INSTRUCTIONAL DESIGN AND ASSESSMENT

A Veterinary Comparative Counseling Elective Featuring Web-based, Student-created, Client Information Sheets

Jennifer C. Miller, BS, Inder Sehgal, DVM, PhD

Marshall University School of Pharmacy, Huntington, West Virginia

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Objective. To design and implement a course in Companion Animal Comparative Counseling that would expose students (N=38) to essential elements of veterinary therapeutics and provide them with the opportunity to apply their knowledge by writing and posting client information sheets (CIS) on an open web site.

Design. The elective course was limited to companion animals. Nine different topics were covered over the semester. Class sessions included a didactic component, trivia questions, and field trips. There were 4 major graded assessments: an examination on foundation knowledge, followed by two comparative counseling assessments and evaluation of group-composed CIS. Attendance and participation were also considered.

Assessment. The class learned comparative disease states, how to counsel on common pet prescriptions, where to access informatics about specific veterinary drugs, and how to create their own CIS.

Conclusion. As pharmacists, these students may have improved their training in veterinary comparative pharmacy.

Keywords: active learning, interprofessional education, client information sheets, veterinary, counseling, dogs and cats

INTRODUCTION

An increasing number and complexity of animal-related prescriptions are being referred to retail community pharmacies. However, pharmacists in these practices generally lack adequate training in veterinary medicine as it relates to therapeutics,¹⁻³ because most doctor of pharmacy (PharmD) curricula do not provide training in veterinary physiology, disease states, pharmacology, pharmacokinetics, drug administration, adverse effects, or disease or drug counseling.⁴ Some pharmacists, therefore, can be uncomfortable with aspects of veterinary pharmacy such as specific companion animal disease states, pharmacotherapy options, dosages, informatics resources, and client counseling.⁵ The veterinary profession has expressed concern with pharmacists erroneously substituting medications, altering dosages, and misadvising on expected effects.⁶

Despite the general lack of animal-related training in pharmacy schools, approximately 35 schools of pharmacy do offer veterinary-related elective courses; however, these courses follow no standardized format for content and thus instruct at various depths of disease states, client prescription counseling, student contact

hours, and instructor backgrounds.⁷ A literature search produced information on three such elective courses at schools of pharmacy as well as one compounding training program. A course at the University of New England emphasizes compounding and laws applicable to compounding.⁸ In this elective course, the objectives are to ascertain essential veterinary pharmacy subjects for retail settings, experience some veterinary compounding, and gain clinical experiences through animal health-related tasks. At the University of Hawaii Hilo, Adrian et al reported on the development of an elective introductory pharmacy practice experience (IPPE) at a companion animal veterinary clinic for two days during one week.⁴ They accompanied a preceptor veterinarian on rounds of in-house patients as well as completion of a subjective objective assessment plan ("SOAP note"). Students discussed veterinary clinical pharmacology onsite including indications, mechanisms, compounding, and extra-label drug use. Student questionnaires indicated students felt increased interest or knowledge in veterinary pharmacy, veterinary compounding, client education, and counseling. Professional Compounding Centers of America (PCCA) offers students a veterinary compounding training program consisting of an online section and an onsite laboratory on animal drug compounding. The course aims to teach

Corresponding Author: Inder Sehgal, One John Marshall Drive, Huntington, WV 25755. Tel: 304-696-3520. E-mail: sehgal@marshall.edu

veterinary pharmacotherapy and compounding drug applications relevant to several species.⁹

The most well-established elective course was at Creighton University. This 2-hour veterinary therapeutics elective course covered common disease states and animal or human-label drugs used to treat these states, as well as legal and regulatory issues affecting animal drug use.¹⁰ The course also pointed out facts about veterinary drugs and animals that, while well-known to those in veterinary medicine, were surprising to pharmacy students. Students shared personal experiences through open discussion, self-assessment quizzes and examinations.³ A similar course is now offered at the University of Florida.¹¹

For postgraduate community practice PharmDs, continuing education (CE) courses offer a path to gain further expertise in facets of animal-related pharmacy. However, these courses also vary in content and depth. Online CE courses are available through the University of Florida (30 hours),¹² University of Wisconsin (8.0 hours),¹³ Pharmaceutical Education Consultants (1 hour),¹⁴ and Pharmacist's Letter monthly newsletter (2 hours).¹⁵

