

RESEARCH ARTICLES

Pharmacoeconomic Fellowships: Preceptors' Views Regarding Adherence to the American College of Clinical Pharmacy Guidelines

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Objectives. The purpose of this study was to describe the extent to which pharmacoeconomic/outcomes research (PE/OR) fellowships adhere to the American College of Clinical Pharmacy (ACCP) guidelines developed in 1999.

Methods. Fellowship preceptors' opinions regarding the components that identify the structure and process of current PE/OR programs were solicited using a web-based survey method.

Results. Of the 49 preceptors who completed the web-based survey, 38 met the inclusion criteria. Concerning the structure of PE/OR fellowships, preceptors reported that their programs provided fellows with appropriate resources and facilities in accordance to ACCP guidelines. Preceptors indicated that their programs offered fellows appropriate didactic coursework as well as skills taught in adherence to ACCP guidelines. Few preceptors indicated that their programs provided trainees with hands-on research activities at the level suggested by the guidelines. Preceptors' responses showed that current PE/OR fellowship programs reportedly are adhering to the 1999 ACCP guidelines.

Conclusions. Continued refinement and assessment of the ACCP guidelines are needed, and outcomes for PE/OR fellowship programs need to be defined and evaluated.

Keywords: pharmacoeconomics, fellowship, outcomes research, American College of Clinical Pharmacy guidelines

INTRODUCTION

Postgraduate pharmacoeconomic/outcomes research (PE/OR) fellowships have been developed in an effort to meet the rising demand for expertise in health economics.¹⁻³ The first fellowship program in PE/OR began in 1989, and since then additional programs have been created across the United States.¹ In a recent survey of 41 colleges and schools of pharmacy, 22 institutions were identified as having established PE/OR fellowships for the academic year 1998-1999, with the majority associated with a Master's or PhD degree program.⁴ However, with the increasing number of programs and with many programs offered at multiple sites, quantifying existing PE/OR fellow-

ships is difficult. In addition, there is no comprehensive list of these programs or a central location for information about the programs. According to the International Society for Pharmacoeconomics and Outcomes Research (ISPOR) and the American College of Clinical Pharmacy (ACCP) fellowship directories, there were a total of 41 fellowship positions available in 2001.^{5,6}

In 1999, the ACCP developed guidelines for conducting PE/OR fellowships.¹ According to these guidelines, PE/OR fellowship programs are designed for the fellows to work under the close direction of a qualified preceptor and to prepare the participant to become an independent investigator by developing a strong background in the health sciences (eg, pharmacy or medicine), epidemiology, economics, decision analysis, and biostatistics.^{1,7} The objective of the guidelines is to define the core competencies that these programs should address for PE/OR fellows.

Using Donabedian's framework of structure, process, and outcomes,⁸ the various aspects of PE/OR fellowship programs may be categorized.⁹ The structure of PE/OR fellowship programs includes the administrative

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and related aspects that support and direct the learning method (Table 1).⁹ These aspects comprise the characteristics of the institution, such as the facilities and staff qualifications. The process focuses on the features of the educational components and skills that are taught during the course of the fellowship (Table 1).⁹ The outcomes of fellowship programs are not defined in the ACCP guidelines.¹ The organization and design of these fellowships as well as their content vary.⁹ There are differences in the duration, the types and number of the institutions involved, the skills taught and the research and educational components among the programs. With these differences, it is important to determine to what extent these programs adhere to the ACCP guidelines for PE/OR fellowship programs and to determine the impact of the ACCP guidelines on the curriculum and organization of these programs.

The purpose of this study was to describe the extent to which PE/OR fellowship programs adhere to the ACCP guidelines.

METHODS

This was an observational, cross-sectional, web-based survey. During November and December 2001, a 28-item questionnaire was administered via the ISPOR web site to identified study participants. The study was deemed "exempt" from the Institutional Review Board (IRB) review.

Participants

With the objective to capture information regarding current PE/OR fellowships, study participants were preceptors of these programs. Preceptors were defined as professionals who are actively involved and participated in the training and research activities of fellows.¹⁰ Theoretically, a survey design would include a sample of participants taking into account one preceptor per program. However, PE/OR programs are usually conducted in multiple sites, and consequently the preceptor at each site might contribute differently to the program's curriculum development. Therefore, we felt it was important to solicit the opinions of as many preceptors as possible in order to gain as much information as possible concerning the curriculum of these programs. We assumed that these preceptors would represent the views of their PE/OR fellowship program. However, we recognize that multiple preceptors from each site may have responded to this survey, potentially overinflating or underinflating the characteristics of particular PE/OR fellowship programs.

