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INSTRUCTIONAL DESIGN AND ASSESSMENT

"Brown Bag" Simulations to Teach Drug Utilization Review

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Objective. To teach drug utilization review (DUR) skills to pharmacy students and assess their abilities and confidence before and after training.

Design. Profile reviews and online and live drug-utilization-review activities of increasing difficulty were incorporated into the first (P1), second (P2), and third (P3) years of the Pharmacy Skills Training Laboratory sequence in a doctor of pharmacy (PharmD) curriculum.

Assessment. An online survey instrument was administered to gauge how comfortable students were with specific DUR skills before and after the activities. Students' confidence in performing specific DUR skills improved after completing the activities.

Conclusion. Profile reviews, as well as online and live medication reviews, gave students numerous opportunities to practice drug utilization review skills throughout the first 3 years of the pharmacy curriculum. Students' confidence in performing specific drug utilization review skills improved after the activities. Students' ability to perform the skills also improved as measured with the developed checklist in section V and VI of the Pharmacy Skills Laboratory sequence.

Keywords: drug utilization review, pharmacy skills laboratory

INTRODUCTION

Drug utilization review has been a standard part of pharmacists' practice for many years.[1] Drug utilization review is used to assess drug therapy appropriateness and ensure patient safety.[2] The Institute for Safe Medication Practices encourages the use of "brown-bag" checkups by pharmacists as a safety measure to check for problems such as drug-allergy contraindications, therapeutic duplication, drug-drug interactions, drug-disease interactions, inappropriate dosage or duration of therapy, or clinical abuse and misuse. For a brown-bag checkup, the patient brings all prescription and nonprescription medications to a pharmacist and has him or her review them for any potential problems.[3] The brown bag review process has been developed and used in the Creighton University School of Pharmacy and Health Professions' skills laboratory program for the specific purpose of having students apply principles of DUR without the assistance of a technical interface.

Drug utilization review involves the review of a prescription prior to dispensing a drug to the patient. This review includes such activities as screening for drug-disease contraindications and drug-drug interactions.[4] Most pharmacies have systems that alert the pharmacist to a potential problem before the prescription is dispensed. However, it is important that pharmacists have the professional knowledge and judgment necessary to conduct a prospective DUR without the aid of a computer program. To conduct a DUR, the pharmacist must consider and be able to judge these elements: prescription accuracy; allergies; medication appropriateness; dosage and length of therapy; drug interactions (including drug-drug, drug-disease, drug-food, and drug-laboratory); therapeutic duplication; appropriate use; adverse effects; and abuse or misuse.[2]

The Omnibus Budget Reconciliation Act of 1990 (OBRA '90) created a requirement for states to ensure prospective drug review occurs with every dispensed prescription reimbursed by government programs:

> "The State plan shall provide for a review of drug therapy before each prescription is filled or delivered to an individual receiving benefits under this subchapter, typically at the point-of-sale or point of distribution. The review shall include screening for potential drug therapy problems due to therapeutic duplication, drug-disease contraindications, drug-drug interactions (including serious interactions with nonprescription or over-the-counter drugs), incorrect drug dosage or

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duration of drug treatment, drug-allergy interactions, and clinical abuse/misuse."[5]

Most states have implemented statutes and regulations that require the same type of prospective DUR for all prescriptions regardless of the type of reimbursement. Additionally, several pharmacy organizations have enacted codes of ethics and standards of practice that support this view of DUR. These include the American Pharmacists Association, the American Society of Health-Systems Pharmacists, the National Association of Boards of Pharmacy, and the Academy of Managed Care Pharmacy.[2]

The American Association of Colleges of Pharmacy's Pharmacy Practice Supplemental Educational Outcomes, which are based on CAPE 2004, specifically state: "Interpret and evaluate patient and drug-related data needed to identify actual or potential drug therapy problems (prescription and non-prescription)".[6] Under this heading, the following activities are listed: assess any patient history of allergies and intolerances, evaluate the significance of actual or potential drug interactions, assure that there is not excessive medication use or unnecessary drug duplication, and identify signs or potential indicators of drug misuse or abuse.