Few training programs exist for postgraduate specialty training. The veterinary schools at University of California (UC) Davis, North Carolina State University, Purdue University, and the University of Wisconsin-Madison offer veterinary clinical pharmacy and therapy residencies to prepare a resident to test for board certification in the Society of Veterinary Hospital Pharmacists. The UC Davis program, the first established veterinary pharmacy residency program, offers two years of training encompassing clinical rounds and rotations, research, regulatory laws, and compounding.¹⁶ The website advertises that graduates may find work in many areas, stating that "academic veterinary centers, drug companies, manufacturing companies, and regulatory agencies have all expressed interest in graduates from the program." The residency at North Carolina State College of Veterinary Medicine is a 1-year training program in which residents divide time between clinical rounds and rotations and in clinical pharmacy or clinical pharmacology laboratories.¹⁷ The residency at Purdue University is a new program that offers one year of training during which residents cover veterinary pharmacotherapy and pharmacy research, and participate in clinical rounds and in clinical pharmacy or pharmacology laboratories. The program offers supplemental learning opportunities at external sites such as veterinary pharmaceutical companies, local specialty compounding pharmacies, the United States Pharmacopeia, and the Food and Drug Administration Center for Veterinary Medicine (CVM).¹⁸ The University of Wisconsin-Madison School of Veterinary Medicine opened a 1-year residency program in Veterinary Clinical Pharmacy Practice. Among listed objectives of this residency are providing

education in veterinary clinical pharmacy and therapeutics, building a working knowledge of the regulatory aspects of drug use in animals, and preparing high quality, safe, effective, and legally acceptable compounded preparations for animal patients.¹⁹

One potential reason for the lack of animal-related pharmacy education within pharmacy schools is a divided attitude within the pharmacy profession regarding what, if any, aspects of animal pharmacy are relevant for nonspecialist pharmacists. Ceresia et al found that while veterinarians and PharmDs with a knowledge of clinical, hospital, and community veterinary pharmacy reported that they think traditional pharmacists should be able to counsel pet clients almost to the extent as they would human patients, pharmacy academics lacked a consensus that nonspecialists need to be able to counsel clients on drug effects on animal pathophysiology, drug interactions, or adverse effects.² Academics also did not feel pharmacists needed to provide advice on differences in animal physiology, disease states, or administration techniques. Most nonacademic groups perceived a need for veterinary-related didactic course work in pharmacy school; academics at pharmacy schools however, did not.

We report here on an elective course, instructed by a veterinarian, designed to expose pharmacy students to essential elements of companion animal therapeutics. The goal of the course was to instill in students the knowledge, confidence, and resources to advise clients presenting veterinary prescriptions in a retail setting. These abilities can benefit pharmacists in practices where animal prescriptions are common. Students in the course learn common companion animal disease states, desired and adverse drug effects, and then employ these abilities to design and publish their own veterinary client information sheets (CIS) on a publically accessible website.

DESIGN

The focus of this veterinary pharmacy elective course was limited to companion animals, mainly dogs and cats. The course met once each week for 3 hours. Because it is not possible to discuss every human drug that can be used in companion animals, the instructor asked former veterinary students (now practicing veterinarians) to identify for the course the drugs they most commonly refer to be filled at a local retail pharmacies.

The course's objectives and corresponding methods of assessment are shown in Table 1, and topics are shown in Table 2. Most topics had an almost weekly active-learning component consisting of a set of trivia questions discussed and answered by groups. Questions included gestation lengths, breed characteristics, anatomical differences, tell-tale disease symptoms, and matching

Table 1. Course Objectives and Assessment Methods Used in a Veterinary Comparative Counseling Elective Course