Preceptors were included in the study if they met the following criteria:

1. They were currently involved in the above duties in a PE/OR fellowship program, or
2. They had relinquished their duties within three months prior to the initiation of the survey.

Subjects were excluded from the study if they met the following criteria:

1. They were involved in a PE/OR fellowship outside the US, or
2. They did not have an email address, or
3. They did not respond within 1 month of survey initiation.

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

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 preceptors. Finally, names of preceptors were added to the compiled list based on personal contacts of the project staff.

Seventy-seven preceptors were identified. These names were matched with the ISPOR membership roster to obtain further information (eg, e-mail address). In addition to this compiled list, participants were recruited through the ISPOR's website and membership roster.

Questionnaire

The authors developed the questionnaire. With the initial survey questions respondents were asked when they began their experience as preceptors in PE/OR fellowship programs, and whether they were currently involved in this duty. Respondents were asked for demo-

Table 1. Guidelines for Pharmacoeconomic Fellowship Programs ^{*†‡}

Structure	Process
Practice site	Program
Types of facilities available	General Features
Medical library	Length of 2 years
Clinical research center	80% of time dedicated to pharmacoeconomic research activities
Computer center	Research projects
Center for analysis of data from clinical studies	Applicant as the principal project manager on a minimum of one major research project
Other environments	Clinical research design and analysis
Staff qualifications	Pharmacoeconomic research design and analysis
Preceptors	Skills taught
Expertise in pharmacoeconomics and outcomes research	Economic analyses and methodologies
Relevant fellowship training experience	Health-related quality of life
Record of funded research projects	Research study design
Record of publications in peer reviewed journals	Data sources
Active collaborative research relationships with other health researchers and providers	Written and oral skills
Teaching staff	Computer applications
Evidence of pharmacoeconomic experience by grant applications, abstract presentations, and manuscript	Didactic coursework available
	Biostatistics
	Research methods
	Economics and/or Health economics
	Epidemiology
	Pharmacoeconomic research
	Quality of life assessment
	Pharmacoeconomic applied tools
	Cost of illness determination
	Disease outcome and economic modeling
	Cost-effectiveness analysis
	Cost-benefit analysis
	Utility, satisfaction, quality of life, and health status evaluation
	Pharmacoeconomic research skills [§]
	Conceptualization
	Conceptualization of the research project
	Development of the scientific hypothesis
	Development of the hypothesis into a research plan
	Operationalization
	Experimental methods to test hypothesis
	Preparation of a grant proposal
	Development of the budget for the study
	Getting financing from the sponsor
	Identification of the appropriate tool to measure outcomes
	Development and validation of outcome instruments
	Plan of data analysis
	Submission of the protocol for a PE/OR study to the institutional review board (IRB) or human subjects committee

Table 1 (Continued). Guidelines for Pharmacoeconomic Fellowship Programs^{*†‡}

Structure	Process
	Development of a protocol, case report and/or other required study documents
	Data management
	Development a data management system to maintain collected data
	Collection of data
	Statistical data analysis
	Application
	Preparation of the technical report for submission to sponsor
	Preparation and submission of abstracts for presentation at meetings
	Preparation and submission of manuscripts for publication in a peer-reviewed biomedical journals

*Adapted from reference 9

†Adapted from the American College of Clinical Pharmacy (ACCP) guidelines¹

‡Adapted from the International Society for Pharmacoeconomics and Outcomes Research (ISPOR) standards¹⁰

§Adapted from The Basics of Social Research, Babbie ER¹¹

graphic information, including age, gender, and level of education. There were also a number of questions about the general organizational characteristics of these fellowships, such as the number and type of practice settings involved. Finally, several survey items were designed to capture the structure, process, and potential outcomes from the preceptors' perspective of fellowship programs. To preserve confidentiality, the name(s) of programs in which preceptors were involved were not solicited.

