American Journal of Pharmaceutical Education **2004; 68 (3) Article 62.**

RESEARCH ARTICLES

Effectiveness of Pharmacoeconomic and Outcomes Research Fellowship Programs Within the United States

Vittorio Maio, PharmD, MS, and Jennifer H. Lofland, PharmD, PhD, MPH

Department of Health Policy, Jefferson Medical College

Submitted October 20, 2003; accepted December 22, 2003; published July 8, 2004.

Objective. The purposes of this study were to develop outcome measures for pharmacoeconomic/outcomes research (PE/OR) fellowship programs in the United States, and to use these outcome measures as a means to evaluate their effectiveness.

Methods. Outcome measures within the cognitive, affective, and psychomotor domains were developed to assess the effectiveness of PE/OR fellowship programs, incorporated in a survey questionnaire, and administered to former fellows via the International Society for Pharmacoeconomics and Outcomes Research (ISPOR) Web site.

Results. Of the 68 former fellows who completed the survey, 61 met the inclusion criteria. Former fellows reportedly demonstrated the attainment of cognitive and psychomotor skills through tangible products such as abstracts and manuscripts developed during the fellowship program. Concerning affective outcomes, fellows reported that not only were they satisfied with the fellowship experience, but also felt the experience satisfactorily prepared them for the job market and helped them obtain a satisfactory job within the workforce.

Conclusion. The results of this study suggest that PE/OR fellowship programs are appropriate educational models to meet the demand for expertise in health economics.

Keywords: pharmacoeconomics, fellowship, outcomes research

INTRODUCTION

Pharmacoeconomic/outcomes research (PE/OR) fellowships have been in existence for more than 10 years in response to the rising demand for expertise in economic evaluation.[1-4] The first fellowship in PE/OR began in 1989[1]; however, finding detailed information about these programs is difficult for several reasons. First, quantifying PE/OR programs is a challenge due to their increasing number in the last few years. In addition, a comprehensive list of these programs or a central location in which to retrieve information is not readily available. Recently, the International Society for Pharmacoeconomics and Outcomes Research (ISPOR) and the American College of Clinical Pharmacy (ACCP) responded to this need through the development of fellowship directories.[5,6] Based on these directories, there were 41 fellowship positions available in 2001. Moreover, the ACCP and ISPOR have developed guidelines for PE/OR fellowships that define the structure and process of these programs in order to ensure that fellows acquire a standard set of PE/OR research skills and experiences.[1,7]

There is a paucity of information about the organizational features of PE/OR fellowship programs[8]; however, 2 recent studies that surveyed fellows and preceptors provided insight regarding the structure and process of current PE programs.[9,10] According to these studies, a common organizational and educational profile can be described for PE/OR programs. The "basic" PE/OR program is 2 years in length, sponsored by the pharmaceutical industry, and conducted primarily in academic and pharmaceutical industry settings. The PE/OR fellowships provide trainees with a variety of research skills and exposure to various PE/OR research designs and analyses. In addition, current PE/OR programs appear to be adhering to the existing ACCP and ISPOR guidelines for PE/OR fellowships.[9]

Judging the structures and processes may be a useful method of assessing the effectiveness of PE/OR fellowships[11]; however, the ultimate indicator of the effectiveness of PE/OR programs are the outcomes of these programs, which to date have not been defined.[8]

Therefore, the purpose of this investigation was (1) to develop outcome measures for PE/OR fellowship programs in the United States, and (2) to use these outcome measures as a means of evaluating their effectiveness.

Corresponding Author: Vittorio Maio, PharmD, MS. Address: Project Director, Department of Health Policy, Jefferson Medical College, 1015 Walnut Street, Suite 115, Philadelphia, PA 19017. Tel: 215-955-1821. Fax: 215-923-7583. E-mail: vittorio.maio@jefferson.edu.