Course Objectives	Assessment Method
1. Interpret the pharmacology, clinical pharmacology, clinical uses, common adverse effects, administration, and comparative efficacies of commonly sold veterinary pharmaceuticals ^a in the retail pharmacy setting	Structured examination
2. Advise clients about the proper use, adverse effects, storage, and administration of veterinary medications to enhance successful patient care	Written answers to mock client questions
3. Describe basic anatomy and pathophysiology aspects of common companion animal disease states that influence medication selection	Structured examination
4. Apply the pharmacology and pharmacokinetics of veterinary medicines frequently dispensed or available at community pharmacies to prescription cases	Written answers to mock client questions
5. Create and publish CIS ^b for common human drugs prescribed for pets through retail pharmacies	Rubric covering inclusion of necessary components, accuracy and design creativity.
6. Comprehend the facilities, resources, and techniques necessary to compound common companion animal prescriptions and propose compounding in specific cases.	Written answers to mock client questions

^aBoth prescription and nonprescription

^bClient Information Sheets

images of classmates with their own pets. The instructor also used student experiences as pet owners in class discussions of pharmacotherapies.

Creating and publishing animal CIS (objective 5) was a novel aspect of applied learning in this elective course. Student groups were provided with instructions for design, followed by an example of a CIS. Components (where applicable) were to include drug name and type, what effects the client could expect from the drug, when the effects should occur, the route of administration, the drug's most common potential adverse effects, and what the client should do if they observe adverse effects. A CIS might also have information on missed dosing, storage, and drug interactions. Client information sheets were assessed on inclusion of applicable components and technical accuracy (70%), design creativity (20%),

and timeliness of posting (10%). Following this content assessment, the CIS were posted online as pages in both HTML and Word documents through Google Sites,²⁰ so these student-generated CIS could be accessed by students during the elective course, but also in the future by pharmacists and veterinarians.

There were 4 major graded assessments: one structured multiple choice/short-answer examination, two essay examinations and the evaluation of the CIS. Student performance on these assessments is shown in Table 3. The two essay examinations assessed objectives 2, 4, and 6. In these essays, students were presented with 10 cases beginning with a description of a pet's disease state or behavior, the treatment leading to the pharmacy-prescribed drug, and a set of reasonable client questions for that drug application, such as how soon the pet would get better,

Table 2. Specific Companion Animal Drug and/or Disease Topics Covered and Active-learning Techniques Employed with Those Topics in a Veterinary Comparative Counseling Elective Course

Session Topic	Active Learning
Drug regulations and ELDU ^a	Dog and cat trivia
Comparative pharmacokinetics and drug metabolism	Dog and cat trivia, sharing student experiences at pharmacies
Routes of administration	Instructor and student demonstration at dog park
Antiparasitics	Answer mock client questions
Analgesics	Dog and cat trivia, develop CIS ^b
CAVM ^c	Dog and cat trivia, develop CIS
Common disease states and drug therapies	Dog and cat trivia, share/discuss CIS
Potential errors in dispensing; metaphylactic use of antibiotics in livestock	Dog and cat trivia, student opinions of the livestock antibiotic controversy
Compounding of veterinary drugs	Trips to compounding pharmacies

^aExtra-label drug use

^bClient Information Sheets

^cComplementary and alternative veterinary medicine

Table 3. Assessments of Student Learning in a Veterinary Comparative Counseling Elective Course

Assessment	Student Performance, Average Class % (SD)
Structured examination	91.3 (11.6)
Client question set 1	84.7 (7.0)
Client question set 2	96.0 (3.6)
Client Information Sheets (CIS)	95.1 (2.3)

whether there were side effects, and whether to give the medicine with food. Some cases also indicated the need for students to consider other options for drug administration including pharmacy compounding. The students individually answered the questions in writing, with the CIS as visual aids and handouts they would give to clients. Answers to these mock client questions did not strictly follow guidelines such as the ASHP Guidelines on Pharmacist-Conducted Patient Education and Counseling,²¹ as several recommended process steps for human patients were inappropriate for pet patients. The written responses to client questions were graded on accuracy (70%), clarity (15%), and understandability for a nonprofessional (15%).

The class was also asked to complete an optional survey instrument to profile their experiences with pets and pet prescriptions in pharmacies (Table 4). They were then asked their opinions on CIS and the instruction of veterinary pharmacy in pharmacy schools (Table 5). These questions were answered in a “yes” or “no” format

or on a 5-point Likert scale (5 = strongly agree, 4 = agree, 3 = neutral, 2 = disagree, and 1 = strongly disagree). Some questions were asked at the beginning and again at the end of the course for comparison. The questions and format were deemed exempt by the Marshall University Institutional Review Board.