In order to quantify elements of the ACCP guidelines (Table 1), survey questions were constructed using the ACCP guidelines as the foundation. Then, the ISPOR PE/OR fellowship standards¹⁰ were integrated into these questions to explicitly define the elements of the structure and process of fellowship programs. For example, in order to define preceptors' expertise in PE/OR, the specification from the ISPOR standards, which suggests that preceptors have at least five years of experience in PE/OR, was used (Table 1). In addition, we categorized the ACCP guidelines for pharmacoeconomic research skills into four major stages using the traditional framework of the scientific research process¹¹: conceptualization, operationalization, data management, and application (Table 1).

Data Collection and Analysis

The survey was pilot-tested with a convenience sample of preceptors. Then, the ISPOR staff format-

ted the questionnaire 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 preceptor and all registered members of ISPOR. Participation was voluntary and confidential. A follow-up e-mail was sent within 2 weeks to non-respondents. The survey was closed after 1 month of survey implementation. All data were collected on the ISPOR web site.

Descriptive statistics were computed for all variables using SAS statistical package software (SAS Institute, version 8.2, Cary, NC, USA). Demographic characteristics of all preceptors were calculated including variables such as age, gender, and level of education. To measure the adherence of programs to the ACCP guidelines, we computed the responses of preceptors with regard to the elements that should constitute the structure and process of a fellowship as described in the guidelines (Table 1). In particular, for each of the 4 categories of pharmacoeconomic research skills (ie, conceptualization, operationalization, data management, and application), the responses of preceptors were classified as compliant if their program had at least 50% of the components included in that specific research skill (Table 1). This was a conservative estimate of compliance.

Table 2. Demographic Characteristics of Preceptors (N=38)

Mean age in years* [age range 29-62]	42.3 (\pm 9.2)
Gender: Male (%)	76
Preceptors started their training experience after 1999 (%)	34
Level of education (%)	
Multiple degrees [†]	45
PhD	32
PharmD	13
Master	10

*Age was available for 37 of the 38 preceptors who responded.

[†]The variable multiple degrees refers to a combination of 2 or more of the following degrees: PharmD, PhD, Master's, MD.

RESULTS

Participants

Of the 77 identified preceptors and the unknown number of participants recruited from the ISPOR's web site and membership roll, 49 individuals completed the survey and 38 met the inclusion criteria. Of the 11 respondents who did not meet the inclusion criteria, 10 were excluded because they had not been preceptors within 3 months prior to the initiation of the survey, and 1 respondent was not a preceptor within the United States. Of the 38 preceptors included in the study, 45% were involved in a program established prior to 1995, 37% in a program started between 1996 and 1999, and 18% in a program started in 2000 or afterward.

Overall, 76% of preceptors were male, and the mean age of preceptors was 42.3 years (range, 29 to 62 years) (Table 2). Thirty-four percent of the respondents have been preceptors of a PE/OR research fellowship since 2000. All preceptors had an advanced degree, and 45% had multiple degrees (eg, a PharmD and an MPH).

General Characteristics of Fellowship Programs

Sixty-eight and 16% of preceptors reported that PE/OR fellowship programs were sponsored by pharmaceutical industry and academic institutions, respectively (Table 3). Fifty percent of the preceptors indicated that programs had 1 fellowship position per year. The majority (76%) of respondents stated that fellowships included at least 2 practice sites, pre-

dominantly an academic institution and pharmaceutical industry.

Few preceptors indicated that their programs granted fellows an advanced degree (ie, Masters or PhD) as part of the fellowship program. Finally, the majority (89%) of preceptors stated that the fellowship programs appear not to be accredited by any institution or organization, such as the ACCP.

Structure of Fellowship Programs

Regarding the components that identify the structure of current PE/OR fellowship programs, preceptors reported that programs provided fellows with appropriate resources and facilities to conduct scientific research, such as a medical library (97%), a computer center (87%), and a clinical research center (66%) (Table 4).

In terms of staff credentials and qualifications, 89% of preceptors reported having strong expertise in PE/OR, and 79% had an established and ongoing record of research in the field. Eighty-nine percent of the respondents indicated that they were the principal or primary project manager on at least 1 research grant, and 84% were actively involved in collaborative research programs with other scientists. In addition, 53% had a leadership role in a professional organization. Less than half of preceptors had completed a fellowship experience.