The previous pharmacy curriculum at the School of Pharmacy and Health Professions at Creighton University had limited student exposure to developing and improving DUR skills prior to the fourth year, with that occurring only in the classroom during the sixth semester of the program. In the new curriculum, Pharmacy Skills Laboratory faculty members implemented DUR activities in the 6-semester PSL sequence using a brown bag review process. Because Creighton University's program includes campus and distance students, the activities were integrated into both pathways. The educational objective was to improve students' abilities to perform DUR. This was accomplished by introducing DUR concepts in the first semester and allowing students to practice and improve their skills in subsequent semesters by sequencing these activities with course content.

DESIGN

The Pharmacy Skills Laboratory was a longitudinal experience taught in semesters 1 through 6 of the curriculum. The sessions were designed to reinforce understanding of concepts presented in course lectures, and to support the development and application of skills required to practice contemporary pharmacy. Specific pharmacy practice skills with regard to disease state monitoring and medication therapy management for the assurance of optimal therapeutic outcomes were reinforced through knowledge-in-use activities in simulated pharmacy practice cases and situations. Selected practice fundamentals and processes, such as patient counseling, patient safety exercises, pharmaceutical calculations, compounding, prescription processing, and DUR were reinforced throughout all 6 semesters of the curriculum.

Both campus and distance pathway students were required to complete all 6 semesters of PSL. Campus students attended laboratory throughout the semester. Distance students complete online portions of the laboratory course throughout the semester and then traveled to campus for a 1- to 2-week summer "intensive" portion of the course.

The expanded DUR curriculum was introduced to students in their P1 year beginning in 2010. The students were given a foundational lecture that presented the basic elements of a prospective DUR. Each student was assigned a patient profile with 6 medications. The initial step required the student to go through his or her patient's profile and complete a table regarding the patient's medications. Students identified the brand and generic name of each medication, pharmacological classes, medication indications, appropriate dosage ranges, and any patient allergies. Using this information, the students' next step focused on screening the patient profile for therapeutic duplications, drug-allergy interactions, drug-disease interactions/contraindications, drug-drug interactions, inappropriate doses or duration of action, and clinical abuse or misuse. These 6 components constituted the DUR process reinforced throughout the Pharmacy Skills Laboratory sequence. The patient cases were constructed so that at least 1 of each of the issues existed. Students and faculty members then convened in small groups and discussed their findings.

The second DUR in the P1 year was a "mini" brown bag review. Each student was assigned a simulated patient who needed 2 new prescriptions filled and 2 medications refilled. They checked the 4 medications and performed a DUR which involved the same process that they used in the first DUR activity. Finally, when a drug problem was identified they prepared a "request for change" form to be transmitted to a provider's office, simulating what would occur in practice Faculty members assessed students' request-for-change forms.

In the second semester of the P2 year, online brown bag cases were introduced. Three DUR cases were administered electronically to both campus and distance pathway students using an online assessment program. Each patient case focused on specific disease states that were concurrently covered in Pharmacotherapeutics II (asthma, gastrointestinal disorders, and chronic hepatitis C). The cases provided a brief introductory scenario including a list of

the patient's medications and disease states. The questions that followed asked students to identify issues related to the 6 DUR components for each medication in a step-by-step fashion. Follow-up questions asked students to identify the mechanism of action of any drug-disease interaction or drug-drug interaction. The number of questions in each case ranged from 37 to 54. The students were given 40 minutes to complete each case and were allowed to use resources.

Later in the semester, students were randomized into groups of 5 to 10 and assigned to a station with 1 faculty member to complete a brown bag review. Each station was equipped with a brown bag filled with a simulated patient's prescription and nonprescription medications. During the 20-minute session, faculty members assisted students with the DUR process by asking them to verbally identify any issues. Faculty members did not grade students' performance in this activity but did provide them with verbal feedback.

The DURs in the third year were more complex. In the first semester, students completed 2 small-group brown bag reviews. Students from each group first individually reviewed the same patient's disease states and medication list for 15 minutes. They then met as a group with a faculty member to discuss their findings and receive feedback. In the final laboratory session of the semester, each student completed 2 brown bag reviews individually. They were given 15 minutes to identify issues and then 10 minutes to discuss their findings with a faculty member. Faculty members graded these 2 brown bag activities (Appendix 1).

In the second semester, students were given a brown bag of medications, both prescription and nonprescription, and a patient wallet card that included allergy information. Students had approximately 10 minutes to perform a DUR. Students then spent 5 minutes communicating their findings to a faculty member. The 15-minute time limit was imposed to realistically simulate the performance of this task in an actual practice setting. Faculty members assessed students based on how many issues they correctly identified and assigned a score using the developed checklist. To ensure that faculty assessment of the brown bag activities was consistent, a short video was created demonstrating the DUR assessment process to provide guidelines to aid faculty members in assessing students' performance. The video was sent via e-mail to all faculty members participating in the P2 live group or P3 one-on-one brown bag activities.

