

RESEARCH

Pharmacoeconomics Education in US Colleges and Schools of Pharmacy

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Objective. To determine the extent of pharmacoeconomics education in US colleges and schools of pharmacy provided to doctor of pharmacy (PharmD) students in 2011.

Methods. E-mails requesting syllabi and information about courses covering pharmacoeconomic topics were sent to all US colleges and schools of pharmacy from which PharmD students had graduated in 2011 (n=103).

Results. Of 87 responding pharmacy colleges and schools, 85 provided pharmacoeconomics education in 2011. The number of hours dedicated to pharmacoeconomic-related topics varied from 2 to 60 per year (mean=20).

Conclusions. Pharmacoeconomics education is provided at almost all US colleges and schools of pharmacy; however, variation in the number of teaching hours and topics covered demonstrates a lack of standardization in the PharmD curriculum. Pharmacy administrators and educators should invest more resources and tools to standardize training in this area.

Keywords: pharmacoeconomics, pharmacy education, curriculum

INTRODUCTION

Pharmacoeconomics is an interdisciplinary field that overlaps with health economics and clinical/humanistic outcomes.¹ The International Society for Pharmacoeconomics and Outcomes Research (ISPOR) is a pioneer in promoting the science of pharmacoeconomics and outcomes research with the goal of improving health by enhancing the effectiveness of health care.² The ISPOR Learning Outcomes Task Force defined the target audience for pharmacoeconomics and healthcare outcomes research as follows: pharmaceutical industry (marketing/sales/managers), formulary committee members, clinicians, outcomes researchers (academia/industry/contract research organizations /etc), and health policymakers or funders (government/private). The minimum skills for all target audiences (eg, pharmacy students) include being able to do the following³: identify and define terminology; describe the basics of economic evaluation (principles); know when an economic evaluation is necessary (evaluation grid); explain the techniques of basic statistics; distinguish between clinical (ie, practical) and statistical (ie, mathematical) significance; evaluate the quality of a publication/report; describe methods for liter-

ature searches and reviews; identify the basics of quality-of-life/patient-reported outcomes measures.

In addition to their role as providers of health and wellness to the population, pharmacists need to be experts in monitoring and assessing outcomes associated with their services.⁴ An understanding of pharmacoeconomic concepts can help pharmacists compare inputs (costs for pharmaceutical products and services) and outputs (outcomes).⁵ Pharmacoeconomic analysis allows pharmacists to make critical decisions about formulary determination, disease management, and assessment of therapeutic and biotechnology drugs.⁶ Hence, awareness of pharmacoeconomics and outcomes research is critical for pharmacists. This raises questions about the extent of pharmacoeconomics education for PharmD students and its standardization.

The vision of future pharmacy practice described in the 2011 Accreditation Council for Pharmacy Education (ACPE) Guidelines includes training pharmacists to be responsible for optimal medication therapy outcomes while providing patient care. This includes assessing the cost-effectiveness of treatment options. Specific guidance on the PharmD curriculum (Appendix B of the AFPE Guidelines) includes the following topics for economics/pharmacoeconomics (unchanged from 2007)⁷: economic principles in relation to pharmacoeconomic analysis; concepts of pharmacoeconomics in relation to patient care; and applications of economic theories and health-related

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quality-of-life concepts to improve allocation of limited health care resources.

In 2010, the North American Pharmacist Licensure Examination (NAPLEX) added pharmacoeconomics to 3 competency statements⁸:

Section 1.2.0. “Evaluate information about pharmacoeconomic factors, dosing regimen, dosage forms, delivery systems and routes of administration to identify and select optimal pharmacotherapeutic agents for patients”

Section 1.3.0. “Evaluate and manage drug regimens by monitoring and assessing the patient and/or patient information, collaborating with other health care professionals, and providing patient education to enhance safe, effective, and economic patient outcomes.”