METHODS

Development of Outcome Measures

By classifying PE/OR fellowships as educational programs, outcome measures can be considered as specific tools used to determine the extent to which trainees achieve the program's educational objectives.[12] Educational objectives may be extrapolated from the current ACCP and ISPOR guidelines, yet a conceptual framework is needed for their classification. In 1956 Bloom et al developed the first classification system for educational objectives, "Taxonomy of Educational Objectives."[13] Since then, numerous other taxonomies have been suggested for identifying educational objectives; however, all have incorporated and agreed on 3 common domains: cognitive, affective, and psychomotor.[14]

The *cognitive* domain deals with variables pertaining to knowledge, including recall or recognition of specific facts, procedural patterns, and concepts that serve in the development of intellectual abilities and skills. The *affective* domain refers to the manner in which one deals with occurrences emotionally, such as one's feelings, appreciation, enthusiasm, motivation, and attitude. The *psychomotor* domain embraces coordination and use of skills. These skills pertain to how proficient one is in a task, and therefore are measured in terms of speed, precision, distance, procedures, or techniques in execution.

Based on this framework, the educational objectives for PE/OR fellowships defined in the ACCP and ISPOR guidelines were reviewed and classified into 1 of the 3 domains (Table 1). Possible evaluation procedures were considered for determining mastery of the educational objectives in each domain. According to Gronlund, evaluation procedures include both objective techniques, such as tests and examinations, and subjective techniques, such as self-report methods.[15]

Objective tests, as opposite of subjective measures, might be more appropriate tools for appraising cognitive skills, which encompass knowledge, understanding, and thinking skills, and psychomotor skills, which are concerned with the ability and aptitude to perform a task. For PE/OR fellowship programs, however, there is neither a standardized examination nor a national certification program. Therefore, possible objective measures of one's knowledge and performance in the PE/OR field may include the completion of a degree program, the publication of a manuscript, and/or the presentation of a scientific abstract (Table 1). For instance, a degree would suggest that a fellow has acquired basic competencies in the field. The peer-reviewed process associated with a manuscript would demonstrate that a fellow has completed a critical analysis of the literature and mastered the materials and methods in the PE/OR field. The number of manuscripts published and abstracts presented may be one indicator of the skills gained through a PE/OR fellowship as well as evidence of one's verbal and written skills.

Objective techniques, while valuable in determining if a given set of knowledge and performance skills has been learned, are not as appropriate for the evaluation of educational objectives within the affective domain. Since the affective domain deals with one's attitudes, interests, and values, subjective techniques may provide the best means to capture these characteristics (Table 1). Outcomes of PE/OR programs for the components of the affective domain may include one's overall satisfaction with a fellowship, as well as appreciation with the types of research and management skills obtained as part of the fellowship (Table 1).

Development of Pharmacoeconomic/Outcomes Research Fellowship Survey

The methods for this study have been described in detail elsewhere.[9,10] A survey was conducted to assess PE/OR fellowship programs through the developed outcome measures. This was an observational, cross-sectional, web-based survey. A 41-item questionnaire was administered to identified study participants during November and December 2001 via the ISPOR Web site. The Institutional Review Board at Thomas Jefferson University approved this study.

Participants

Study participants were former fellows of PE/OR programs. The views of these former fellows were assumed to represent those of their PE/OR fellowship programs. Former fellows were defined as professionals who finished a United States-based fellowship and had completed the fellowship at least 3 months prior to the initiation of the survey. Individuals were excluded if they were enrolled in a PE/OR fellowship program outside of the United States, did not have an e-mail address or Internet address, or did not respond within 1 month of the survey initiation. Because several developed outcome measures solicited information about level of satisfaction with the PE/OR fellowship associated with experiences gained within the work environment, to be conservative, both those respondents who were not employed and those not employed in the PE/OR field were excluded.

Former fellows were identified by collecting information from different sources. First, an initial list of names and e-mail addresses of potential participants was compiled based on the contact names for PE/OR fellowship programs described in the ACCP and the ISPOR

Table 1. Educational Objectives and Potential Outcome Measures for PE/OR Fellowship Programs

