

RESEARCH ARTICLES

Organizational Structure and Educational Components of Pharmacoeconomic Fellowship Programs: A Fellows' Perspective

Vittorio Maio, PharmD,^a Jennifer H. Lofland, PharmD, MPH,^a QuynhChau Doan, MS,^b Sandeep Dutttagupta, PhD,^c Zeba M. Khan, PhD,^d Amy L. Phillips, PharmD,^e Sujit S. Sansgiry, PhD,^f Amishi B. Shah, PharmD,^g Jennifer Sung, PharmD,^h and Krista Yokoyama, PharmDⁱ

^aThomas Jefferson University, Office of Health Policy and Clinical Outcomes, Philadelphia, PA

^bUniversity of Texas, College of Pharmacy, Austin, TX

^cPfizer Inc., Global Outcomes Research Group, New York, NY

^dNovartis Pharma AG, Pharma Affairs, Basel, Switzerland

^eAbbott Laboratories, Center for Pharmaceutical Appraisal and Outcomes Research, Abbott Park, IL

^fUniversity of Houston, College of Pharmacy, Department of Clinical Sciences and Administration, Houston, TX

^gPharmacia Corporation, US Endocrine Care Outcomes Research, Peapack, NJ

^hNovartis Pharmaceuticals Corporation, East Hanover, NJ

ⁱWellPoint Pharmacy Management, West Hills, CA

Objective. The purpose of this study was to describe the organizational structures and educational components of the pharmacoeconomics and outcomes research (PE/OR) fellowship programs in the United States.

Methods. A survey questionnaire was administered to current and past fellows of PE/OR fellowship programs via the International Society for Pharmacoeconomics and Outcomes Research (ISPOR) web site.

Results. Of the 102 fellows who completed the survey, 71 met the inclusion criteria. A common profile emerged regarding the organizational and educational features of PE/OR fellowships. Fellows reported that their PE/OR fellowship programs were 2 years in length, typically sponsored by the pharmaceutical industry, and conducted predominantly in academic and pharmaceutical industry sites. Fellows indicated that their fellowships provided them with a variety of coursework and a diversity of research skills to enhance their knowledge about PE/OR.

Conclusion. The characteristics of PE/OR fellowships revealed from this study may be beneficial for organizations and institutions wishing to develop new or refine existing programs.

Keywords: fellowship, pharmacoeconomics, postgraduate training, outcomes

INTRODUCTION

In an era of cost-conscious health care delivery, there is a rapid expansion and growth of research in economic evaluations of pharmaceutical therapies and services.¹⁻⁵

Corresponding Author: Jennifer H. Lofland, PharmD, MPH. Mailing Address: Research Assistant Professor of Medicine, Department of Medicine, Jefferson College, Project Director, Office of Health Policy and Clinical Outcomes, Department of Medicine, Jefferson Medical College, Thomas Jefferson University, 1015 Walnut Street, Suite 115, Philadelphia, PA 19017. Tel: 215-955-7348. Fax: 215-923-7583. E-mail: jennifer.lofland@jefferson.edu.

As a result, experts and skilled professionals are increasingly required not only to conduct health economic evaluations, but also to interpret and use the data for healthcare decision making.^{6,7} In the United States, a number of educational programs have been developed to fulfill this emerging need for expertise in health economics.⁷ Among the diverse types of training opportunities, postgraduate pharmacoeconomics and outcomes research (PE/OR) fellowships have emerged as the most common type of training program in health economics.⁸