Section 3.1.2. “Evaluate the suitability, accuracy, and reliability of clinical and pharmacoeconomic data by analyzing experimental design, statistical tests, interpreting results, and formulating conclusions.”

Previous studies have investigated the extent of pharmacoeconomics education in US colleges and schools of pharmacy in 1997⁹ and 2007,⁶ the same year that the new ACPE standards and guidelines became effective. As

of 1997, of the 79 US colleges and schools of pharmacy, 63 (82%) were offering at least some pharmacoeconomics education, with a median of 16 classroom hours on the topic.⁹ In 2007, 83 (92%) of 90 schools were offering pharmacoeconomics education, with a median of 19 hours spent on pharmacoeconomic-related topics.⁶ The present study analyzed pharmacoeconomics education in US colleges and schools of pharmacy, with a greater focus on the topics covered and experiential education opportunities offered in pharmacoeconomics.

METHODS

From the American Association of Colleges of Pharmacy (AACP) 2010-2011 roster,¹⁰ the authors obtained a list of 103 US colleges and schools of pharmacy from which PharmD students had graduated in 2010. In May 2011, the authors sent an e-mail to the chair of the department of pharmacy practice or social and administrative sciences at each college or school with a brief description of the study and a request for either (1) a copy of the syllabus for the course within their PharmD curriculum that contained pharmacoeconomic-related topics, or (2) the name and e-mail address of the faculty member responsible

Table 1. The Most Commonly Cited Pharmacoeconomics Objectives of US Colleges and Schools of Pharmacy^a (N = 72)

Objective	Respondents, No. (%)
Evaluate PE literature; critique current PE literature	44 (61)
Describe, define and address advantages/disadvantages of pharmacoeconomic analyses (CEA, CBA, CUA, CMA); apply basic pharmacoeconomic analyses in case studies	40 (55)
Define decision analysis, its purpose and the steps for performing a decision analysis; apply decision analysis methodology in calculating average costs and outcomes; conduct threshold analysis; apply decision analysis methodology; understand principles and methods of decision analysis and its application to pharmacoeconomics	33 (46)
Understand economic principles in relation to pharmacoeconomic analysis; relate the basic principles of economics to health care and the pharmaceutical industry; apply economic theories to improve allocation of limited health care resources	30 (42)
Identify the basics of health-related quality of life (HRQoL) and patient reported outcomes (PRO); describe the importance of measuring HRQoL; compare and contrast generic HRQoL measures with disease-specific HRQoL measures	27 (37)
Apply basic principles of pharmacoeconomics to the evaluation of pharmaceuticals and pharmacy services; describe the application of pharmacoeconomics to various pharmacy settings; outline the steps for conducting a pharmacoeconomic analysis	26 (36)
Compare and contrast cost-of-illness, cost minimization, cost effectiveness, cost utility and cost benefit analyses	26 (36)
Describe the rationale and importance of pharmacoeconomic analyses	22 (30)
Identify and classify costs associated with pharmacy products and services; describe controversies related to identifying costs, discounting benefits, and the need of sensitivity analysis	21 (29)
Identify and define terminology; define pharmacoeconomics and outcomes research	15 (21)

Abbreviations: CEA = cost-effectiveness analysis; CBA = cost-benefit analysis; CUA = cost-utility analysis; CMA = cost-minimization analysis; PE = pharmacoeconomics.

^a Only those objectives listed by at least 15 respondents were included.

for teaching pharmacoeconomics. If chairs did not respond within 3 weeks, the authors contacted another person from among the pharmacy practice, social, and administrative sciences faculty members listed in the AACP roster. From July through August 2011, the authors organized the list of faculty members responsible for teaching pharmacoeconomics in the 2010-2011 academic year and any syllabi collected, and extracted information from them as to: (1) the number of clock hours devoted to pharmacoeconomics education, (2) the list of topics covered in the course, and (3) the books and articles used in the course. A follow-up survey instrument was sent to course instructors asking: (1) the number of students in the course per year, (2) whether the course was part of an elective or required curriculum, (3) whether PharmD students conducted pharmacoeconomic projects and completed pharmacoeconomic practice experiences, and (4) whether, in the instructor's opinion, the amount of hours devoted to pharmacoeconomics education at his or her college/school/was too much, about right, or too little. After 2 weeks, a follow-up reminder with a copy of the survey instrument was sent by e-mail to nonrespondents. Data