Domain*	Educational Objectives†	Outcome Measures
Cognitive and thinking	• Identify and apply the appropriate form of economic analysis • Comprehend the value of quality of life, and select and apply appropriate health-related quality of life and patients satisfaction instruments in economics of health care • Describe and apply research design methods, develop the hypothesis, define the duration and identify appropriate endpoints • Identify types of outcomes data and appropriate outcome measures, select data sources, manipulate and analyze data collected • Identify and apply basic research analysis methods • Be able to use statistics methods and perform sensitivity analysis extensively • Acquire knowledge of statistical software and apply them on data analysis • Prepare a research proposal, and develop the protocol and case report forms • Prepare a technical report • Write a manuscript for publication • Create a presentation of research • Describe adequacy and consistency of arguments by reviewing manuscripts of others	• Completion of a degree program • Type of the degree granted • Manuscripts published in peer-reviewed biomedical journals • Abstracts presented as a poster and/or a formal presentation at meetings
Affective	• Understand the importance of accountability in proving evidence of the quality, cost, and outcome of health care • Seek objectivity in the interpretation of evidence • Base ideas and opinions on the best scientific evidence available • Promote the development of the disciplines of outcomes research through contributions to the literature and support of relevant professional organizations • Support the mission of the organization • Participate in relevant local, regional, and national meetings and conferences • Share ideas and cooperate with others in carrying out activities • Work independently when solving problems as well as on assigned projects	• Fellows' self-report of research and management skills acquired • Fellows' self-report of attitudes and satisfaction of program
Psychomotor	• Justify the procedures used in the study • Analyze and interpret the results • Summarize the findings and their implications • Use language appropriate for a written report • Present orally a report in well-organized manner • Be able to perform an oral presentation holding the audience's attention and interest • Use computer applications to clarify ideas and relationships • Be adept in literature retrieval and literature evaluation • Manage multiple projects • Complete work assignments on schedule	• Manuscripts published in peer-reviewed biomedical journals • Abstracts presented as a poster and/or a formal presentation at meetings

*Adapted from Gronlund NE.[15]

†Adapted from the American College of Clinical Pharmacy (ACCP) guidelines[1] and the International Society for Pharmacoeconomics and Outcomes Research (ISPOR) standards[7]

directories. Web sites of the institutions and organizations involved in these programs were searched for additional names of fellows.

An Internet search using the search engines www.google.com and www.yahoo.com was conducted to identify PE/OR fellowship programs that were not included in the ACCP and the ISPOR directories. The search strategy included individual terms and/or combinations of terms from the following list: fellowship, program, pharmacoeconomic(s), outcomes, outcomes

research, economics, health economics, pharmaceutical economics, drug development, and pharmacoepidemiology. Institutions that reportedly conduct PE/OR fellowships were further investigated. All Web sites of identified PE/OR fellowship programs were then sought for additional names of former fellows. Finally, names of former fellows were added to the compiled list based on personal contacts of the project staff.

Seventy-four former fellows were identified. These names were matched with the ISPOR membership roster to obtain further information (eg, email address). In addition to this compiled list, participants were recruited through the ISPOR's Web site and membership roster.

Questionnaire

Respondents were asked for demographic information, including age, gender, and level of education. To preserve anonymity of fellows and to increase the likelihood that information collected was unbiased, the names of the programs and of the fellows were not solicited. There were also several questions about the general organizational characteristics and educational components of these fellowships, such as the number and type of practice settings involved. Finally, several survey items were designed to capture the developed outcome measures.

Information was solicited about the completion and type of degree associated with the PE/OR fellowship, as well as abstracts presented and manuscripts accepted for publication. Fellows' perceptions of research and management skills acquired as part of the fellowship were captured via several survey items defining 3 fundamental elements of pharmacoeconomic research skills: conceptualization, operationalization, and data management. Details about the components of these 3 stages of pharmacoeconomic research skills have been described elsewhere.[9]

Information regarding satisfaction with PE/OR fellowships was elicited by asking participants a series of questions. Overall satisfaction with the program was captured by asking fellows how satisfied they were with the experience gained in the program. Respondents were also asked to describe the degree of difficulty in finding a job after completion of the program, whether the program was useful in pursuing their career objectives, and to what extent the fellowship provided them with the skills and knowledge needed for their work setting. Responses to the above questions were measured using a 5-point Likert scale, in which 1 was the highest value, 3 the neutral value, and 5 the lowest value. For example, overall level of satisfaction with the fellowship was measured using a 5-point scale with 1=satisfied, 3=neither satisfied nor dissatisfied, and 5=dissatisfied.

Data Collection and Analysis

After being pilot-tested with a convenience sample of fellows, the survey was formatted by the ISPOR staff for online administration on the ISPOR Web site. An e-mail, which included a description of the study along with an ISPOR Web site link for accessing the survey, was sent to each identified former fellow and all registered members of ISPOR. Participation was voluntary and confidential. A follow-up e-mail was sent within 2 weeks to nonrespondents. The survey was closed 1 month after survey implementation. All data were collected on the ISPOR Web site.