The number of PE/OR programs has grown substantially since the initiation of the first fellowship at Glaxo Wellcome, Inc, in 1989.⁸ A recent survey of 41 United States colleges and schools of pharmacy

showed that as many as 22 institutions established a PE/OR fellowship for the academic year 1998-1999, with the majority associated with a Master's or PhD degree program.⁶ However, PE/OR fellowships are not solely associated with pharmacy schools; pharmaceutical industry, managed care organizations, and hospitals frequently offer such programs as well.⁹ As a result, with the rising number of programs, with many fellowships offered at multiple sites, and with the lack of a central location for detailed information about programs, it is difficult to know the exact number of existing PE/OR fellowships.⁷ Recently, the International Society for Pharmacoeconomics and Outcomes Research (ISPOR), which is an international organization promoting PE/OR whose members are health care researchers and practitioners, and the American College of Clinical Pharmacy (ACCP), a professional organization that provides education and resources to their members who are mostly PharmD, have each developed a directory of PE/OR fellowships. In 2001 the directories reported that the number of available fellowship positions varied from 38 to 41.^{10,11}

Along with a lack of awareness of the actual number of PE/OR fellowships, there is also limited information about how these programs are structured.⁹ The organization and design of these programs, as well as their content, may vary.⁹ Differences among programs have been found relating to the duration of the fellowship, the types and number of institutions involved, the types of skills taught, and the types of research and educational components discussed. In addition, concerns were also raised that the educational infrastructure of these programs might not be adequate to satisfy the demand for qualified professionals.⁷ Therefore, a thorough, systematic description of the main organizational characteristics and educational components of these programs is needed.

As an initiative of the ISPOR Fellowship Task Force, the purpose of this study was to describe the organizational structures and educational components of the existing PE/OR fellowship programs in the United States.

METHODS

This was an observational, cross-sectional, web-based survey. From November 2001 through December 2001, potential study participants completed a questionnaire via the ISPOR web site. The study was deemed "exempt" from the Institutional Review Board (IRB) at Thomas Jefferson University.

Participants

With the objective of capturing information regarding existing PE/OR fellowships, the primary sample population was current fellows of PE/OR fellowship programs. However, current fellows may lack some information with regard to the program's structures, depending upon how long they have been enrolled in a fellowship. Therefore, a sample population of former fellows was included, since they may provide more complete program information. Given these facts, current and past fellows were included in the study if they met the following criteria:

- Current fellows had completed at least 3 months of a PE/OR fellowship program, and had not already finished a PE/OR fellowship program at the time of initiation of the survey.
- Former fellows had completed a PE/OR fellowship program prior to the initiation of the survey, and had finished a PE/OR fellowship program from 1999 onward.
- Subjects from both categories were excluded from the study if they were involved in a PE/OR fellowship program outside the United States, or did not have an E-mail address, or did not respond within 1 month of survey initiation.

Current and past fellows were identified by collecting information from different sources. PE/OR fellowship programs were first used to compile a list of names and E-mail addresses of potential participants. Fellowship programs were identified through the ISPOR and ACCP directories of PE/OR fellowships, as well as through references reported in the literature.^{6,9} In addition, an Internet search using the search engines www.google.com and www.yahoo.com was performed to identify additional PE/OR fellowships. The following list of individual terms and/or combinations of terms was used to conduct this search: fellowship, program, pharmacoeconomic(s), outcomes, outcomes research, economics, health economics, pharmaceutical economics, drug development, and pharmacoepidemiology. Web sites of institutions and organizations that reportedly conduct PE/OR fellowships were visited to confirm their participation in these programs. All web sites of institutions were then sought for names of current and former fellows. Finally, names of fellows were added to the compiled list based on personal contacts of the ISPOR Fellowship Task Force, of which the authors of this manuscript are members.

A total of 102 individuals, including 28 current fellows and 74 former fellows, were identified. These names were then matched with the ISPOR membership roster to identify any missing information (eg, E-mail address). In addition to the compiled list, participants were recruited through the ISPOR's web site, as well as through the ISPOR's membership roster.

Questionnaire

The ISPOR Task Force developed 2 questionnaires; 1 with 36 items for fellows currently enrolled in a PE/OR fellowship program, and 1 with 41 items for former fellows. The surveys were similar except for 5 additional questions regarding occupational setting, which were included in the questionnaire for former fellows. To ensure the anonymity of study participants and PE/OR fellowships, questions that could readily identify a participant or a program (eg, names of fellows and programs, geographic location) were not asked in the questionnaires.