Table 2. Pharmacoeconomic Topics Covered in US Colleges and Schools of Pharmacy^a

Topic	Respondents, No. (%)
Types of studies (CEA, CBA, CUA, CMA)	81 (95)
Health-related quality of life	68 (80)
Articles/research evaluation	61 (72)
Outcomes research/ECHO model	59 (69)
Application of pharmacoeconomics (hospital, industry, etc.)	54 (63)
Costs: types of costs, adjustments, discounting, inflation	54 (63)
Decision analysis	54 (63)
Cost of illness/burden of illness	48 (56)
Sensitivity/threshold analysis	46 (54)
Calculations (eg, ICERs)	43 (51)
Formularies/budget impact	42 (49)
Health-care economics, microeconomics	23 (27)
Markov modeling	20 (23)
International perspective	16 (19)
Research design/methods	16 (19)
Future issues	11 (13)
Epidemiology/population studies	10 (12)
Retrospective databases	10 (12)

Abbreviations: CEA = cost-effectiveness analysis; CBA = cost-benefit analysis; CUA = cost-utility analysis; CMA = cost-minimization analysis; ICER = incremental cost-effectiveness analysis.

^a Only those topics listed by at least 10 respondents were included.

collection was completed by September 2011. This study was awarded an exemption by the Institutional Review Board of The University of Texas at Austin. Descriptive statistics were calculated using SPSS for Windows, version 18 (IBM, New York).

RESULTS

Of the 103 colleges and schools of pharmacy contacted, 89 (86.4%) responded. Eighty-seven of the 89 colleges and schools had included pharmacoeconomic-related topics in their 2011 curriculum. Of these respondents, 11 did not want to send a copy of their syllabus but agreed to answer questions about their course. The 2 colleges at which pharmacoeconomics was not taught in 2011 explained that this was because of temporary faculty vacancies. About 90% of the colleges and schools covered pharmacoeconomics in required courses only, 2% covered pharmacoeconomics in elective courses only, and 8% covered pharmacoeconomics in both required and elective courses.

The objectives from 72 courses were summarized. The 3 most common objectives were literature evaluation (44), definition and application of 4 basic types of pharmacoeconomic analyses (40), and the definition and application of decision analysis (33). Other objectives are listed in Table 1. The pharmacoeconomic topics taught at 85 colleges were categorized. The 3 most common topics were the 4 basic types of pharmacoeconomic studies (81), health-related quality of life (68), and articles/research

Table 3. Articles Used in Pharmacoeconomics Courses in US Colleges and Schools of Pharmacy^a

Detsky AS, Naglie G, Krahn MD, Naimark D, Redelmeier DA. Primer on medical decision analysis: part 1—getting started. <i>Med Decis Making</i> . 1997;17(2):123-125.
Naglie G, Krahn MD, Naimark D, Redelmeier DA, Detsky AS. Primer on medical decision analysis: part 3—estimating probabilities and utilities. <i>Med Decis Making</i> . 1997; 17(2):136-141.
Krahn MD, Naglie G, Naimark D, Redelmeier DA, Detsky AS. Primer on medical decision analysis: Part 4—analyzing the model and interpreting the results. <i>Med Decis Making</i> . 1997;17(2):142-151.
Garrison LP, Mansley EC, Abbott TA, Bresnahan BW, Hay JW, Smeeding J. Good research practices for measuring drug costs in cost-effectiveness analyses: a societal perspective: the ISPOR Drug Cost Task Force report—part II. <i>Value Health</i> . 2010;13(1):8-13.
Siegel JE, Weinstein MC, Russell LB, Gold MR. Recommendations for reporting cost-effectiveness analyses. Panel on cost-effectiveness in health and medicine. <i>JAMA</i> . 1996;276(16):1339-1341.

