TEACHERS' TOPICS

An Elective Course to Introduce Clinical Pearls Related to Commonly Prescribed Medications

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Objective. To develop and implement a 2-hour elective course to reinforce clinical aspects of various commonly prescribed medications and identify important differences between various drug classes.

Design. Drugs and drug classes were systematically and chronologically presented to highlight “clinical pearls” and subtle differences, and provide a framework that facilitates learning.

Assessment. Learning was assessed via 3 paper-based examinations, a written drug consult, and a comprehensive final examination. Students performed well on the examination and rated the course favorably on standardized evaluations.

Conclusion. The RX File course proved to be a popular elective which appears to meet a niche by providing a course that supplements and complements the existing curriculum by providing detailed information on the clinical aspects of medications.

Keywords: elective, curriculum, pharmacology, prescription medications

INTRODUCTION

Instruction of pharmacology in most doctor of pharmacy curricula takes place within both basic science courses and components of pharmacotherapy courses.¹ This knowledge is often augmented and applied using either “paper-based” patient cases or standardized patients. These interactions often occur in the setting of a professional practice laboratory course, module, or sequence. Basic science instruction related to pharmacology often involves a molecular approach to understanding a given drug’s mechanism of action as well as anticipated adverse effects. Pharmacotherapy course work usually focuses on the rationale, structured, and logical use of various drugs and drug classes for the management and treatment of specific diseases. Emphasis in pharmacotherapy coursework is often placed on diseases and disease states and how the pathophysiology of a given condition may be corrected or altered by drug therapy.

Most health care professionals are familiar with the term “clinical pearls,” which refer to insights or bits of wisdom acquired through practice and which in pharmacy usually regard a drug or drug class. Many of these pearls are garnered from extensive clinical experience with the use and monitoring of these agents. Much of this anecdotal knowledge about drugs is not included in typical curricula either because basic scientists lack practical experience with the use of these agents or time precludes their inclusion in practice-based courses such as pharmacotherapy. Recognizing that pharmacy students are often interested in augmenting their knowledge of the clinical aspects of medications, the course The RX Files was developed. This elective was designed with the following objectives: to reinforce clinical aspects of various commonly prescribed medications and to recognize, compare and contrast important differences between prescription medications within various drug classes.

DESIGN

The RX Files was proposed as a 2-credit-hour elective and approved by both the curriculum committee of the Department of Pharmacy Practice and the college curriculum committee at the University of Kentucky. Subsequently, the course was approved by the University Health Care Colleges Council. The course was designed as a third-year elective, with the second-year introductory therapeutics course serving as a prerequisite. By the third year of the doctor of pharmacy (PharmD) program, students have completed all basic science pharmacology courses except for a cardiovascular module, which occurs in the fall of the third year. Students also have completed the nonprescription medications course, as well as 4 of the 6 semesters of a patient care laboratory sequence. Within the third year, students are enrolled in a yearlong

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therapeutics sequence, coursework in public health and pharmacy management, and a pharmacy seminar course that encompasses various issues related to the practice of pharmacy.² The therapeutic course sequence is primarily instructed in a modular format utilizing both lectures and capstone cases as teaching modalities. Each course module is based on an organ system (eg, cardiovascular, gastrointestinal, hematology/oncology, endocrine) and includes instruction on the affiliated pathology and pharmacotherapeutics associated with that organ system. Material is presented via lectures and interactive discussion of capstone cases.

RX Files was intentionally placed within the third year so that students would have completed the majority of their pharmacology course work and so the teaching of course material would coincide with the teaching of complementary/related material being taught in therapeutics (Table 1). For instance, the first module within the therapeutics course is infectious disease; correspondingly, the first 3 drug classes covered in the RX File course are

antimicrobials, antiretrovirals, and antivirals. The RX Files course met weekly for 2 hours and instruction was delivered by a single instructor. Within each class period, the instructor reviewed 1 to 2 drug classes in an extemporaneous lecture that was conversational in tone. Although PowerPoint slides and outlines were not used, a handout was provided to students. No textbook was required for the course.