Process of Fellowship Programs

Overall, 84% of preceptors indicated that their program was at least 2 years in length (Table 5). Through

Table 3. Percent of Preceptors Reporting Characteristics of Fellowship Programs (N=38)

Characteristics	Percent
Type of sponsor	
Pharmaceutical Industry	68
Academic Institution	16
Hospital and other Health Care Organizations	8
Managed Care Organizations	3
Other	5
Number of fellowship positions per year supported by the sponsor	
One	50
Two	37
Three or more	13
Practice site	
One site	24
Hospital and other Health Care Organizations	33
Pharmaceutical Industry	23
Managed Care Organization	11
Academic Institution	3
Two or more sites *	76
Academic Institution	97
Pharmaceutical Industry	83
Hospital and other Health care Organizations	41
Managed Care Organization	41
Contract Research Organization	7
Pharmacy Benefit Management	7
Government Research Organization	3
Degree granted during a fellowship	
None	71
Master	24
PhD	5

*Multiple-response question

the program, relevant didactic coursework was available to fellows, such as statistics (94%), research methods (94%), outcomes research (89%), and quality of life assessment (86%). However, 8% of respondents stated that their programs did not offer fellows any didactic coursework.

All preceptors reported that programs exposed fellows to PE/OR design and analysis (Table 5). In addition, 81% and 72% of respondents indicated that fellows gained experience in clinical research design and gained a familiarity with clinical research analysis

during the programs, respectively. Finally, the majority of preceptors specified that fellows were involved as a principal project manager on at least 1 major research project.

Concerning skills taught during a fellowship, preceptors indicated that programs helped fellows enhance their expertise in many disciplines, such as research design and methods (97%), economic analysis and methodologies (97%), and data management (81%) (Table 5). In addition, preceptors stated that fellows were ex-

Table 4. Percent of Preceptors Reporting Components of the Structure of Fellowship Programs (N=38)

Structure Features	Percent
Types of facilities available*	
Availability of applied computer software (eg, SAS, STATA)	100
Medical library	97
Access to medical database	92
Computer center	87
Center for analysis of data from clinical studies	82
Clinical research center at which pharmacotherapeutic studies are conducted	66
Preceptors' qualifications*	
5 years or more of experience in PE/OR	89
Principal or primary project manager on at least 1 research grant	89
Active collaborative research relationships with other health services researchers that resulted in at least 5 finalized projects	84
Published at least 5 research papers in peer-reviewed journals where the preceptor was the primary or senior author	79
Leadership role in professional organizations	53
At least 1 fellowship training experience complete	45

*Multiple-response question

pected to make an oral presentation (97%) and prepare an abstract/manuscript (100%). Based on preceptors' responses, programs provided fellows with research skills, including the conceptualization (95%), operationalization (87%), data management (92%), and application (92%) of research projects. However, only 32% of preceptors specified that their programs devoted 80% or more of the fellows' time toward applied PE/OR activities.

DISCUSSION

This investigation is the first to determine the adherence of PE/OR fellowship programs to the ACCP guidelines. In addition, this study provides insight into the current structure and process of these programs.

The results of this research demonstrate that, according to preceptors, current PE/OR fellowship programs appear to be adhering to the ACCP guidelines. In particular, according to preceptors' responses, programs show significant compliance with the main aspects of the guidelines that define both the structure and process of fellowships.

In regard to the structural elements, preceptors report that PE/OR fellowship programs appear to provide fellows with the appropriate resources and settings to conduct scientific research. In accordance with the guidelines, several types of facilities are

available for fellows at the fellowship sites. More importantly, highly qualified preceptors appear to be training the fellows. Preceptors reportedly have expertise in PE/OR with publications, a track record of funded research, as well as ongoing collaborations with other health services researchers. However, less than half of the preceptors reported having fellowship training experience themselves.

In addition, preceptors indicate that the programs appear to be adhering to the guidelines for the processes of fellowship programs. With a program 2 years in length offering didactic coursework as well as exposure to research design and analysis, fellows have the opportunity to serve as a principal project manager for at least 1 research project. Also, in accordance with the guidelines, fellows may acquire appropriate research skills to conduct PE/OR studies through fellowship activities.

