RESEARCH ARTICLES

Comparison of Drug Information Practice Curriculum Components in US Colleges of Pharmacy

Sabrina W. Cole, PharmD, and Nannette M. Berensen, PharmD

College of Pharmacy, Medical University of South Carolina

Objective. To compare drug information training in US colleges of pharmacy.

Methods. Course coordinators and principal preceptors were identified and surveyed. The survey instrument solicited information regarding various topics covered in didactic drug information courses and students' major efforts during drug information practice experiences.

Results. Data were obtained from 90% (79) of the 88 colleges of pharmacy surveyed. Eighty-nine percent of first professional pharmacy degree programs and 72% of nontraditional doctor of pharmacy (PharmD) degree programs required at least 1 didactic course. The mean number of semester hours devoted to didactic drug information courses in first professional pharmacy degree programs and nontraditional PharmD degree programs was 3.6 (mode = 3) and 2.5 (mode = 3), respectively. Twenty percent of first professional degree and 16% of nontraditional PharmD degree programs required a drug information practice experience. Seventy percent of first professional degree and 59% of nontraditional degree programs offered an elective drug information practice experience.

Conclusion. The high percentage of programs that required at least one didactic drug information course and offered drug information practice experiences supports the premise that drug information practice skills are an important component of contemporary pharmacy education.

Keywords: drug information, practice experience, drug information course, curriculum, PharmD

INTRODUCTION

The problem of keeping up with the biomedical literature confronts all persons and organizations involved with the healing arts.[1] The US Senate recognized the significance of this issue when they commissioned a study by the National Library of Medicine (NLM) to identify mechanisms to effectively mobilize, exchange, and use information.[1] The report, published over 40 years ago, states that the drug literature is growing rapidly in size and is increasingly complex.[1] This finding is perhaps more relevant today than in the past. Consider the following; NLM's *PubMed* is the world's largest biomedical database.[2] It contains citations from about 4,500 biomedical journals.[3] On August 11, 2004, the 15 millionth journal citation was indexed.[2] More than 2.2 million *PubMed* searches are conducted each day.[2] Furthermore, about 2,000 new citations are added each day, Tuesday through Saturday, January through October.[3]

The provision of drug information is one of the most fundamental responsibilities of pharmacists, regardless of practice setting. Because of the dynamic nature of medical and drug information, graduating pharmacists will need to have well-developed skills in information retrieval, interpretation, and clinical application in order to practice effectively.

At present, there are over 10,000 prescription medications available in the United States, and that number is rising.[4] According to a recent survey by the Pharmaceutical Research and Manufacturers Association, pharmaceutical and biotechnology companies have more than 800 new medicines in development to better manage diseases common in the elderly, including Alzheimer's disease, arthritis, cancer, heart disease, osteoporosis, Parkinson's disease, and stroke.[5] In addition, there are more than 100,000 over-the-counter products currently marketed, encompassing about 800 active ingredients and more than 80 therapeutic categories.[4]

The strong influence of the pharmaceutical industry on health care professionals and consumers through marketing and advertising is important to consider. The pharmaceutical industry spends more resources on administration and marketing than it does on product research and development.[6] Physician detailing by pharmaceutical representatives is a common practice whereby representatives present company-sponsored marketing materials with the intent of increasing product mar-

Corresponding Author: Sabrina W. Cole, PharmD. Address: 150 Ashley Ave., Room 608 RT Annex, PO Box 250584, Charleston, SC 29425. Tel: 843-792-3896. Fax: 843-792-0566. E-mail: colesab@musc.edu

ket share and having their products added to health care organizations' formularies. While the content of company-sponsored marketing materials is based in fact, there is a critical need for noncommercial, unbiased presentation of data. Direct-to-consumer (DTC) pharmaceutical advertising is unprecedented, as it is now common for patients to request medications by name. DTC advertising has generated a great deal of controversy over what the World Health Organization has referred to as an inherent conflict of interest between legitimate goals of manufactures and the social, medical, and economic needs of providers and the public to select and use medications in the most rational way.[7] The growing number of pharmaceuticals, the increasing amount and complexity of literature, and the critical need for unbiased assessment of clinical data underscore the importance of future pharmacists having well-developed drug information skills.

The objective of this survey was to compare various components of didactic and experiential drug information practice training in US colleges of pharmacy. To date, there are no current national data published on this topic. What constitutes drug information practice is somewhat dependent on an individual practitioner's interpretation; therefore, an organized comparison between programs is beneficial for those responsible for designing and delivering program content.

