

## RESEARCH

# Impact of Advanced Pharmacy Practice Experiences on Residency Interview Invitations

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**Objective.** To determine how postgraduate year one (PGY1) pharmacy residency program directors perceive factors related to advanced pharmacy practice experiences (APPEs) when selecting candidates for residency interviews.

**Methods.** An online cross-sectional nationwide survey of 1,280 PGY1 residency program directors was conducted. Participants were asked to rank the overall influence of five APPE categories, including location, structure, elective type, timing, and preceptor references, as well as the desirability and necessity of APPE-related variables representing the five categories, in their assessment of residency candidates.

**Results.** Program demographics and survey data were collected from 375 participants (29% response rate). The category most influential to program directors' decisions was APPE preceptor reference letters, while the category that was the least influential was APPE timing factors. An APPE's location, structure, and elective type ranked second, third, and fourth, respectively, as the most influential categories. Respondents perceived factors similar to their own residency environment as desirable, supporting the study's conceptual framework of person-environment fit. The variables that the majority of residency directors specifically desired were two reference letters from APPE preceptors and letter grades for each APPE completed. Completion of inpatient elective APPEs was considered more desirable than completion of a balanced mix of elective APPEs. Participants rarely indicated that a specific APPE variable was a necessity for a candidate to be considered.

**Conclusion.** Applicants to pharmacy residency programs should consider the importance of person-environment fit when selecting APPEs and preparing applications as program directors desire candidates who possess attributes compatible with their organization and complete APPEs in settings similar to that of their organization. Conversely, the absence of desired APPE-related variables does not necessarily exclude an applicant from consideration.

**Keywords:** advanced pharmacy practice experiences, postgraduate year one pharmacy residency, residency interviews, person-environment fit, letters of recommendation

## INTRODUCTION

The gap between the number of doctor of pharmacy (PharmD) students who desire to complete a postgraduate year one (PGY1) residency and the lack of sufficient residency positions nationwide presents a challenge to graduates of schools and colleges of pharmacy. Between 2013 and 2018, the number of unmatched applicants participating in the American Society of Health-System Pharmacists (ASHP) Resident Matching Program increased by 34%, from 1,438 to 1,925.<sup>1</sup> This gap is unlikely to decline in the near future because of several factors, including

professional initiatives that have suggested that all pharmacists entering patient care roles to have first completed a PGY1 residency, the tightening pharmacist employment market, and the increase in PharmD graduates.<sup>2-6</sup>

Because of this competitive environment, residency applicants are likely interested in learning what factors may be influential in the PGY1 resident selection process. Previous studies suggest positive contributors include reference letters,<sup>7-14</sup> pharmacy grade point average (GPA),<sup>7-8,11,14-17</sup> work experience,<sup>7-9,11,13-15</sup> advanced pharmacy practice experiences (APPEs),<sup>7-8,10,15-16,18</sup> professional leadership,<sup>8,10,11,14-16</sup> letters of intent,<sup>7,9,13,14</sup> and program fit.<sup>8,12,15</sup> Although APPEs were highly ranked in these studies, how APPEs influenced residency placement was unclear because of study limitations such as the types of APPEs studied, inconsistent and ambiguous definitions of APPEs, or limited

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study scope.<sup>7-16,18</sup> Advanced pharmacy practice experiences also indirectly influence other important applicant information such as reference letters<sup>7-15</sup> and letters of intent.<sup>7,9,13,14</sup>

Because of the potential direct or indirect influence of APPEs on the resident selection process, a greater understanding of which APPE-related factors are preferred by residency directors would help guide pharmacy students when selecting APPEs. This information would also assist experiential education directors at pharmacy schools when creating program policies and procedures. The conceptual framework of person-environment fit has the potential to describe the resident selection process. Person-environment fit suggests that, when pursuing candidates for positions, recruiters prefer candidates who possess attributes that are similar to the organization.<sup>19</sup> There are many subtypes of this framework. Person-organization fit is one subtype that suggests recruiters seek similarity by focusing on applicant values and personality traits in comparison to the organization. Person-job fit is another subtype that suggests recruiters seek to match job tasks to the knowledge, skills, and abilities of the applicant.<sup>19-23</sup> Person-organization fit serves as a potential model for desirability in this study while person-job fit serves as a potential model for necessity.

The purpose of this study was to better understand how various APPE-related factors are perceived by PGY1 residency program directors when selecting residency candidates for interviews. The study objectives were to determine the overall influence on residency program directors of five categories of APPE-related factors, including APPE location, structure, elective types, timing, and preceptor references, as well as the desirability and necessity of APPE-related factors.