The time commitment and number of faculty members required for each DUR activity varied depending on the specific activity. Online brown bag activities required only the time of 1 faculty member to design the activity and enter questions into the online assessment program. Group brown bag activities were facilitated by 1 faculty member for every 5 to 10 students, while live individual brown bag activities required up to 6 faculty members for campus pathway students and 10 faculty members for distance pathway students per 3-hour laboratory to ensure one-on-one assessment.

EVALUATION AND ASSESSMENT

Online pre- and post-semester survey instruments were created using an online survey (SurveyMonkey, Palo Alto, CA). Both survey instruments were sent to all campus P3 students and all campus and distance P2 students. Two hundred twenty-five students completed the pre-semester survey instrument (78.6% response rate). One hundred forty students completed the post-semester survey instrument (62.2% response rate). The same 11 questions were asked on the pre- and post-semester survey instruments to determine how comfortable students were in performing specific DUR tasks before and after training. Students chose responses from a 5-point Likert scale, ranging from "not at all confident" to "extremely confident." Data from the survey instruments were exported to an Excel spreadsheet and a Wilcoxon signed rank test was conducted.

Students' confidence significantly improved over the semester in every assessed capability involved in performing DUR and brown bag reviews (Table 1). The 2 items in which the greatest changes occurred were in "Recognition of potential drug-allergy interactions" and "Ability to conduct a 'brown bag review'". The item on which the least improvement occurred was "Ability to appropriately communicate potential problems to patients"; however, the improvement was still significant.

Student scores on P2 and P3 activities (Pharmacy Skills Laboratory [PSL] IV, V, and VI) were also assessed using the developed checklist (Appendix 1). Student scores were analyzed with a Friedman test (with the exception of PSL V) followed by a Wilcoxon signed rank test for post hoc pair comparisons. In PSL V, the mean score on the second DUR was significantly higher than that on the first DUR ($p<0.001$). In PSL VI, the mean score on DUR 3 was significantly higher than that on DUR 1 ($p=0.001$); the mean score on DUR 4 was significantly higher than that on both DUR 1 and DUR 2 ($p=0.001$). In the PSL IV course, there was a significant decrease in students' mean scores from DUR 1 to DUR 3 ($p<0.001$) and from DUR 2 to DUR 3 ($p<0.001$).

DISCUSSION

In our old curriculum, DUR activities were introduced to students in the Dispensing and Pharmaceutical Care course in the second semester of the P3 year. In this

Table 1. Second- and Third-Year Pharmacy Students' Self-Assessment of Their Knowledge of and Skills in Drug Utilization Review Before and After Completing Training in a (N=140)

Capabilities	Score, Mean (SD)[a] Pre-DUR/Brown Bag Activities	Post-DUR/Brown Bag Activities	P^b
Recognition of medications that have a narrow therapeutic index	2.7 (0.8)	3.4 (0.8)	<0.01
Recognition of potential therapeutic duplications	3.1 (0.8)	3.8 (0.7)	<0.01
Recognition of potential drug-drug interactions	2.2 (0.7)	2.9 (0.7)	<0.01
Recognition of potential drug-disease contraindications	2.3 (0.8)	2.8 (0.8)	<0.01
Recognition of potential drug-allergy interactions	2.7 (0.8)	3.5 (0.9)	<0.01
Recognition of potential inappropriate dosages	2.2 (0.9)	2.7 (0.9)	<0.01
Recognition of potential clinical abuse or misuse issues	2.9 (0.9)	3.5 (0.9)	<0.01
Ability to appropriately communicate potential problems to patients	3.4 (0.8)	3.8 (0.7)	<0.01
Ability to appropriately articulate medication issues with faculty preceptors	3.1 (0.8)	3.6 (0.8)	<0.01
Ability to conduct a "brown bag review"	2.3 (0.8)	3.1 (0.7)	<0.01
Application of the DUR process	2.6 (0.7)	3.3 (0.7)	<0.01

[a] Rating scale: 1=not at all confident, 2=not very confident, 3=moderately confident, 4=very confident, 5=extremely confident.
[b] Wilcoxon signed-rank test.

course, students had the opportunity to complete 6 DUR activities. The first class of students enrolled in the new curriculum completed the 6 semester Pharmacy Skills Laboratory sequence in May 2013. These students completed 15 DUR activities over the 3-year period.