Descriptive statistics were computed for all variables using the SAS statistical package software (SAS Institute, version 8.2, Cary, NC, USA). Demographic characteristics, including variables such as age, gender, and level of education, were calculated for all former fellows. For each of the 3 categories of pharmacoeconomic research skills, the responses of fellows were classified as compliant if their program had at least 50% of the components included in that specific research skill.[9]

For the purposes of the analyses, all 5-point scales used to capture levels of appreciation and satisfaction with the PE/OR fellowship were recorded such that response values of 1 and 2 were grouped together as the "higher rank," response values of 3 were grouped as the "neutral rank," and response values of 4 and 5 were grouped together as the "lower rank." For example, the 5-point scale used to capture overall level of satisfaction with the PE/OR fellowship was converted into a new variable with response values of 1 and 2 grouped into a "satisfied" category, response values of 3 defined as "neutral," and response values of 4 and 5 grouped into a "dissatisfied" category.

RESULTS

Characteristics of Participants and PE/OR Programs

Sixty-eight former fellows completed the online survey. Seven individuals were excluded; 1 completed a fellowship program within 3 months prior to the start of the survey, 1 completed a program outside of the United States, 1 did not complete a fellowship program, 3 were not employed, and 1 was not employed in the PE/OR field. Therefore, 61 respondents were included in the analysis.

The mean age of respondents was 33 years and 49% of the respondents were men (Table 2). Fifty-six percent of the fellows completed a fellowship program after 1998. In terms of their current level of education, 38% of the former fellows had a PharmD degree and 45% had multiple degrees (eg, a PharmD and an MPH degree). Fifty-four per-

Table 2. Demographic Characteristics of Former Fellows (N=61)

Characteristic	
Mean age in years*	33.0 (±6.2)
Gender: Male (%)	49
Level of Education(%)*†	
Multiple degrees‡	45
PharmD	38
PhD	8
Master	3
No graduate degree	5
Program completion (%)	
Before 1995	8
1995 - 1998	36
1999 or afterward	56
Work setting (%)†	
Pharmaceutical Industry	54
Academic institution	20
Managed Care Organization	7
Pharmacy Benefit Organization	7
Consulting Firm	7
Hospital and other Health Care Organizations	5
Self-employed	2
Reported 2001 salary (%)	
≤$79,999	38
$80,000-$119,999	52
≥$120,000	10

*Age and level of education were available for 60 of the 61 fellows who responded. The age range was 26-65 years.
†Percentages may not total 100% because of rounding.
‡The variable "multiple degrees" refers to a combination of 2 or more of the following degrees: PharmD, PhD, Masters.

cent and 20% of respondents were employed in the pharmaceutical industry and academic institutions, respectively. Respondents' activities while in the job setting included outcomes research (32%), pharmacoeconomic research (27%), clinical investigations (12%), marketing/public relations (8%), financial management (5%), personnel management (4%), and other activities (12%). Fifty-two percent of participants had an average annual salary between $80,000 and $119,999 (United States dollars).

In terms of the motivation to apply for a PE/OR fellowship, 77% former fellows reported wanting to develop research skills, 59% wanted to obtain hands-on experience, and 48% wanted to enter into the pharmaceutical industry as a career. Almost all of the respondents (97%) stated their fellowship program was 2 years in length. Seventy-five percent reported that 2 sites were involved in the PE/OR fellowship program, and 80% indicated that their program included an academic institution and a pharmaceutical industry site.

Cognitive Outcomes

One of the possible cognitive outcome measures is the completion of a degree as part of the program. Fifty-nine percent of the former fellows reported that a degree was not offered as a part of their fellowship experience (Table 3). For the other respondents, 31% obtained a master's degree and 10% obtained a PhD as part of the fellowship.

Another measure of the obtainment of cognitive skills is the ability to write, present, and publish abstracts and manuscripts of the research activities in which they were involved as a fellow. In regard to abstracts, 90% and 57% of former fellows reported presenting an abstract for a poster presentation and an abstract as a formal presentation, respectively. Sixty-seven percent of respondents reported having at least one manuscript accepted for publication.