The surveys contained a number of questions regarding the general characteristics of PE/OR fellowships, such as the duration of programs, as well as the type of sponsor that sustained the costs of the program. In addition, some items asked for information about the characteristics of the organizational components of fellowships, such as the number and types of practice settings involved, as well as the credentials of fellows and preceptors. Preceptors were defined as professionals who are actively involved, guide, and participate in the training and research activities of fellows at the practice settings.¹² To capture detailed information, each survey respondent could identify up to 4 of their preceptors at the practice site(s) during a fellowship, and then define credentials for each identified preceptor. Finally, several survey items were designed to capture the characteristics of the skills taught, as well as the research and educational components of these programs. In order to quantify the organizational and educational elements of fellowships, survey questions were constructed based on the criteria recommended in the ACCP and ISPOR guidelines for PE/OR fellowship programs.^{8,12} These criteria have been described elsewhere.⁹

Data Collection and Analysis

The survey was pilot tested with a convenience sample of current and former fellows, and then the ISPOR staff formatted the questionnaires for the online administration via the ISPOR web site.

An E-mail letter, which included a description of the study, along with an ISPOR web site link for ac-

cessing the survey, was sent to each potential participant identified and all registered members of ISPOR. Simultaneously, to increase the number of potential respondents, an advertisement that included a description of the study and a link to log on to the questionnaires was directed toward occasional web page visitors was posted on the ISPOR's web site. Participation in this study was voluntary and confidential. A follow-up e-mail letter 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. Demographic characteristics of all fellows were calculated, including age, gender, and level of education. To define organizational and educational components of PE/OR fellowship programs, we aggregated the responses of current and former fellows. In particular, for each of the 4 pharmaco-economic research skills described in Appendix 1, participants' responses were classified as compliant with the ACCP and ISPOR guidelines if their program had at least 50% of the components included in that specific research skill. This served as a conservative estimate of compliance. Descriptive analyses were performed using the SAS statistical package software (SAS Institute, version 8.2, Cary, NC, USA).

RESULTS

Participants

One hundred two fellows completed the survey for a response rate of 100%. Of these, 71 participants (70%), 33 current fellows and 38 former fellows, met the inclusion criteria. Of those fellows who did not meet the inclusion criteria, 1 current fellow was excluded because he/she had not completed at least 3 months of a PE/OR fellowship program from the study inception; 1 past fellow did not complete the fellowship program; 1 past fellow completed a program outside the United States; and 28 past fellows completed the fellowship program before 1999.

Overall, the mean age of fellows was 29.8 ± 5.0 years, and 39% of them were male (Table 1). Ninety-seven percent of fellows had an advanced degree; the majority of which were PharmD degrees, and 38% had a combination of at least 2 of the following degrees: PharmD, PhD, Masters, and MD. On average, current fellows were enrolled for 12.7 ± 8.6 months in a program, with 27% involved in a fellowship for at least 18 months or more. Approximately 40% of former fellows had completed their program in 2001.

Table 1. Demographic Characteristics of Fellows (N=71)

Characteristic	
Mean age-years (SD) [Range]*	29.8 (5.0) [24-46]
Gender: Male (%)	39
Level of Education (%)*	
PharmD	47
PhD	9
Masters degree	3
MD	0
Multiple degrees [†]	38
Other	3

*Available for 70 fellows

[†]A combination of at least 2 of the following degrees: PharmD, PhD, Masters, MD

Table 2. Fellows Reporting General Characteristics of Fellowship Programs (N=71)

Characteristics	n (%)
Duration of programs	
One year	3 (4)
Two years	62 (87)
Three or more years	6 (9)
Type of sponsor*	
Pharmaceutical Industry	58 (83)
Academic Institution	7 (10)
Other	5 (7)
Average salary	
Less than \$30,000	12 (17)
≥\$30,000 - <\$40,000	57 (80)
\$40,000 or more	2 (3)
Degree granted during a fellowship	
None	40 (56)
Master	24 (34)
PhD	7 (10)

*Available for 70 fellow

General Characteristics of Fellowship Programs

Many similarities among PE/OR fellowships were found based on the fellows' responses (Table 2). Eighty-seven percent of fellows reported that their program was 2 years in length, 83% that the fellowship was sponsored by the pharmaceutical industry, and 48% that the program offered 2 fellowship positions per year.