However, this study did reveal one point of discrepancy between the guidelines and the current fellowship programs. Few preceptors indicated that their programs were currently meeting the ACCP recommended minimum for the amount of time (80%)¹ the fellow should dedicate to applied PE/OR activities (Table 5). In addition, 23% of the preceptors reported that their fellows devoted less than 40% of their time to hands-on research activities (data not shown).

Table 5. Percent of Preceptors Reporting Components of the Process of Fellowship Programs (N=38)

Process Features	Percent
Duration of 2 years or more	84
Didactic coursework available *†	
Statistics	94
Research methods	94
Epidemiology	91
Pharmacoeconomic research	91
Economics and/or health economics	89
Outcomes research	89
Quality of life assessment	86
Health care systems	80
Research ethics	63
Types of research projects **	
PE/OR design	100
PE/OR analysis	100
Clinical research design	81
Clinical research analysis	72
Fellow as a principal project manager	87
Skills taught *§	
Abstract and manuscript preparation	100
Research design and methods	97
Oral presentation skills	97
Economic analyses and methodologies	97
Data sources	92
Health-related quality of life	86
Computer software applications	86
Manuscript evaluation/review	86
Data management	81
Teamwork skills	76
Research skills *	
Conceptualization	92
Operationalization	87
Data management	92
Application	92
80% or more of time devoted to applied PE/OR activities	32

*Multiple-response question

†Responses about didactic coursework were available for 35 preceptors

‡Responses about research projects were available for 36 preceptors

§Responses about skills taught were available for 37 preceptors

|| Programs were classified as compliant for each research skill if they reported at least 50% of the components (described in Table 1) included in that specific research skill

This may indicate that fellowship programs are providing fellows with in-depth experience on a limited number of projects, but they are not providing a breadth of research experience on multiple projects. Another explanation may be that PE/OR fellowship programs are offering more didactic-like research activities as opposed to hands-on research skills. A third interpretation may be that for this aspect of PE/OR fellowship programs, the ACCP guidelines may not

be realistic. For instance, the guidelines may not have sufficiently considered the time that fellows need to spend taking didactic coursework, and attending national meetings in order to gain knowledge of PE/OR and research skills.

In addition, the guidelines do not take into account the complex relationship between the sponsor (eg, a pharmaceutical industry) and the primary educational

site (eg, an academic institution). Although the sponsor and the primary educational institution jointly define the goals of a fellowship program, each may have a different perspective and method of attaining these objectives. For instance, 80% of the fellow's time may be dedicated to hands-on research experience in an academic setting; however, the same may not be true in the pharmaceutical industry where a fellow may be more concentrated on managerial aspects of projects.

This discrepancy between the recommendations of the ACCP guidelines and the fellows' actual practice activities suggests that the guidelines may need to be revised and undergo further evaluation to ensure they address the different perspectives of the various stakeholders involved in a PE/OR fellowship program.

An additional finding of the study is that, regardless of the year of inception, preceptors reported that fellowship programs appeared to be very similar in their organizational characteristics and educational content. First, this may suggest that since the initiation of PE/OR fellowships, the structure and process associated with these programs may not have changed. Therefore, the ACCP guidelines may not have introduced any new significant aspect(s) to these programs. However, another explanation may be that, since their introduction, PE/OR fellowships have been using the ACCP guidelines as a guide to develop the curriculum for their programs. In this case, the ACCP guidelines have significantly contributed to the improvement and the harmonization of fellowship programs. To verify these opposing hypotheses, further research is needed to determine whether institution(s), organization(s), and preceptors involved in a fellowship program are aware of the existence of these guidelines, and to what extent programs have adopted and developed internal standards for fellowship training based on the ACCP guidelines.

Finally, preceptors' opinions indicate that PE/OR programs apparently are adhering to the components described in the ACCP guidelines that define the structures and processes for a fellowship. However, the desired outcomes of these programs are not defined in the ACCP guidelines. Further research is needed to define and develop desired outcomes for PE/OR fellowship programs in order to determine their effectiveness.

There are limitations to our study. One major limitation is that the survey participants may not be representative of the true PE/OR fellowship program preceptors' population. Preceptors may not have been defined properly, so the possibility of misclassifica-

tion bias exists. The ACCP and ISPOR directories, which were our primary sources of information, list the name of the contact person(s) for each fellowship. The tasks associated with being the contact person of a fellowship may not be consistent with the definition of a fellowship preceptor used for our study. For instance, the contact person may be the director of the fellowship program, but may not directly guide fellows' activities.