Most class sessions were taught with PowerPoint presentations posted on Blackboard Learn 9.1 SP14 (Blackboard Inc., Washington, DC) prior to the class session. The class met once at a local dog park for demonstration of routine methods of drug administration and to have a show and tell by students of their own pets. The class also visited two local pharmacies that compound significant numbers of veterinary prescriptions.

One difference between veterinary and human dosing is that systemic veterinary dosing is expressed in quantity (eg, mg, µg) per kilogram (kg) body weight per day instead of quantity per person per day. Therefore, to discuss comparative dosing, the typical human daily dose of drugs was compared against the dose of that drug that would be necessary for the instructor’s 25 kg female Labrador retriever. The use of a medium-size dog as a standard of comparison was intended to give students an appreciation of how, in many instances, the dosing for a dog equals or exceeds expected human dosing.

EVALUATION AND ASSESSMENT

Students demonstrated a strong level of knowledge on the structured examination which assessed the outcome of foundational knowledge (objectives 1 and 3). This

Table 4. Pet Ownership and Pharmacy Experience Profiles of Students in a Veterinary Comparative Counseling Elective Course

Question	Response, n (%) (N=38)
Do you own a pet?	
Yes	33 (86.8)
If so, what kind?	
Dog	26 (68.4)
Cat	16 (42.1)
Large animal	3 (7.9)
Other	4 (10.4)
At this time, which type of pharmacy setting do you plan to practice in after graduation (retail, community-based, residency, hospital, other)?	
Retail-Chain	23 (60.5)
Retail-Community	5 (13.2)
Residency	2 (5.3)
Hospital	4 (10.5)
Veterinary specialty	2 (5.3)
Other	2 (5.3)
Do you work or have familiarity with retail pharmacy?	
Yes	34 (89.5)

For yes vs no answers, only the yes % is shown

Data reflect the raw count of respondents in a category/total students responding followed by the percent in parenthesis

Table 5. Comparison of the Effect of a Veterinary Pharmacy Elective on Student Opinions Regarding Companion Animal (“Pet”) Informatics and Relevance

Questions	Response, n (%) (N=38)
In your retail pharmacy work experiences, did or does your pharmacy receive more than one veterinary prescription per day (on average)?	
Yes	11 (31.6)
Do you know where to find accurate pet-based client information sheets on specific commonly dispensed veterinary drugs in the retail setting (carprofen, porcine insulin zinc suspension) or human drugs dispensed to pets (amitriptyline, thyroxine, methimazole)?	
Survey early in course	
Yes	9 (23.7)
Survey late in course	
Yes	36 (94.7) ^a
Should veterinary pharmacy questions be asked on the NAPLEX ^b board examination?	
Survey early in course	
Strongly agree	8 (21.0)
Agree	17 (44.7)
Neutral	12 (31.7)
Disagree	0
Strongly disagree	1 (2.6)
Survey late in course	
Strongly agree	7 (18.4)
Agree	19 (50.0)
Neutral	11 (29.0)
Disagree	1 (2.6)
Strongly disagree	0
Do you feel graduate pharmacists understand sufficient veterinary pharmacotherapy to counsel on adverse drug reactions specific to pets, time for the beneficial effect of a drug to occur, and administration methods such as how to administer a pill to a cat by hand?	
Survey early in course	
Strongly agree	0
Agree	2 (5.3)
Neutral	9 (23.7)
Disagree	24 (63.2)
Strongly disagree	3 (7.9)
Survey late in course ^c	
Strongly agree	1 (2.6)
Agree	0
Neutral	5 (13.2)
Disagree	25 (65.8)
Strongly disagree	7 (18.4)
I would feel comfortable creating an accurate client information sheet on specific commonly dispensed human drugs dispensed to pets in the retail setting (eg, amitriptyline, thyroxine, methimazole). ^d	
Strongly agree	24 (63.2)
Agree	12 (31.5)
Neutral	1 (2.6)
Disagree	0
Strongly disagree	1 (2.6)

(Continued)

examination tested the abilities to identify and discriminate differences between human and dog/cat anatomy, pathophysiology, and basic and clinical pharmacology of

commonly prescribed agents. It also tested students’ abilities to contrast different styles of drug administration and interpret common adverse effects and toxicity symptoms.