Eighty percent of fellows had an average salary between \$30,000 and \$40,000. In addition, fellows reported that programs provided them with numerous fringe benefits, such as health insurance (85%), tuition reimbursement (86%), and relocation allowance (65%).

Forty-four percent of fellows stated that their program granted them an advanced degree (ie, Masters or PhD) as part of the fellowship program.

Organizational Components of Fellowship Programs

A common profile regarding the organizational components that characterize PE/OR fellowship programs emerged from the fellows' responses. Eighteen percent of respondents indicated that their program involved only 1 site, such as a hospital or an academic institution (Table 3). The majority of fellows (82%) reported that their program included at least 2 practice sites, predominantly an academic institution and a

Table 3. Fellows Reporting Organizational Components of Fellowship Programs (N=71)

Organizational Features	n (%)
Practice site	
One site	13 (18)
Academic Institution	7 (54)
Hospital and other Health Care Organizations	4 (31)
Pharmaceutical Industry	2 (15)
Two or more sites*	58 (82)
Academic Institution	53 (91)
Pharmaceutical Industry	50 (86)
Hospital and other Health Care Organizations	17 (29)
Managed Care Organizations	10 (17)
Pharmacy Benefit Management	4 (7)
Contract Research Organizations	3 (5)
Consulting Firm	3 (5)
Types of facilities available*	
Medical library	71 (100)
Availability of applied computer software (e.g. SAS, STATA, etc.)	66 (93)
Computer center	60 (85)
Access to medical database	56 (79)
Clinical research centers at which pharmacotherapeutic studies are conducted	36 (51)
Center for analysis of data from clinical studies	36 (51)

*Multiple-response question

pharmaceutical industry. Overall, fellows stated that programs provided them with appropriate resources and facilities, such as a medical library (100%), a computer center (85%), and clinical research center (51%), for conducting scientific research.

In terms of credentials, 94% of fellows had an advanced degree before applying for a fellowship program, the majority of which were PharmD degrees. Fellows were motivated to seek a PE/OR fellowship in order to develop research skills (86%), to gain hands-on experience (65%), and to obtain a position within the pharmaceutical industry (55%).

All 134 preceptors at the fellowship practice site(s) who were identified by fellows had an advanced degree, a PharmD or a PhD. Fellows reported that 72% of their preceptors had 5 years or more of experience in PE/OR, 43% published at least 5 research papers in peer-reviewed journals where the preceptor was the primary or senior author, 40% were principal or primary project manager on at least one research grant, and 30% had completed a fellowship experience.

Educational Components of Fellowship Programs

Overall, fellows reported that programs provided them with a variety of coursework and skills (Table 4). Through fellowship programs, didactic coursework, such as statistics (93%), epidemiology (84%), outcomes research (71%), and pharmacoeconomic research (74%), was available to fellows. An array of skills was apparently taught throughout the fellowships. Fellows indicated that the programs helped to develop competencies in many disciplines, such as research design and methods (87%), economic analysis and methodologies (94%), and data management (77%). Fellows had the opportunity to improve their abilities in oral presentation (80%), as well as abstract and manuscript preparation (89%). In addition, fellows reported that software applications were taught during their program, such as Excel (82%) and Access (62%) (Microsoft Corporation, Seattle, Wash), and particular statistical software, such as SAS (85%) (SAS Institute, Cary, NC).

Eighty-three percent of fellows indicated that they were involved as principal project managers on one or more major research projects during their fellowships, and 93% were exposed to PE/OR design and analysis.