METHODS

This project was determined by IRB policy to be exempt from review. A survey instrument was developed to assess drug information practice training in first professional pharmacy degree and nontraditional PharmD degree programs. Various aspects of the curricula were compared, including didactic coursework and drug information practice experience components. For didactic courses, topics included were consistent with those found in drug information textbooks.[8,9] For practice experiences, a list of major efforts was developed based on the investigators' experience and is consistent with activities described in drug information textbooks.[8,9] In addition, the following data were collected: programs offered (eg, first professional pharmacy degree, nontraditional PharmD degree); class size; number of didactic courses (including required or elective status); number of credit hours; required or elective status of practice experience, if applicable; and practice experience length. If a program did not have a didactic course in the curriculum, respondents were asked to explain why and whether they knew of any plans to develop a course. Similarly, if a program did not offer or require a drug information practice experience, respon-

dents were asked to identify how a student's drug information skills were evaluated.

Eighty-eight US colleges of pharmacy were accredited by the Accreditation Council for Pharmacy Education (ACPE) at the time the survey was developed.[10] Course coordinators and principal experiential preceptors were identified for each pharmacy program to increase the validity of the responses obtained. Surveys were conducted via telephone interviews to increase the participation rate. A standardized script was used by each surveyor to minimize interviewer bias. Each telephone survey took approximately 15 minutes to complete. Data were collected from January 2004 through August 2004.

The survey contained a list of 22 topics frequently covered in didactic drug information courses, including systematic approach to drug information requests, organization of the biomedical literature, drug information resources, literature searching, critical literature evaluation, biostatistics, formulary management, drug use policy and development, adverse drug reactions, and medication errors. The survey instrument contained a list of 11 major efforts of a drug information practice experience that included the following: staffing the drug information center, responding to drug information requests, improving knowledge of all types of references, improving computerized searching skills, developing critical literature evaluation skills, writing a formulary monograph, participating in journal club, attending and/or presenting at a pharmacy and therapeutics committee or subcommittee meeting, and preparing newsletter articles. Any other significant didactic or experiential efforts unique to a program were identified by respondents and were documented by the surveyors.

For those programs that do not require or offer a drug information practice experience, respondents were asked to identify one of the following methods by which students' drug information skills were assessed: students submit a portfolio containing written responses to questions compiled throughout their practice experiences and a drug information faculty member evaluates the students' choice of drug information references, searching capabilities, writing skills, literature interpretation skills, and information assimilation skills; students submit a portfolio containing written responses to questions compiled throughout their practice experiences and a faculty member outside the area of drug information practice evaluates the students' choice of drug information references, searching capabilities, writing skills, literature interpretation skills, and information assimilation skills; or students' drug information skills are assumed, they are not specifically taught or evaluated.

Table 1. Major Topics Covered in Didactic Drug Information Courses, n (%)

Major Topic	First Professional Pharmacy Degree 1st course n = 70	First Professional Pharmacy Degree 2nd course n = 25	Nontraditional PharmD Degree 1st course n = 23	Nontraditional PharmD Degree 2nd course n = 3
Concept of a drug information specialist	58 (83)	7 (28)	15 (65)	0
Systematic approach to drug information requests	67 (96)	5 (20)	21 (91)	0
Assimilating information to synthesize patient-specific responses	60 (86)	6 (24)	18 (78)	0
Drug information resources	66 (94)	9 (36)	20 (87)	0
Organization of the biomedical literature	66 (94)	8 (32)	22 (96)	0
Computerized searching skills	64 (91)	10 (40)	23 (100)	0
MICROMEDEX	59 (84)	6 (24)	16 (70)	0
Critical literature evaluation	48 (69)	18 (72)	19 (83)	3 (100)
Biostatistics	43 (61)	17 (68)	17 (74)	3 (100)
Formulary management	36 (51)	7 (28)	12 (52)	0
Preparing formulary monographs	23 (33)	9 (36)	7 (30)	1 (33)
Preparing newsletters	16 (23)	6 (24)	4 (17)	0
Adverse drug reactions	50 (71)	7 (28)	14 (61)	0
Medication use evaluations	32 (46)	8 (32)	10 (43)	1 (33)
Medication errors	33 (47)	7 (28)	10 (43)	0
Poison control centers	40 (57)	1 (4)	10 (43)	0
Drug use policy development and implementation	20 (29)	6 (24)	6 (26)	1 (33)
Ethics of drug information practice	45 (64)	5 (20)	12 (52)	1 (33)
Continuous quality improvement	24 (34)	3 (12)	5 (22)	1 (33)
Professional writing skills	41 (59)	11 (44)	12 (52)	0
Academic detailing	18 (26)	5 (20)	8 (35)	0
Pharmaceutical advertising	30 (43)	6 (24)	10 (43)	0