Table 5. (Continued)

Questions	Response, n (%) (N=38)
This course helped me better understand pharmacology or pharmacotherapy in other therapeutics courses. ^d	
Strongly agree	26 (68.4)
Agree	12 (31.6)
Neutral	0
Disagree	0
Strongly disagree	0

For yes vs no answers, only the yes % is shown

Data reflect the raw count of respondents in a category/total students responding followed by the percent in parenthesis

^aA significant difference from early in the course by contingency analysis (Fisher's exact test, $p < 0.01$)

^bNorth American Pharmacist Licensure Examination

^cA significant difference from early in the course by nonparametric ordinal analysis (Wilcoxon signed rank test, $p < 0.05$)

^dQuestions asked only at the conclusion of the course

The first of the two written assessments was given approximately two-thirds of the way through the course, and the second was given at the conclusion. Average student scores increased more than 10% from the first (formative) to the second (summative) examination. All students achieved scores of at least 90% on the summative question sets. This level of mastery indicated achievement of objectives 2, 4, and 6. Students responded with clarity, brevity, and simplicity to mock client questions. They analyzed the pet's therapy and then composed a reply for the circumstance presented. Written answers also indicated students learned to display empathy and engagement by referring to the pet by its name and often asking if the client had a photo of the pet. In classroom discussions, students also used knowledge gained in other courses to engage in a lively debate with the instructor on the topic of antibiotic resistance vs metaphylactic use of antibiotics in concentrated animal feeding operations.

Client information sheets were rated by the instructor as accurate, informative and creative. The high evaluation scores of students' CIS compositions indicated they had acquired the abilities to access veterinary drug information and were able to organize the information in an outline. The accuracy indicated students learned to correctly interpret the information they had gathered and to translate that information into language understandable to a pet client. Client information sheets also often contained animations or pet images, indicating students had applied design creativity to the texts they authored. This performance of student groups in composing their CIS and then applying these CIS to answer questions demonstrated new knowledge gain and the skill of composing and publishing a veterinary CIS.

The survey results showed 86.8 percent of students enrolled in this elective owned pets, mostly dogs and cats, and this may have reflected their interest in this elective and in animal pharmacy in general. They were experienced in

retail pharmacy and almost three-fourths planned to practice in retail (Table 4). In terms of retail experience, 89.5% of pharmacy students commonly worked or were familiar with retail pharmacies, and in those experiences, almost one-third of the students reported their pharmacy received more than one veterinary prescription/day on average (Table 5). This correlated with anecdotal reports of increased animal prescriptions in retail.^{1,3} At the beginning of the course, only 23.7 % of students felt they knew where to access pet-based CIS for human drugs a pharmacy would dispense to animals. Since there is no central database of CIS for human drugs commonly prescribed for companion animals, this initial response was not unexpected. By the conclusion of the course however, 94.7 % of students knew where to access CIS, and 94.7 % either strongly agreed or agreed that they would feel comfortable creating their own accurate CIS on human drugs commonly dispensed to companion animals.

At the beginning of the course, a two-thirds majority of students already felt veterinary pharmacy should be part of the North American Pharmacist Licensure Examination (NAPLEX), and more than 70% disagreed or strongly disagreed that graduate pharmacists know sufficient veterinary pharmacotherapy to counsel pet owners. Beliefs about NAPLEX inclusion did not significantly change by the conclusion of the course; however, belief of a lack of sufficient knowledge for counseling did increase (Wilcoxon signed rank test, $p < 0.05$). Although the topics of this elective course were veterinary species, it was still a pharmacotherapy course, and all participants felt that the course not only taught them more about veterinary pharmacy, but also reinforced pharmacology or pharmacotherapy learned in other core pharmacotherapy courses.

Final student evaluations (quantitative and qualitative) indicated high ratings for both the instructor and the course. Students reported enjoying the "relaxed and

open” teaching style, field trips, personal pet experience discussions, and the creation of their own publically available pieces of veterinary pharmacy informatics.