^a Only articles that were listed by more than 1 college or school are included.

evaluation (61). All topics taught in at least 10 colleges and schools are presented in Table 2.

Fifty-six of the 87 respondents provided information on required or recommended book(s) for their pharmacoeconomics course. The 3 most-used textbooks were Rascati's *Essentials of Pharmacoeconomics*, first edition⁵ (n=34); Bootman, Townsend, and McGhan's *Principles of Pharmacoeconomics*, third edition¹¹ (n=9); and Drummond, Schulpher, and Torrance's *Methods for Economic Evaluation of Health Care Programmes*, third edition¹² (n=7). Fifteen syllabi contained information on articles used in the pharmacoeconomics course (Table 3).

The number of hours offered and the number of students in the class for the 84 required courses and the 8 elective courses were analyzed. The mean number of clock hours dedicated to pharmacoeconomics in the required courses was 20.4 ± 15.3 (Figure 1). The mean number of clock hours offered in elective courses was 32.5 ± 12.9 . Most instructors (33 of the 54 that responded to this question) thought the number of hours offered was about the right amount.

The average number of students in the 84 required courses was 119 students (range 28-289). In the 5 elective courses for which data were available, the average number of students was 11 (range 1-30). Of 56 schools that responded to this item, 27 (48%) offered pharmacoeconomic projects on which PharmD students could participate. Of the 54 colleges and schools that replied, 28 (52%) provided opportunities for pharmacoeconomic practice experiences.

DISCUSSION

Previous studies that analyzed the extent of pharmacoeconomics education in US colleges and schools of pharmacy before the new ACPE guidelines were in effect found that the majority of colleges and schools (80% in 1997 and 92% in 2007) offered pharmacoeconomic-related topics. In the present study, all but 2 responding colleges and schools had a course in place in 2011 that covered pharmacoeconomic-related topics (98%). The median number of hours devoted to pharmacoeconomics in required coursework was 16 hours in 1997, 19 hours