Table 4. Fellows Reporting Educational Components of Fellowship Programs (N=71)

Educational Features	n (%)
Skills taught*†	
Economic analyses and methodologies	66 (94)
Computer software applications	66 (94)
Abstract and manuscript preparation	62 (89)
Research design and methods	61 (87)
Health-related quality of life	60 (86)
Teamwork skills	59 (84)
Manuscript evaluation/review	57 (81)
Oral presentation skills	56 (80)
Data management	54 (77)
Data sources	52 (74)
Software application taught*	
SAS	60 (85)
Microsoft Excel	58 (82)
Microsoft Access	44 (62)
DATA	41 (58)
SPSS	23 (32)
STATA	15 (21)
Fellow as a principal project manager	59 (83)
Types of research projects*†	
Pharmacoeconomic/outcomes research design	65 (93)
Pharmacoeconomic/outcomes research analysis	65 (93)
Clinical research design	34 (49)
Clinical research analysis	32 (46)
Research skills*‡	
Conceptualization	61 (86)
Operationalization	38 (54)
Data management	41 (58)
Application	50 (70)
Time devoted to applied pharmacoeconomic and outcomes research activities	
40% or less	18 (25)
41% - 79%	37 (52)
80% or more	16 (23)

*Multiple-response question

†Available for 70 fellows

‡Fellows' responses were classified as compliant for each research skill if they reported at least 50% of the components (described in Appendix 1) included in that specific research skill

In addition, fellows stated that programs provided them with research skills, including the conceptualization (86%), operationalization (54%), data management (58%), and application (70%) of research projects. Furthermore, in accordance with the ACCP PE/OR fellowship guidelines,⁸ 23% of fellows reported that programs dedicated 80% or more of the fellows' time toward applied PE/OR activities.

DISCUSSION

This study increases our knowledge about the current state of PE/OR fellowship programs in the United States. The results of this investigation demonstrate that, according to fellows, there are many similarities in terms of the general characteristics and the organizational and educational aspects of PE/OR fellowships such that a common profile for these programs can be described.

In general, the majority of fellows reported that the PE/OR fellowship programs were 2 years in length, sponsored by the pharmaceutical industry, and conducted predominantly in academic and pharmaceutical industry sites. Fellows' responses suggest that programs provided applicants with adequate resources to conduct scientific research, which was the primary motivation that fellows reported for applying to a fellowship. In addition, a large proportion of fellows indicated that programs offered them didactic coursework as well as exposure to different types of research design and analysis to enhance their knowledge about PE/OR.

However, a concern emerged regarding preceptors' qualifications. Fellows reported that most of their preceptors had experience in PE/OR; however, they indicated that few of their preceptor(s) had a substantial record of research in the field. Fellows may not have been completely aware of preceptors' credentials. However, these findings may raise questions about whether preceptors are qualified and able to effectively train fellows in PE/OR, an issue that has been raised by others within the field.⁷

Fellows' responses indicated that programs focused their training curriculum on PE/OR research. As advocated by experts in the field,⁷ experiential education, including contact with a real-life setting and exposure to "real-world" applications, should be preeminent in a PE/OR fellowship program, with the objective to enhance the fellows' background in the field. The ACCP guidelines for PE/OR fellowships recommend that a program should devote 80% or more of the fellows' time toward applied PE/OR activities.⁸ However, fellows reported that programs offered more classroom learning than experiential research opportunities. For instance, 25% of respondents said that programs dedicated 40% or less of their time to hands-on, applied research activities. This suggests that more PE/OR experiential training activities need to be incorporated within the curriculum of these fellowship programs.

In addition to gaining experience in the field of PE/OR, fellows indicate that programs provide them with additional benefits. The majority of fellows experienced working in the pharmaceutical industry, which is the main sponsor and one of the principal sites for these programs. This suggests that a fellows' goal to complete a fellowship in order to obtain a position in the pharmaceutical industry might be easily reached by completing a PE/OR fellowship.

Limitations

There are limitations to this study. First, all data were self-reported and thus subject to recall bias. In addition, because this study was designed to capture information on PE/OR programs from former fellows, it is possible that their programs could have changed or been terminated thereby biasing our results. However, we surveyed only fellows who had completed a fellowship from 1999 onward, with the assumption that programs active 3 years prior to the study were still in existence. In addition, 71% of the former fellows finished programs within 2 years of the study initiation, increasing our confidence that we obtained information regarding current PE/OR programs.