DISCUSSION

Retail and community-based pharmacists are likely to be presented with prescriptions for pets. Pharmacists in most states have a legal offer-to-counsel requirement,^{21,22} which could reasonably extend to animal prescriptions.²³ At the school level, ACPE Standard 11 requires the curriculum to prepare students to provide care as a member of an interprofessional team, including prescribers.²⁴ When dispensing a pet prescription, the teammate is the veterinarian. These requirements necessitate knowledge of current veterinary pharmacotherapy, adverse effects, and use of common human drugs in pets. This is a difficult task without veterinary-specific training. The anatomy, pharmacokinetics, routes, and means of drug administration and pet behaviors and responses are not transferrable from people. Animal reference materials are of limited value without a foundational context in which to place this data. For instance, acetaminophen is particularly toxic to cats, yet the symptomatic adverse effects of acetaminophen toxicity are not the same as in people; the timing of an every-other-day dose of prednisolone to a person is not the same as for a dog who is crated during the day; and how a pet displays adverse drug effects such as nausea are different than how people display them. Merely knowing the potential for a particular form of toxicology will not help counsel clients without knowing how a pet displays the toxicology. Survey data in Table 5 indicated that students believed even more strongly after taking the course that graduate pharmacists do not understand sufficient veterinary pharmacotherapy. The further shift of this already strong belief suggests that the more students learned about veterinary pharmacy, the greater they sensed the lack of sufficient training.

Class performance, as measured by scores in the structured multiple-choice/short answer format examination, the two sequential client question sets, and the CIS evaluation indicated successful educational outcomes targeted in the learning objectives. The objectives were centered on the goal of training this cohort of future pharmacists to transfer human pharmacotherapy principles to pets by predicting companion animal patient responses and integrating their own CIS into counseling. This ability can be used in future practice involving pet prescriptions.

Although pharmacies routinely provide printed patient drug information sheets to people, this information is of limited use to pet-owning clients because human-based drug information indications and adverse reaction

symptoms are often different for pets. Pet owning clients need animal-specific CIS, but these are accessible for only a few drugs such as NSAIDs on the FDA’s Animal Veterinary website,²⁵ and typically these CIS are for approved veterinary drugs rather than human drugs that will be prescribed in an extra-label manner for pets.

The goal of the client question exercises was to allow students to apply their enhanced training in comparative animal diseases, drugs, and adverse effects and their new ability to create and access CIS. The overall performance and the improvement in performance on student written responses to client questions about prescriptive scenarios suggest that students acquired both formative and summative knowledge during this elective course.

Given the prevalence of veterinary prescriptions for human drugs and the lack of veterinary-specific general training in schools of pharmacy, the knowledge and skills students in this elective course acquired in topics such as companion animal drug pharmacokinetics, toxicity, disease states, and drug administration will benefit them in practice when faced with veterinary prescriptions and client questions. The ability to assess information and design brief, informative sheets in lay terminology can also be used by the students in future practice to answer questions and educate clients. The students’ advanced training in common pet medication administration techniques and compounding options can be applied to counsel and empathize with pet owners in future practice.

There is a disconnect between the need of community pharmacists filling veterinary prescriptions to possess the knowledge to differentiate between applications of human and animal therapeutics and the perceived lack of a need by pharmacy academics to uniformly teach such a knowledge base. In addition to the survey by Ceresia et al, in which pharmacy academics saw the most limited role for nonspecialist (traditional) pharmacists in supporting the needs of veterinary clients, mainstream pharmacy school texts offer no veterinary-related material,²⁶ and the NAPLEX lacks animal-related questions. Survey data from students in this elective course suggest that students who appreciate therapeutic particulars in animals see a need for animal pharmacy to be included in the NAPLEX and also sense that there is a lack of sufficient comprehension of these topics among pharmacists.