Affective Outcomes

Affective outcomes attempt to quantify one's behavior and attitudes towards a particular event. Therefore, one possible indicator of affective outcomes is a former fellow's general satisfaction with the PE/OR fellowship program, as well as satisfaction with the skills obtained as part of the fellowship. Regarding overall satisfaction with a PE/OR fellowship, 90% of the respondents reported they were satisfied with their experience (Table 3). Former fellows stated that fellowship programs offered them the opportunity to develop their research skills, including the conceptualization (89%), operationalization (64%), and data management (70%) of research projects. When asked about how difficult it was to obtain a professional position after completing the fellowship, 79% stated it was easy or extremely easy to do so. Ninety-five percent of participants felt that the specialized training they received contributed to their ability to pursue their primary career goals. In addition, 92% reported that the skills acquired through the PE/OR program matched those needed in their job setting.

Psychomotor Outcomes

One way to assess an individual's performance during the fellowship program as seen in the cognitive outcomes, is by the number of manuscripts that were accepted for publication and the number of abstract presented. These results are provided above (Table 3).

DISCUSSION

Previous investigations have studied the structures and processes of PE/OR fellowship programs[8-10]; however, this is the first study to define and examine the out-

Table 3. Percent of Former Fellows Reporting Hypothesized Outcome Measures for PE/OR Fellowship Programs (N=61)

Outcome Measures	**n (%)***
Degree program	
Not offered	36 (59)
Master	19 (31)
PhD	6 (10)
Poster presentation	
None	6 (10)
1	10 (16)
2	17 (28)
≥3	28 (46)
Formal abstract presentation	
None	26 (43)
1	16 (26)
2	12 (20)
≥3	7 (11)
Manuscript accepted	
None	20 (33)
1	20 (33)
2	12 (20)
≥3	9 (15)
Research skills acquired	
Conceptualization	54 (89)
Operationalization	39 (64)
Data management	43 (70)
Satisfaction with the program	
Satisfied	55 (90)
Neutral	3 (5)
Dissatisfied	3 (5)
Job search	
Easy	48 (79)
Neutral	9 (15)
Poor	4 (7)
PE program helped pursue career goals	
Agreed	58 (95)
Neutral	3 (5)
Disagreed	0 (0)
Skills acquired matched those for job setting	
Well	56 (92)
Neutral	4 (7)
Poor	1 (2)

*Percentages may not total 100% because of rounding

comes of PE/OR fellowship programs within the United States. This study provides a framework by which outcome measures for such programs may be developed, and a set of measures by which current and future programs may be evaluated.

The outcomes developed in this paper offer one way of assessing the educational objectives of PE/OR programs within the cognitive, affective, and psychomotor domains. To the extent to which the purpose of evaluating the effectiveness of educational programs is to determine whether trainees achieve both learning and behavioral goals,[15] these outcomes were in fact thought to include both quantitative and qualitative measurements. In the absence of a standardized examination for PE/OR fellowships, measurements of types of degree granted and/or research presented may be considered an appropriate proxy to use in appraising the level of knowledge acquired by fellows from the program. In addition, fellows' perception of attitudes and satisfaction with the fellowship may help to determine whether trainees have reached specific behavioral objectives established within the program. Using the developed outcomes, the results of this research demonstrate that, according to former fellows, PE/OR fellowship programs within the United States overall appear to have positive cognitive, affective, and performance outcomes and appear to be effective in providing well-trained professionals within the field.

In regard to the cognitive and psychomotor outcomes, study findings may be subject to different interpretations. From one perspective, it appears that most former fellows demonstrate the attainment of cognitive skills with the development of a tangible product (abstract or manuscript) from the projects in which they have participated as a fellow. In addition, abstract and manuscript accomplishments support the idea that current PE/OR fellowship programs are providing individuals with the necessary skills and knowledge sets in order to perform the required tasks within the fellowship.

However, in a less optimistic interpretation, one may argue that from a 2-year, research-intensive program,[1,10] more writing and other forms of scholarly productivity would be expected. In fact, one third of the fellows did not have any evidence of publishing a manuscript, and another one third had only 1 manuscript accepted for publication during the fellowship. Almost half of the fellows did not deliver any formal research presentations. In addition, we did not ask respondents their specific order in terms of authorship on each manuscript or abstract published. Conceivably, a fellow who was the lead author on a manuscript, as opposed to second or third author, may have obtained a higher level of cognitive skills in order to complete such a task. Finally, we do not have information about the quality of the material produced, for instance, whether the manuscripts were published in peer-reviewed as opposed to non–peer-reviewed journals.

