upper respiratory problem to the PharP 572 student and provide them with information on your current and previous medications. Alternatively the PharP 572 student can look up your profile in the PCL file cabinet once you identify yourself. The PharP 572 students may refer to any books or notes during the consultation. Remember that you are trying to help them learn how to consult a patient about a condition treatable with OTC drugs. The exercise isn’t a test although you will need to fill out the OTC Patient Care Checklist as the exercise proceeds. If one of the categories is not applicable, write NA and score it with a 2. When the role play is finished, review the case with the student. Turn in your written care plans and have them turn in the checklists. There is not one right answer to the case.

Description of Current Condition: MS
You had a baby in March and are currently breastfeeding. You have developed a runny, stuffy nose yesterday and you are concerned about passing the condition on to the baby particularly because you are sneezing frequently. You have no fever or body aches. You usually buy Comtrex when you have a cold but you are wanting some advice because you are breastfeeding.

OTC Patient Care Checklist
Student_________________ Checker_________________

2 1 0 1. Questions to evaluate condition:
   Can you describe the problem?
   When did the problem start?
   How long does it last? Does it come and go or is it continuous?
   Does the problem limit your daily activities?
   Is this a new problem or is it a recurrence or worsening of an old one?
   Are there other problems that occur concurrently?
   Does any food, drug or activity make the problem worse?
   Does anything relieve the problem?
   What has been done so far to treat the problem?

2 1 0 2. Questions to evaluate patient:
   Who is the patient? How old? M or F?
   Pregnant or breastfeeding?
   Does the patient have any other medical problems? Allergies? Special nutritional requirements?
   What other drugs, prescription, nonprescription and social, does the patient use?
   Has the patient had adverse drug reactions in the past?

2 1 0 3. Collects additional information when necessary.

2 1 0 4. Formulates plan: (check course of action selected):
   Physician referral (severe symptoms, persistent or recurrent symptoms with no identifiable cause)
   Self care with OTC drugs. Drug(s)
   Self care with nondrug treatment.

APPENDIX C

General Instructions for PharP 574 students
This is a profile of a patient who has had prescriptions filled at the PCL pharmacy earlier in the semester. You may want to look for a drug-related problem for practice but you can assume that the earlier drug-related problem has been resolved during the previous visit. The patient (you will play the patient role as well as the facilitator/evaluator role) will come into the pharmacy with symptoms of an upper respiratory condition (see below). You need to know the information on this profile so that you can answer questions that the PharP 572 students may ask. You will need to describe the upper respiratory problem to the PharP 572 student and provide them with information on your current and previous medications. Alternatively the PharP 572 student can look up your profile in the PCL file cabinet once you identify yourself. The PharP 572 students will have studied the chapter on OTC drugs for colds, cough and allergies and will need to question you and refer to the profile to get the necessary information to make appropriate recommendations. They do not have a copy of the profile in advance. You should review the chapter on OTC drugs for colds, cough and allergies and have a written care plan for the patients you will play before you come to class. Include 1) a hypothesis as to the condition (i.e. viral URI), 2) any questions necessary to confirm or rule out the diagnosis (assume that unless you ask questions you have no information other than there is a patient who wants to buy a product for a cold, cough or allergy), 3) any questions necessary to determine the appropriate course of action, 4) state any contraindications to or reasons for caution in using OTC drugs, and 5) plan for self care. The purpose of this is two fold: first you will have worked the case out for your own learning and second you will have a general idea of what the PharP 572 should be doing.

Start the role play with a simple lead in such as ‘What can you recommend for cough?’ The PharP 572 student should follow this with several questions to assess your condition and your suitability for self care. You may prompt your students with questions such as “Did you want to know about my medical conditions?” or “Do you need to know the other drugs I’m taking?” if the student begins to make recommendations without taking all relevant information into consideration. PharP 572 students may refer to any books or notes during the consultation. Remember that you are trying to help them learn how to consult a patient about a condition treatable with OTC drugs. The exercise isn’t a test although you will need to fill out the OTC Patient Care Checklist as the exercise proceeds. If one of the categories is not applicable, write NA and score it with a 2. When the role play is finished, review the case with the student. Turn in your written care plans and have them turn in the checklists. There is not one right answer to the case.

Description of Current Condition: MS
You had a baby in March and are currently breastfeeding. You have developed a runny, stuffy nose yesterday and you are concerned about passing the condition on to the baby particularly because you are sneezing frequently. You have no fever or body aches. You usually buy Comtrex when you have a cold but you are wanting some advice because you are breastfeeding.
5. Advises patient on self care:
2  1  0  Reasons for self-treatment.
2  1  0  Administration of the drug and/or nondrug treat-
ment.
2  1  0  Side effects.
2  1  0  Disease interactions.
2  1  0  Drug interactions.
2  1  0  Techniques for self monitoring.
2  1  0  6. Follow up plan.
2  1  0  7. Responds to questions appropriately.

Total Score _________________

APPENDIX D. DRUG USE REVIEW CHECKLIST

Student _______________ Name of patient

2  1  0  1. Is the patient information complete?
   Patient name, address and telephone numbers
   — Drug allergies and adverse drug reaction
   — History
   — Birthdate/age, weight and height, occupation
   — Clinical condition(s)
   — Current prescription drug therapy including
   — Product name, strength, dosage form,
   — Quantity dispensed, directions for use, Rx
   — Number, dispensing dates, refills, prescriber
   — and pharmacist initials.
   — Nonprescription drug therapy

5  4  3  2  1  2. What questions would you like to ask the
   patient or doctor?

5  4  3  2  1  3. What drug related problems did you identify?
   Therapeutic duplication
   Drug-disease interactions
   Drug-drug interactions
   Incorrect drug dosage, frequency or duration of
   drug treatment
   Drug allergies and adverse reactions
   Clinical abuse/ misuse
   Suboptimal drug, dosage form or route
   Drug indication mismatches

5  4  3  2  1  4. What is your plan to resolve the problem?:
   (check and describe course of action selected):
   To dispense the prescription with patient moni-
   toring
   To decline to dispense the prescription

Total Score _________________

PharP 572/574 Peer Teacher Evaluation

Peer Teacher _________________________

5  4  3  2  1  1. Communicates clearly and effectively.
5  4  3  2  1  2. Demonstrates command of techniques present-
   ed.
5  4  3  2  1  3. Presented work in a logical sequence.
5  4  3  2  1  4. Uses class time effectively
5  4  3  2  1  5. Responds appropriately to questions and com-
   ments.
5  4  3  2  1  6. Demonstrates willingness and/or enthusiasm for
   helping students.

Total Score _________________

Add any constructive comments here:

Based on Preparing for Peer Observation, A Guidebook prepared by The
Center for Teaching Effectiveness, The University of Texas at Austin.

APPENDIX E

Pharmaceutical Care Laboratory I
Course Evaluation
Spring, 1999

1. Define the purpose of this semester’s pharmaceutical care lab.
2. What exercises did you find most helpful/enjoyable and why?
3. What exercises did you find least helpful/enjoyable and why?
4. What topic/exercise do you think was most related to what you
   will be doing postgraduation?
5. Comment on each of the following methods with regard to how
   helpful it was in promoting your learning:
   a. Paired coaching and checking with PharP 574 students
   b. Demonstration followed by practice
   c. Cooperative grouping (third party programs)
   d. Role playing (Patient counseling, patient care with OTC drugs)
   e. Take home law worksheets.
6. What other topics/skills would you like to cover before your
   first internship summer? (What are we missing in this course?)

Thanks for working with us this semester!