Rationale for the drug classes covered was based on reports of commonly prescribed medications in the United States.³ It was not possible to cover every drug and drug class available; however, it was hoped that the systematic process employed for reviewing agents would assist students when exposed to other drug classes or newer agents within existing classes. The first class meeting introduced students to the course goals and associated objectives and provided a landscape for how drugs and drug classes would be covered. For a given drug class, the lecture typically began with an overview of the associated clinical pharmacology of the class, including mechanism of action, associated adverse effects, and general use in practice (eg, primary indication). Subsequently, individual drugs or representative drugs (in cases where covering each drug was impractical) were discussed, with comparisons and contrasts made to other agents in the class. An emphasis was placed on the advantages and disadvantages of one agent compared with another. Attention was also placed on teaching important clinical pearls about each agent (Table 2). Although the RX Files focused on the same disease states as the therapeutics course, the elective course taught associated pearls not covered in the required therapeutics course.

“In the first class, clinical communication skills were reviewed and reinforced since students were expected to use these skills to assess a patient case involving a drug consultation. Following some explanation of process, the same paper-based case was distributed to all students. The case involved at least 1 drug class or therapy that had been or would be discussed in the course. Additionally, each student randomly received 1 of 6 consult questions related to the drug therapy involved in the case and asked to “leave a consult” using the chart note paper provided. Students had to compose the handwritten note as if it were to be placed in an actual medical chart, and could not exceed the length of a single sheet of chart note paper (back and front). The purpose of the consult was to provide students a simulated experience that allowed them to practice their clinical writing and to engage them in an exercise that also required them to manipulate their drug knowledge in such a way as to provide logical recommendations to a clinical dilemma. The course instructor was available to answer students’ questions and review rough

Table 1. Course Topics and Sequence

Sequence	Course Topic
Class Meeting 1	Course Introduction Clinical Writing
Class Meeting 2	Anti-Infectives
Class Meeting 3	Antiretrovirals Antivirals
Class Meeting 4	Antihistamines Non-steroidal Anti-inflammatory Drugs
Class Meeting 5	Beta-blockers Calcium Channel Blockers
Class Meeting 6	Gastrointestinals
Class Meeting 7	Angiotensin Converting Enzyme Inhibitors/ Angiotensin Receptor Blockers Diuretics
Class Meeting 8	Antihyperlipidemics Miscellaneous Cardiac Medications
Class Meeting 9	Antidepressants
Class Meeting 10	Antipsychotics
Class Meeting 11	Anti-anxiety Sleep Aids Muscle Relaxants
Class Meeting 12	Miscellaneous Medications
Class Meeting 13	Miscellaneous Medications Drugs Question and Answer Session Review

Table 2. Clinical Pearls: Select Examples

Tricyclic antidepressants: toxicity manifests as TCA (tonic clonic seizures, cardiac pathology, and anticholinergic effects)
Medications preferring an acidic environment in gut: iron, digoxin, atazanavir, itraconazole
First generation non-nucleoside reverse transcriptase inhibitors: often considered “one and done” in terms of their resistance profile and cross-reactivity
Sulindac: often considered among the most ‘renal friendly’ of the non-steroidal anti-inflammatory drugs (NSAIDs)
Celecoxib: the first and least potent of the COX-II inhibitors
Hydroxyzine: antihistamine considered to have significant anti-pruritic efficacy
Phenylephrine: cannot be converted to methamphetamine
Sucralafate: may chelate other susceptible drugs because of aluminum moieties found in the drugs chemical structure
Sublingual nitroglycerin: potency is related to the tablets ability to produce a stinging sensation when placed under the tongue
Aspirin, angiotensin converting enzyme inhibitors: common drugs that can induce angioedema
Aspirin allergies: may be associated with asthma, nasal polyps, and leukotriene sensitivity
Loop diuretics conversions: 1 mg bumetanide = 10-20 mg torsemide = 40 mg furosemide
Digoxin toxicity: may be predisposed by visual changes (halo-vision, green/yellow visual hues)
Cyclobenzaprine: structurally related to amitriptyline, treat as a TCA overdose
Chlorpromazine: may be used to manage intractable hiccups

drafts of the assignment. In reviewing drafts, the instructor provided constructive criticism to the students regarding the quality of their writing and feedback regarding their recommendations, but did not reveal the solution to the dilemma. Each consult received a score of 0-10 based on a rubric that had been provided to the students along with the consult question. Scoring was based equally on the quality of writing and the rationale and recommendations proposed. Grading emphasis was placed on the logic of the proposed recommendations given the patient case. Although there were no right or wrong answers, certain errors within the consult could result in a grade of zero (eg, use of an incorrect documentation format, use of brand versus generic drug names, failure to recognize and/or document a drug allergy, recommendation of therapy that would result in significant harm to/death of the patient). Following grading, each student received the rubric scores as well as individual comments intended to improve writing skills and/or the logic used to arrive at the given conclusions for the case. Students were given 5 weeks to complete this assignment.