RESULTS

Data were obtained for 79 of 88 colleges of pharmacy (90%). Sixty-four of 79 (81%) colleges followed an academic semester system; whereas, 13 (16%) used an academic quarter system. A block-scheduling system was used by 2 (3%) colleges. All of the colleges who participated offered a first professional pharmacy degree, and 32 (41%) of those colleges offered a nontraditional PharmD degree program for pharmacists who had a previous baccalaureate degree in pharmacy.

Seventy (89%) first professional degree programs and 23 (72%) nontraditional degree programs required completion of at least 1 didactic drug information course. Whereas, 25 (36%) of the 70 first professional degree programs required 2 drug information courses, and 3 (13%) of the 23 nontraditional degree programs required 2 drug information courses. The mean number of semester hours devoted to didactic drug information course(s) in first professional degree programs was 3.6 (mode = 3); whereas, the mean number of semester

hours devoted to drug information course(s) in nontraditional degree programs was 2.5 (mode = 3). For programs using an academic quarter system, credit hours were converted to semester credit hours.

The primary reason given for not requiring didactic courses in drug information for both first professional degree and nontraditional degree programs was that drug information skills were incorporated into other courses. Other reasons stated were drug information instruction was a pre-requisite, there was no room in the curriculum, or the program lacked qualified faculty members.

Major topics covered in the didactic drug information courses are listed in Table 1. Other topics identified by course coordinators as being covered in their didactic courses include off-label drug use, Internet resources, clinical practice guidelines, journal club participation, and patient education.

Sixteen (20%) first professional degree programs required a drug information practice experience, and 55 (70%) offered it as an elective practice experience. A

Table 2. Major Efforts of Drug Information Practice Experiences, n (%)

Major Effort	First Professional Pharmacy Degree Program n = 67	Nontraditional PharmD Degree Program n = 24
Staff drug information center and respond to drug information requests	65 (97)	24 (100)
Evaluate adverse drug reactions	53 (79)	16 (67)
Write a formulary monographs	50 (75)	15 (63)
Participate in journal club	60 (90)	20 (83)
Prepare and/or present inservices	36 (54)	8 (33)
Improve knowledge of references	67 (100)	22 (92)
Improve computerized searching skills	66 (99)	22 (92)
Attend pharmacy and therapeutics committee meeting or subcommittee meeting	39 (58)	12 (50)
Present to pharmacy and therapeutics committee or subcommittee	21 (31)	5 (21)
Prepare and present therapeutic consults	41 (61)	11 (46)
Prepare newsletter articles	46 (69)	14 (58)

Table 3. Method to Evaluate Drug Information Skills

Method	First Professional Pharmacy Degree Program n = 63 (%)	Nontraditional PharmD Degree Program n = 27 (%)
A drug information portfolio is kept throughout practice experiences and is evaluated by a drug information faculty member.	3 (5)	3 (11)
A drug information portfolio is kept throughout practice experiences and is evaluated by faculty preceptors outside the area of drug information practice.	12 (19)	5 (18)
Drug information skills are assumed and are not specifically taught or evaluated.	44 (70)	18 (67)
Respondent was unsure.	4 (6)	1 (4)

drug information practice experience was not offered in 8 (10%) of the first professional degree programs. The mean length of a required drug information practice experience in a first professional degree program was 4 weeks (range 2.5 to 6 weeks); whereas, the mean length of an elective practice experience was 5 weeks (range 4 to 8 weeks). Of the nontraditional degree programs, a drug information practice experience was required in 5 (16%), an elective in 19 (59%), and a practice experience was not offered in 8 (25%). The mean length of a required drug information practice experience in a nontraditional degree program was 5 weeks (range 4 to 6 weeks); whereas, the mean length of the practice experience was 4.5 weeks (range 1 to 6 weeks) if the experience was elective. The primary reasons given for not offering a drug information practice experience were a lack of practice sites and a lack of qualified faculty members. A summary of the major efforts that students were engaged in while completing a drug information practice experience is presented in Table 2. Interacting with pharmaceutical industry representatives, presenting patient cases, and participating in medication use evaluations were some of the other common practice experience activities identified by respondents. A summary of how students' drug information skills are evaluated if a drug information practice experience is not offered or required is presented in Table 3.