The absence of generalized animal pharmacotherapy training may have consequences beyond the occasional animal prescription. Several versions of a federal “Fairness to Pet Owners Act” have been introduced in the past and these bills would require veterinarians to provide pet owners with a prescription electronically or by other means, provide a copy by electronic or other means if requested by a pharmacy, and verify the prescription upon

request by a pharmacy.²⁷ This legislation, if passed, could save consumers money by allowing them to choose where to buy pet prescription medications, and it would likely bring a large increase in veterinary prescriptions into retail pharmacies. A strong argument against such legislation is the absence of uniform, relevant training in companion animal physiology, metabolism, and pharmacotherapy. In addition, there have been instances in which veterinary medical associations have been critical of pharmacists, citing surveys indicating errors by pharmacists in animal prescription substitutions and dosing as well as erroneous counseling recommendations that result in inadequate therapy and client misinformation.⁶

Greater interprofessional education (IPE) between pharmacy and veterinary medicine is a potentially good way to resolve these concerns. Veterinary IPE has perhaps the greatest chance of occurring at campuses with both a school of pharmacy and veterinary medicine where faculty members and facilities can be easily applied to either didactic courses or clinical rotations. However, opportunities for these school-to-school IPE are limited as only 9.2% of pharmacy schools share a campus with a veterinary school.²⁸ Therefore, pharmacy programs and pharmacy educators may need to make an effort to actively include animal expertise in their curriculum. This may prove challenging as the majority of pharmacy educators themselves lack training in animal physiology, pharmacology, behavior, and disease states.

We identified one barrier to student learning and course delivery in this elective course, which was the typical university classroom rule that pets are not allowed. The vivarium at the pharmacy school lacks the facilities to hold dogs or cats and therefore live patient simulations were limited to work with the instructor's and students' pets during one trip to the local dog park and videos of medication administrations techniques and disease states such as pet anxiety, seizures, and parasitic infections.

SUMMARY

This elective course provided IPE for at least one class of future PharmDs. The class directly interacted with an instructor who was a graduate veterinarian. Students learned hands-on how to feel for lymph nodes, check mucus membranes, administer a pill, and apply eye and ear ointments to a dog in addition to learning to compile drug information into a CIS. They saw how a veterinarian teaches clients to pill a cat, apply a transdermal for methimazole and administer insulin. They learned major differences between why a particular human drug is used for a dog or cat compared with the drug's common human indications. They learned basic information about drug-drug interactions and more about drug-breed inter-

actions. Students practiced counseling through scenarios with mock pet clients in which the students instructed the clients on how to recognize symptoms such as nausea, pain, or hypoglycemia in their pets. To our knowledge, the development of the student-generated CIS and the establishment of a CIS website is a first for a veterinary pharmacy course. By developing knowledge of comparative disease states and then knowing where to access and apply informatics about specific human drugs, these students will be able to offer more effective professional care to clients and their pets.

REFERENCES

1. Karriker M, Wiebe V. Pharmacists in veterinary education: bridging the gap. *J Vet Med Educ*. 2006;33(2):248-252.
2. Ceresia ML, Fasser CE, Rush JE, et al. The role and education of the veterinary pharmacist. *Am J Pharm Educ*. 2009;73(1):Article 16.
3. Lust EB. A lecture about pharmaceuticals used in animal patients. *Am J Pharm Educ*. 2009;73(7):Article 116.
4. Adrian JAL, Gomez LH, Wongwiwatthanakut S. Development of the veterinary medicine rotation component of the Introductory Pharmacy Practice Experiences curriculum. *Curr Pharm Teach Learn*. 2014;6(4):507-515.
5. Lust E. Educational outcomes in Vet 101; a continuing education course for practicing pharmacists in veterinary therapeutics. *Pharm Educ*. 2003;3(4):237-47.
6. JAVMA news. Substitution errors. Surveys describe harm from differences between prescriptions and drugs dispensed. Greg Cima. Updated September 4, 2014. <https://www.avma.org/News/JAVMANews/Pages/140901a.aspx?mode=full>. Accessed November 20, 2014.
7. Blythe, Elaine. Personal communication, August 2014.
8. Theberge, CR. Development of a veterinary pharmacy elective course. 114th Annual Meeting of the American Association of Colleges of Pharmacy, Chicago, IL, July 13-17, 2013. *Am J Pharm Educ*. 2013;77(5):Article 109.
9. Professional Compounding Centers of America. Veterinary Compounding Training Program. <http://www.pccarx.com/pharmacy-students/courses/course-catalog>. Accessed November 2, 2014.
10. Lust EB. Animal-centered learning activities in pharmacy education. *Am J Pharm Educ*. 2006;70(2):Article 35.
11. University of Florida College of Pharmacy, PHA 6935 Veterinary Pharmacy. <http://pharmacelectives.pharmacy.ufl.edu/courses/pha-6935-veterinary-pharmacy/>. Accessed February 2, 2016.
12. UF Veterinary Pharmacy for Practicing Pharmacists. <http://cpe.pharmacy.ufl.edu/courses/certificate/vetpharmacy/>. Accessed November 2, 2014.
13. University of Wisconsin-Madison, Veterinary Therapeutics. <http://ce.pharmacy.wisc.edu/mod/coursepage/view.php?id=6582>. Accessed February 2, 2016.
14. Pharmaceutical education consultants, Introduction to Veterinary Dispensing Continuing Education Credits for Healthcare Professionals. http://www.freece.com/freece/Cal_Details.aspx?ID=11deea89-2708-4c04-97e9-ef71d8722f83. Accessed November 20, 2014.
15. Editorial Staff of Pharmacist's letter. Caring for Dogs and Cats: A Primer for Community Pharmacists. *Pharmacist's Letter* 2012; Course 221.
16. University of California at Davis, Veterinary Pharmacy elective. http://www.vetmed.ucdavis.edu/vmth/pharmacy/residency_program.cfm. Accessed November 2, 2014.