Second, the survey participants may not be representative of the total population of PE/OR fellows; thus, study findings may not be generalized to all PE/OR fellowship programs. The lack of a comprehensive central location in which to retrieve information concerning PE/OR programs reduced our ability to accurately identify both current and former fellows. Although we used several methodologies to identify as many fellows of PE/OR fellowship programs as possible, it is unlikely that *all* current and past fellows were recruited for this study. In addition, in order to increase the identification of both current and past fellows, we recruited participants from occasional visitors of the ISPOR web site, as well as from the ISPOR membership list. Therefore, we are unable to determine the total population denominator for this study, so we cannot be certain of the true response rate.

In addition, we probably captured information about PE/OR fellowships from more than one fellow from some programs, so study results may under- or overestimate components and characteristics of PE/OR fellowship programs. A more effective means for data collection would have employed gathering information directly from each individual program. However, at the time the study was conducted, an accurate number of PE/OR fellowships was not available so we could not apply this study methodology.

Finally, the use of a web-based survey to administer the questionnaire may have affected the response rate. Issues such as users' confidence towards a web-based survey, as well as technical incompatibilities and program defects may have occurred, as reported by the literature.¹⁴ However, surveys administered using the Internet can potentially reduce costs and survey administration overhead, preserve participants' anonymity, and collect survey data quickly and efficiently, compared with traditional mail surveys.¹⁴

Through a web-based survey administered to fellows, the results of this study describe in detail the organizational and educational components of current PE/OR fellowship programs. Solicited fellows' responses showed that, with substantial organizational and educational resources, programs appear to provide trainees with an adequate environment to develop competencies in PE/OR field. Such acquired competencies, however, emerged to be more theoretical than practical. In fact, fellows indicated that programs offer them a variety of coursework but limited experiential research activities. These results reinforce findings from our previous survey research looking at the adherence of PE/OR fellowships to the ACCP guidelines for these programs from a preceptors' perspective.¹⁵ In this study, preceptors reported that in accordance with the ACCP standards, programs appear to provide fellows with the appropriate resources and settings to conduct scientific research, but few indicated that their programs offer trainees hand-on research activities at the level suggested by those guidelines. Therefore, the results of both studies raise important questions.

Are PE/OR fellowships effective training programs? Do these programs provide fellows with the skills necessary for today's work environment? Further research is needed to assess the effectiveness of PE/OR fellowship programs from the perspectives of all stakeholders involved in these programs.⁹

CONCLUSIONS

This study describes the organizational structures and educational components of current PE/OR fellowship programs in the United States. Through a web-based survey, fellows stated that PE/OR fellowships offer a diversity of educational and experiential opportunities within the field of PE/OR. This study provides insight to institutions and organizations wishing to develop new, or refine existing, fellowship programs.

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The ISPOR Fellowship Task Force, whose chairperson is Dr. Jennifer H. Lofland, was formed in Spring 2000 as a part of the ISPOR Education Steering Committee. The main objective of the Fellowship Task Force is to investigate the existing pharmacoeconomics and outcomes research fellowships in order to define the fundamentals of a core curriculum for these programs. The Fellowship Task Force is committed to the

dissemination of knowledge of fellowships in pharmacoeconomics and outcomes research among students of various scientific and professional backgrounds.

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Appendix 1. 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 pharmacoeconomic and outcomes research (PE/OR) study to the institutional review board (IRB) or human subjects committee
 - Development of a protocol, case report and/or other required study documents
 - Data management
 - Development of 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 peer-reviewed biomedical journals
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*Adapted from the following sources: *The American College of Clinical Pharmacy (ACCP) Guidelines*,⁸ *The International Society for Pharmacoeconomics and Outcomes Research*¹² (*ISPOR*) *Standards*, and *The Basics of Social Research*; Chapter 4; Babbie ER¹³