Faculty members observed a significant improvement in students' performance of DUR activities in PSL V and VI; however, a significant improvement was not seen in students' performance in PSL IV. Possible explanations for this were the topics and increasing complexity with each activity over the course of the semester. The first electronic brown bag activity was created using 6 medications with the patient's main disease state being asthma. The second activity focused on gastrointestinal disorders and involved review of 9 medications. The third activity involved review of 7 medications and the patient's main disease state was hepatitis C. Anecdotally, students reported that they felt the DUR process was more difficult when it involved a complex disease state such as hepatitis C.

Some of the improvement in performance seen in PSL V and VI may have been the result of additional course work and outside work experience; however, the faculty members' experience with the Dispensing and Pharmaceutical Care course in the former curriculum suggests that repeated exposure to DUR activities over the period of 1 semester improves student performance.[7]

This study was limited by the fact that the P1 class was not surveyed. The impact of the DUR/brown bag review activities on this class is unknown. Also, the P3 distance students were not surveyed because of logistical issues resulting from the timing of their laboratory sessions. Future surveys of these groups are planned in order to improve the way sessions are administered and students are assessed.

Based on survey results coupled with positive feedback from students in course evaluations, PSL faculty members will incorporate additional DUR activities into the first semester of the P2 year. A training video is under development for students to preview prior to the DUR/brown bag review that will depict a DUR/brown bag review and role-play between a student and a faculty member. This should provide a better orientation to the activity.

SUMMARY

Drug utilization review is an essential skill for practicing pharmacists. Previously, there were very few specific skills activities focused on DUR in the Creighton University School of Pharmacy and Health Professions' pharmacy curriculum. Coupling the DUR activities with the brown bag review in the PSL sequence resulted in significant improvement in students' confidence in performing these skills. Students' abilities in performing DUR significantly improved in the PSL V and VI courses. These training activities should better prepare students to perform DUR and brown bag reviews in their advanced pharmacy practice experiences and subsequent professional practice. Development and implementation of other DUR/brown bag review activities with formative and summative assessment processes are planned.

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Appendix 1. Sample Brown Bag DUR and Checklist (used in PSL V)

Medication list:
- Ciprofloxacin 500 mg BID x 7 days
- Prednisone 20 mg QD x3 days, 10 mg QD x 3 days, 5 mg QD x 3 days
- Levothyroxine 100 mcg QD
- Glimepiride 1 mg QID
- Metaglip 5/500 mg BID
- Ibuprofen 400 mg QID PRN
- Warfarin 5 mg QD
- Amlodipine 5 mg TID
- ASA-EC 81 mg QD
- Glucosamine 1500 mg BID
- Loestrin 24 FE UD

Allergies:
- Shell fish allergy

	Yes	No
Therapeutic Duplications		
Glimepiride and Metaglip are both antidiabetic sulfonylurea agents		
Drug-Disease Interactions		
Ciprofloxacin and diabetes: may cause severe hypoglycemia		
Prednisone and diabetes: may increase blood glucose levels		
Ibuprofen and hypertension: Increased risk of acute renal injury		
Ibuprofen and diabetes: Increased risk of acute renal injury		
Drug-Drug Interactions		
Ciprofloxacin and prednisone increases risk of tendonitis and rupture		
Ciprofloxacin may interfere with absorption of levothyroxine		
Ciprofloxacin may decrease effectiveness of Loestrin		
Ibuprofen decreases effectiveness of amlodipine		
Prednisone and ASA-EC increases risk of GI bleeds		
Prednisone and warfarin increases risk of bleeding		
Warfarin and ASA-EC increases risk of bleeding		
Warfarin and glucosamine may increase INR		
Warfarin and glyburide/glipizide increases risk of bleeding		
Warfarin and levothyroxine increases risk of bleeding		
Warfarin and Loestrin increases risk of bleeding		
Warfarin and ibuprofen increases risk of bleeding		
Ciprofloxacin and warfarin increases risk of bleeding		
Ferrous sulfate decreases serum concentrations of levothyroxine		
Dosage errors		
Glimepiride 1 mg QID should be dosed QD		
Amlodipine 5 mg TID should be dosed QD		
Allergy		
Shell fish and Glucosamine		