DISCUSSION

To the investigators' knowledge, there are no current national data published on this topic. The high percentage of first professional pharmacy degree and nontraditional PharmD degree programs that require at least one didactic drug information course supports that these skills are an important component of contemporary pharmacy education. Greater than 80% of didactic courses for the first professional pharmacy degree cover the following topics: concept of a drug information specialist, systematic approach to drug information requests, assimilating information to synthesize patient-specific responses, drug information resources, organization of the biomedical literature, computerized searching skills, and *MICROMEDEX*. Greater than 80% of the didactic courses for the nontraditional PharmD degree cover the follow-

ing topics: systematic approach to drug information requests, drug information resources, organization of the biomedical literature, computerized searching skills, critical literature evaluation, and biostatistics.

Greater than 80% of first professional degree and nontraditional PharmD degree programs that offer a drug information practice experience engage students in the following activities: staffing the drug information center and responding to drug information requests, participating in journal club, improving knowledge of references, and improving computerized searching skills. The relatively low percentage of first professional and nontraditional PharmD degree programs that require a drug information practice experience is attributed to the shortage of sites and qualified preceptors.

Several limitations were identified by the investigators. The tendency of surveyors to ad lib as they interacted with different respondents limited strict adherence to the standardized script. This may have affected the type of information given by the respondents. Recall bias may have also affected the information collected, as some respondents referred to their didactic course and practice experience syllabi while answering the survey questions and others did not. In addition, the survey was not designed to assess whether other courses within a curriculum contribute to drug information practice skills; only didactic course(s) dedicated to drug information practice were evaluated. Finally, the investigators did not evaluate the number and scope of assignments and tests required in the didactic courses or practice experiences, which would serve as an indicator of whether the skills taught could be applied and retained by students.

Assuming that in a 4-year professional curriculum students will be taught everything they need to know to effectively and safely practice pharmacy is unrealistic. Even if this were plausible, since medical and drug information is constantly changing and growing, students need to be taught an effective strategy for how to keep up. There is no substitute for providing students with a solid foundation in drug information practice, as these skills promote lifelong learning and hopefully translate into pharmacists who best serve their patients.

The high percentage of programs that require at least one didactic course and offer a practice experience sup-ports that drug information practice skills are an important component of contemporary pharmacy education. Additionally, the investigators believe that drug information practice skills are more important than ever before and challenge those who are responsible for developing or revising pharmacy curriculums to devote adequate resources to drug information training.

ACKNOWLEDGEMENTS

REFERENCES

1. *A Factual Survey on the Nature and Magnitude of Drug Literature by the National Library of Medicine Before the Subcommittee on Reorganization and International Organizations*, 88th Cong, 1st Sess. (1963).
2. *PubMed Reaches a Milestone*. September 14, 2004. Available at www.nlm.nih.gov/news/pubmed_15_mill.html. Accessed September 17, 2004.
3. *MEDLINE* fact sheet. Available at www.nlm.nih.gov/pubs/fact-sheets/medline.html. Accessed September 19, 2004.
4. Approved drug products with therapeutic equivalence evaluations. US Food and Drug Administration. February 2004 Supplement.
5. *Pharmaceutical Research and Manufacturers of America. Drug companies are testing more than 800 new medicines to better treat older Americans*. June 28, 2002. Available at: www.phrma.org. Accessed July 1, 2004.
6. Families USA. New 2001 data show big drug companies spent almost two-and-one-half times as much on marketing, advertising, and administration as they spent on research and development. July 17, 2002. Available at: www.familiesusa.org/site/Pageserver. Accessed November 17, 2004.
7. World Health Organization. *Clinical Pharmaceutical Evaluation in Drug Control*. EUR/ICP/DSE 173, Copenhagen, WHO, 1993.
8. Gehlbach SH. *Interpreting the Medical Literature*. 4th ed. New York: McGraw-Hill; 2002.
9. Malone PM. *Drug Information: A Guide for Pharmacists*. 2nd ed. New York: McGraw-Hill; 2001.
10. Accreditation Council for Pharmacy Education. Available at: http://www.acpe-accredit.org/students/default.asp. Accessed October 17, 2003.