17. NC State University Clinical Veterinary Pharmacy Residency elective. <https://cvm.ncsu.edu/education/residencies/clinical-veterinary-pharmacy/>. Accessed February 2, 2016.
18. Purdue College of Veterinary Medicine Residency program in veterinary clinical pharmacology. <http://www.vet.purdue.edu/vth/pharmacy-residency.php>. Accessed December 5, 2014.
19. School of Veterinary Medicine, University of Wisconsin-Madison, Veterinary Clinical Pharmacy Practice Residency Program. <http://uwveterinarycare.wisc.edu/wp-content/uploads/2012/10/Pharmacy-Residency.pdf>. Accessed February 2, 2016.
20. Sehgal I. Veterinary Pharmacy Counseling. Client Information Sheets (CIS) of some common human drugs dispensed in retail pharmacies for pets. <https://sites.google.com/site/vetpharmacis/home>. Accessed February 2, 2016.
21. American Society of Health-System Pharmacists. ASHP guidelines on pharmacist-conducted patient education and counseling. *Am J Health-Syst Pharm*. 1997;54:431-434.
22. Centers for Medicare and Medicaid Services. Patient Counseling—A Pharmacist's Responsibility to Ensure Compliance. <https://www.cms.gov/Medicare-Medicaid-Coordination/Fraud-Prevention/Medicaid-Integrity-Education/Provider-Education-Toolkits/Downloads/drugdiversion-patientcounseling-111414.pdf>. 2014. Accessed February 2, 2016.
23. Scheidegger J. Veterinary groups contend with retail pharmacy issues. *DVM360.com Magazine*. 2012. <http://veterinarynews.dvm360.com/veterinary-groups-contend-with-retail-pharmacy-issues?id=&sk=&date=&pageID=2>. Accessed February 2, 2016.
24. Accreditation Council for Pharmacy Education. Accreditation Standards and Key Elements for the Professional Program in Pharmacy Leading to the Doctor of Pharmacy Degree. "Standards 2016" Accreditation Council for Pharmacy Education, Chicago, IL; 2015.
25. US Food and Drug Administration. Currently approved labels for companion animal non-steroidal anti-inflammatory drugs (NSAIDs). <http://www.fda.gov/AnimalVeterinary/Products/ApprovedAnimalDrugProducts/DrugLabels/ucm050105.htm>. Accessed November 2, 2014.
26. DiPiro JT, Talbert RL, Yee GC, Matzke GR, Wells BG, Posey LM. *Pharmacotherapy: A Pathophysiologic Approach*. 9th ed., McGraw Hill Education: New York, NY; 2014.
27. Open Congress H.R. 3174 – Fairness to Pet Owners Act of 2015. <https://www.opencongress.org/bill/hr3174-114/show>. Accessed February 2, 2016.
28. Sehgal I. U.S. News and World Report and extramural funding rankings of United States pharmacy schools are predicted by their association with other types of professional schools. *Am J Pharm Health Res*. 2014;2(8):130-141.