Despite this controversial interpretation and the absence of defined quantitative outcomes in existing guide-

lines, it appears that fellows may gain substantial PE/OR knowledge and skills during the fellowship program.

Affective outcome measures are used to try to measure one's behavior and attitude to an educational experience.[15] According to our findings, former fellows were not only satisfied with the fellowship experience, but also felt the experience satisfactorily prepared them for the job market and helped them obtain a satisfactory job within the workforce. These findings confirm the results of a pilot study comparing the outcomes of drug information pharmacy residents and fellows.[16]

There are limitations to our study. One major limitation is that the survey participants may not be truly representative of the population of PE/OR fellows. The ACCP and ISPOR directories, which were our primary sources of information, list the name of the contact person(s) for each fellowship. Since there is no central location from which to obtain comprehensive information concerning PE/OR fellowship programs, we may not have identified all former fellows. However, to overcome this limitation, we used various methods to best identify all possible PE/OR fellowship program fellows.

Another limitation is the method used for recruiting participants. In order to increase the identification of former fellows, we recruited participants from among occasional visitors of the ISPOR Web site, as well as from the ISPOR membership roster. Therefore, we are unable to determine the true population denominator and response rate for this study.

The third limitation is the use of subjective information in order to assess the outcomes of these PE/OR programs. This study relied on data that were reported from former fellows on the state of the fellowship program in which they were enrolled. It may be argued that objective information, such as examination scores, may be better indicators of the true outcomes of a program.

We clearly see in many other educational experiences how examinations are used as a means to assess an individual's knowledge.[15] For many individuals, testing begins in grammar school, continues into graduate school, and culminates with an examination for professional licensure. As seen in some professional organizations, an examination is offered as a means to recognize and acknowledge individuals who have attained a specific set of skills. The ACCP does provide accreditation for fellowship programs. However, not all identified PE/OR fellowship programs are accredited by this organization, and to our knowledge the ACCP does not require accredited programs to administer an examination to its participants.

If the field of pharmacoeconomic and outcomes research feels it is beneficial to measure the outcomes of various PE/OR educational programs,[3,17] of which fellowship programs are a part, then leaders within the field will have to decide the best means by which to measure such outcomes. Should each program conduct individual assessments of the outcomes of their program, or should a national organization begin to measure and document the outcomes of such educational programs? If it is agreed that the outcomes of these programs need to be collected, additional discussion must occur to determine how these measures should be gathered, subjectively or objectively.

Finally, the use of the World Wide Web to administer the survey may have affected the study response rate. Issues such as technical incompatibilities and users' confidence toward a web-based survey are often described as major factors contributing to decreased response rates with Internet-based surveys.[18,19] However, the use of a Web-based survey offers several benefits, such as reducing administrative costs, enhancing data collection by eliminating coding errors and data-entry mistakes, and preserving participants' anonymity.[17,18]

Two major findings may be drawn from this research study. First, potential outcome measures for PE/OR fellowships have been defined based upon a conceptual framework universally used for developing outcomes for educational programs. We would encourage institutions and organizations developing new or refining existing PE/OR fellowships to incorporate these outcomes in establishing standards for their program. In light of the outcomes presented in this paper, we would also advocate ACCP and ISPOR to expand their current guidelines for PE/OR fellowships. Second, according to former fellows' opinions, PE/OR fellowships reportedly are effective training experience. This information suggests that these programs are appropriate educational models for meeting the demand for expertise in health economics.

CONCLUSIONS

A framework for developing outcomes measures for PE/OR fellowship programs within the cognitive, affective, and psychomotor domains is provided. Using this framework, outcome measures were developed and then incorporated in a survey questionnaire administered to former fellows in order to determine the effectiveness of PE/OR fellowships. Through a web-based survey, former fellows indicated that PE/OR fellowships within the United States are effective programs for developing well-trained professionals. The developed outcome measures may be used as a means to evaluate current and future PE/OR educational programs.

ACKNOWLEDGEMENTS

This work was supported by the International Society for Pharmacoeconomics and Outcomes Research (ISPOR). Dr. Jennifer H. Lofland is supported by a grant from the Agency for Health Care Research and Quality K-08 00005 Mentored Clinical Scientist Award.