EVALUATION AND ASSESSMENT

Learning was assessed through the use of 3 paper-based examinations and a cumulative final examination. All examinations were a hybrid of objective and subjective components and hand-graded so that individual feedback could be provided. Students' grades were determined by performance on the 3 paper-based examinations, a final examination, and the clinical consult. Each examination comprised 20% of the final grade, the cumulative final examination was worth 35%, and the clinical consult counted 5%. The course was regularly evaluated by students at the conclusion of the semester as a compo-

nent of the overall college assessment plan. The evaluation was conducted via an online system and consisted of several statements and student responses based on a 4-point Likert scale (strongly disagree = 1; disagree = 2; agree = 3; strongly agree = 4). Mean Likert scale scores and associated standard deviations were calculated for each response statement.

Seventy-eight of 132 eligible students enrolled in the elective the first term the course was offered. All 78 completed a course evaluation using the online CourseEval system. Students agreed with the statement “This course was helpful in developing new skills” (mean score $\pm$ SD = 3.7 ± 0.5). Students also generally agreed with the statement “I have become more competent in the course content and topics because of this course” (3.7 ± 0.5). Students rated the overall value of the course as 3.9 ± 0.4 , based on a 4-point scale, on which 1 = poor and 4 = excellent. Open-ended comments provided by students were generally favorable. In general, students felt the course should be considered as an addition to the core curriculum and favored additional exposure to commonly prescribed drugs earlier and more often within the curriculum. Students also commented that this seemed to be the only pharmacy course focused entirely on medications. One of the most common positive comments regarding the course was that PowerPoint slides were not employed as an instructional method. In terms of areas for improvement, students generally preferred a slower pace for material presentation and commented on the lack of sufficient time to cover all of the course material.

DISCUSSION

The RX File elective is a popular 2-credit elective class that affords students an opportunity to focus on

and review clinical aspects of commonly prescribed medications. Topics are presented in a systematic and chronological fashion to maximize learning. Despite all of the pharmacy-related course work completed prior to and as co-requisites for this course, students still find the class relevant and beneficial. In terms of curricular design, students perceived that typical basic science pharmacology coursework as well as pharmacotherapy coursework did not necessarily emphasize the clinical/practical aspects of drugs. The incorporation of pharmacy practice-related course work earlier in PharmD curricula has been proposed by other authors.⁴ Also of note and deserving of more attention and research was the finding that students enrolled in this course consistently favored a learning experience that did not employ PowerPoint slides. The exact reason that students preferred the lack of PowerPoint is unclear and could either be because the majority of other curricula within the college employ the platform or simply because material was easier for students to manipulate in a non-PowerPoint format.⁵ This specific issue was credited with much success in terms of student learning.

Since this was the first offering of this elective course, further evidence of success in meeting objectives will need to be garnered from future classes/offerings of this course. An additional marker of the impact of the elective is student enrollment. For the second offering of this course, 118 of 133 eligible students enrolled. Future research should examine potential reasons for students not electing the course and what subsets of students (eg, students pursuing residency training, students entering community practice, etc) perceive the greatest benefit.

SUMMARY

The RX File course is an elective 2-credit-hour course that affords students an opportunity to reinforce previous pharmacology knowledge and augment that information with clinical aspects associated with various drugs. The systematic approach to understanding drugs and various drug classes should prove useful to students beyond pharmacy school as they work to remain competent in the setting of new drug development. The piloting of this elective course has been successful in terms of positive student evaluations and heavy elected enrollment. Future considerations include ongoing monitoring of drug classes incorporated into the course, the addition of an oral examination component to stress verbal communication skills, inclusion of course material into the formal curriculum, and application of advanced statistical analysis (eg, Rasch analysis) to the evaluative data.

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