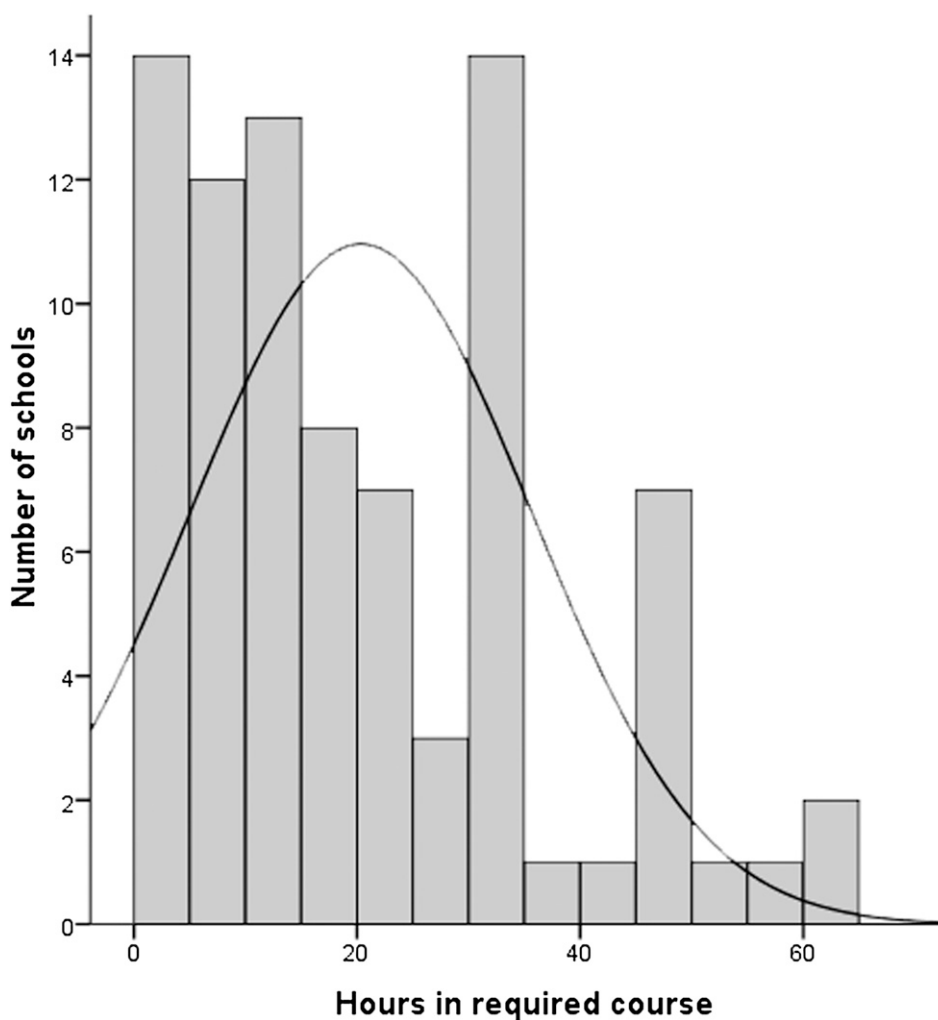


Figure 1. Classroom hours for pharmacoeconomic-related topics in required courses; N = 84; Mean (SD) = 20.4 (15.3).

in 2007, and 16 hours in 2011. The range of hours dedicated to pharmacoeconomic-related topics ranged from 2 to 60 hours, with 14 of 84 schools reporting 5 hours or less spent on/dedicated to these topics.

The recent emphasis on the need for comparative effectiveness research calls for updates in educational programs for healthcare professionals.¹³ An example of how education about comparing treatments (both clinically and economically) can be incorporated into pharmacy programs is by implementing active-learning and project-based collaborative education into the curriculum. For example, the University of Cincinnati College of Pharmacy developed a collaborative decision analysis project that integrates information from their pharmacoeconomics course and the formulary management module of the Pharmacy Practice Skills Development course in order to help students apply pharmacoeconomic knowledge in the decision-making process for formulary management.¹⁴ Involving students in pharmacoeconomic projects and practice experiences can also enhance students' skills in applying pharmacoeconomic tools. In this study, half of respondents indicated that this additional training was available for students. To develop standardized core subjects that should be covered in pharmacoeconomics courses, the authors recommend addressing specific facets of the pharmacoeconomics education reported in this study (eg, objectives, topics) along with the minimum skills for all target audiences developed by the ISPOR Learning Outcomes Task Force.³

The present study has some limitations. The data were collected from syllabi and, in some cases, directly from instructors. Also, the categorization techniques used by instructors may have varied, and all topics might not have been listed on the syllabi. Pharmacoeconomic-related topics may have been incorporated into more than one course, and the courses may have been taught by different instructors. Therefore, this study may not have captured some pharmacoeconomic topics and coverage in the classroom. Unlike the previous 2 surveys, the authors were not able to obtain a 100% response rate. This study also lacked any analysis of pharmacoeconomics education of other graduate- and postgraduate-level pharmacoeconomics education. Future research may aim to study the extent of pharmacoeconomics education available at these levels.

CONCLUSION

Most US colleges and schools of pharmacy provide pharmacoeconomics education; however, the varied number of hours devoted to this area and the variety of pharmacoeconomic-related topics covered demonstrate inconsistency in coverage within the PharmD curriculum. Increasing health care costs point to an acute need

for economic evaluation education for future pharmacists and other health care professionals, and changes to ACPE guidelines and the NAPLEX examination indicate recognition of this need. Additional guidelines and competency measures are needed to provide more standardization in this area of pharmacy education.

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