Second, the lack of a comprehensive central location in which to obtain information concerning PE/OR fellowship programs reduced our ability to accurately identify preceptors. However, we used various methodologies to try to identify all possible PE/OR fellowship program preceptors.

Another limitation is that we gathered information about PE/OR fellowship programs by soliciting opinions probably from multiple preceptors of one program. This may have led to the underestimation or overestimation of the characteristics of PE/OR fellowship programs in the United States. We acknowledge that this may limit the generalizability of our study findings. However, we would emphasize that numerous entities (eg, pharmaceutical industry, academia, or managed care organizations) are usually involved in PE/OR fellowships as confirmed from our study results. Therefore, several individuals with different skills and expertise contributed to the curriculum of these programs. By surveying preceptors of programs as opposed to surveying a single representative of each specific program, we were able to capture as much information as possible regarding PE/OR fellowship that otherwise would have been unavailable. In addition, by soliciting preceptors' anonymous opinions, we helped to ensure that the information obtained was more accurate and less biased than if the information had been collected by each individual fellowship program.

A further limitation is that, to increase the identification of preceptors, some participants were recruited from occasional visitors to the ISPOR web site, as well as from the ISPOR membership roster. Therefore, we were unable to determine the true population denominator and response rate for this study.

Finally, the use of the World Wide Web to administer the survey may have affected the response rate. Issues such as technical incompatibilities and users' confidence toward a web-based survey are often described as major factors contributing to the decreased response rates obtained when using an Internet-based survey.^{12,13} However, recent research has reported the successful use of the Internet for conducting surveys.^{12,13} Some of the advantages a web-based survey offers include: (1) allowing instant distribution, (2) facilitating access to the

questionnaire, (3) increasing trust from participants, (4) preserving participants' anonymity, (5) facilitating the return of information, (6) enhancing data collection by eliminating coding errors and data entry mistakes, and (7) reducing administrative costs.^{12,13}

CONCLUSION

Through a web-based survey, solicited preceptors' responses showed that current PE/OR fellowship programs reportedly are adhering to the ACCP guidelines published in 1999. In particular, preceptors reported that their programs are compliant with the main components of the guidelines that define both the structures and processes of these fellowships. However, few preceptors indicated that their programs provide trainees with hands-on research activities at the level suggested by the guidelines. Continued refinement and evaluation of the ACCP guidelines are needed, and the desired outcomes for PE/OR fellowships need to be defined in order to evaluate the effectiveness of these programs.

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REFERENCES

1. Lee J, Lawrence BJ, Sullivan SD, et al. Guidelines for pharmaco-economic research fellowship. *Pharmacotherapy*. 1999;19:1105-9.
2. Draugalis JR, Coons SJ. The role of colleges of pharmacy in meeting the pharmaco-economic needs of the pharmaceutical industry: a conference report. *Clin Ther*. 1994;16:523-37.
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 pharmaco-economic 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/fellowships_directory.htm. 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. American Society of Health-System Pharmacists. Definitions of pharmacy residencies and fellowships. *Am J Hosp Pharm*. 1987; 44: 1142-1144.
8. Donabedian A. Evaluating the quality of medical care. *Milbank Mem Fund Q*. 1966;44:166-206.
9. Maio V, Girts TK, Lofland JH, Nash DB. Pharmaco-economic fellowships: the need for outcomes measures. *Pharmacoeconomics*. 2001;19:795-802.
10. International Society for Pharmacoeconomics and Outcomes Research. Standards for fellowship training in pharmacoeconomics and outcomes research. International Society for Pharmacoeconomics and Outcomes Research (ISPOR) position statement. May 1998: 1-6 (Data on file).
11. Babbie ER. *The Basics of Social Research*. 2nd ed. Belmont, CA: Wadsworth/Thomson Learning; 2002:101-7.
12. Schleyer TKL, Forrest JL. Methods for the design and administration of web-based surveys. *J Am Med Inform Assoc*. 2000;7:416-425.
13. Wyatt JC. When to use web-based surveys. *J Am Med Inform Assoc*. 2000;7:426-9