This research was presented as a poster presentation at the Eight Annual Meeting of the International Society of Pharmacoeconomics and Outcomes Research, May 20, 2003, Arlington, VA

We greatly appreciate the assistance of the following people: David B. Nash, MD, MBA; Neil Goldfarb; Barbara Bozarth, MSEd; Vanja Sikirica, PharmD; Marilyn Dix Smith, PhD; and the ISPOR fellowship taskforce members (QuynhChau Doan, RPh, MS; Sandeep Duttagupta, PhD; Zeba M. Khan, PhD; Amy L. Phillips, PharmD; Sujit S. Sansgiry, PhD; Amishi B. Shah, PharmD; Jennifer Sung, PharmD, MS; and Krista Yokoyama, PharmD). Finally, we thank the anonymous reviewers for their helpful comments.

REFERENCES

1. Lee J, Lawrence BJ, Sullivan SD, et al. Guidelines for pharmacoeconomic research fellowship. *Pharmacother*. 1999;19:1105-1109.
2. Draugalis JR, Coons SJ. The role of colleges of pharmacy in meeting the pharmacoeconomic needs of the pharmaceutical industry: a conference report. *Clin Ther*. 1994;16:523-537.
3. Copley-Merriman K, Vanscoy G, Angaran D, et al. Panel 4: education and skills needed to conduct, interpret, and use economic evaluations in health-care. *Value Health*. 1999;2:88-91.
4. Jackson TR, Draugalis JR. Graduate pharmacoeconomic and outcomes research educational programs in colleges and schools of pharmacy: a five-year update. *Am J Pharm Educ*. 2000;64:11-14.
5. International Society for Pharmacoeconomics and Outcomes Research. ISPOR directory of fellowships in pharmacoeconomics, health economics, outcomes research or related field of study. Available at: http://www.ispor.org/education/fellowships_directory.asp. Accessed September 11, 2001.
6. American College of Clinical Pharmacy. ACCP directory of residencies and fellowships. Available at: http://www.accp.com/resandfel/. Accessed September 12, 2001.
7. Standards for fellowship training in pharmacoeconomics and outcomes research. International Society for Pharmacoeconomics and Outcomes Research (ISPOR) position statement. May 1998: 1-6.
8. Maio V, Girts TK, Lofland JH, Nash DB. Pharmacoeconomic fellowships: the need for outcomes measures. *Pharmacoeconomics*. 2001;19:795-802.
9. Maio V, Lofland JH, Nash DB. Pharmacoeconomic fellowships: preceptors' views regarding adherence to the American College of Clinical Pharmacy guidelines. *Am J Pharm Educ*. 2003;67(3):article 75.
10. Maio V, Lofland JH, Doan Q, et al. Organizational Structure and Educational Components of Pharmacoeconomic Fellowship Programs: A Fellows' Perspective. *Am J Pharm Educ*. 2003;67(4):article 105.
11. Donabedian A. Evaluating the quality of medical care. *Milbank Mem Fund Q*. 1966;44:166-206.
12. Gronlund NE. How to write and use instructional objectives. 6th ed. Upper Saddle River, New Jersey: Prentice-Hall:2000.
13. Bloom BS, Engelhart MD, Furst EJ, Hill WH, Krathwohl DR. Taxonomy of educational objectives: The classification of education goals. Handbook I: Cognitive domain (Vol. 1). New York, NY: David McKay Company, Inc; 1956.
14. Anderson SB, Ball S, Murphy RT, and Associates. Encyclopedia of educational evaluation. San Francisco, Calif: Jossey-Bass; 1975.
15. Gronlund NE. Measurement and evaluation in teaching. 2th ed. New York, NY: The Macmillan Company, 1971.
16. Lloyd KB, Lee JT, Strassels S. The relative effects of fellowship training on career path, job satisfaction and burnout, and quality of life. *Pharmacother*. 1998;28:430.
17. Lyles A. Standards and certification to recognize pharmacoeconomics as a profession. *Clin Ther*. 2003;25:1004-1006.
18. Schleyer TKL, Forrest JL. Methods for the design and administration of web-based surveys. *J Am Med Inform Assoc*. 2000;7:416-425.
19. Wyatt JC. When to use web-based surveys. *J Am Med Inform Assoc*. 2000;7:426-429.