## **METHODS**

The survey instrument was created based on findings from the existing literature related to APPEs and residency selection. The survey instrument then underwent expert review by two former PGY1 residency program directors and one current postgraduate year two (PGY2) residency program director.<sup>7-17</sup> Their feedback resulted in survey modifications and clarifications. The survey instrument was designed to collect the program demographics of the participants' residency program. The variables for program demographics were derived from the literature as well as the ASHP residency program information form.<sup>7-17,24</sup> Participants were asked to respond using a five-point Likert scale to rate the perceived desirability and necessity of multiple variables in five categories of APPE-related factors. The Likert scale responses for desirability ranged from 1=highly undesirable to 5=highly desirable. The Likert scale responses

for necessity ranged from 1=very unnecessary to 5=very necessary. As outlined in Table 1, the five categories and associated APPE-related factors included in the survey were APPE location (15 variables); APPE structure (including longitudinal APPEs defined as multiple APPEs at one site, elective mix, and grading structure) (10 variables); APPE elective types (36 variables); APPE timing relative to the ASHP Midyear Clinical Meeting (six variables); and APPE preceptor references (eight variables). Variables were selected based on previous literature, the ASHP Residency Program Information form, PGY2 residency program names, and input from the expert panel.<sup>7-17,24,25</sup> Desirability was defined as a factor being "attractive," "advisable," or "advantageous."<sup>26,27</sup> Necessity was defined as a factor being "required" or "needed."<sup>28,29</sup> Participants were also asked to rank the influence of the five APPE-related categories as a whole. An opportunity to provide open comments was provided.

The target population was those serving as PGY1 residency program directors for the 2017-2018 academic year as listed in the ASHP residency online database.<sup>25</sup> Exclusions included programs located outside of the 50 states of the United States and the District of Columbia, invalid email addresses for residency program directors, receipt of an automated email reply indicating the residency program director was on extended leave during the data collection period, and receipt of a reply from the listed residency program director indicating the residency program had been terminated. If the same residency program director was listed for multiple programs, the program director was sent one survey. After these adjustments, a total of 1,280 PGY1 residency program directors were viable participants.

The cross-sectional online survey was administered through Qualtrics (Provo, UT). After the study received institutional review board approval, an email was sent on December 18, 2017, to the identified participants to notify them of the upcoming invitation to participate. The email requesting their participation in the study was sent on December 20, 2017. This email provided consent information and a link to the online survey instrument. The original survey distribution plan was to send reminder emails at weekly intervals and close the survey four weeks after initial survey distribution. The first and second reminders were sent as originally planned, on December 27, 2017, and January 3, 2018, respectively. However, several potential participants reported that they had not received any of the three emails containing a link to the survey instrument. Because it appeared that the email messages had been blocked by firewalls at the participants' place of employment, a new distribution method was employed. Individual emails were sent to each

Table 1. Variables Included in a Survey of US Pharmacy Residency Directors to Identify Desirable and Necessary Factors Related to Advanced Pharmacy Practice Experiences When Selecting Candidates for Residency Interviews

Category	Factors
APPE Location	Federal government hospital/health system, University-based hospital/health system, Community/public teaching hospital/health system, Community/public non-teaching hospital/health system, Private teaching hospital/health system, Private non-teaching hospital/health system, Independent community pharmacy, Chain community pharmacy, Managed care organization, Health plan, Pharmacy benefit management organization, Pharmaceutical industry site, International site, APPE location with a residency program, Participant's residency site
APPE Structure	Longitudinal APPEs: Participant's residency site, Any residency site, Non-residency site APPE Elective Mix: Balanced inpatient and outpatient, More inpatient than outpatient, More outpatient than inpatient APPE Grading Structure: Letter grade for each APPE, One letter grade for all APPEs, Pass/Fail grading, Honors or similar designation
APPE Electives	Academia/Teaching, Anticoagulation, Cardiology, Corporate pharmacy management, Critical care, Diabetes/Endocrinology, Drug information, Emergency medicine, Geriatrics, HIV/AIDS, Hospital/Health system pharmacy administration, Infectious disease, Long term care, Managed care, Medication therapy management, Nephrology, Neurology, Nuclear pharmacy, Nutrition, Oncology, Pain management/Palliative care, Pediatrics, Pharmaceutical compounding, Pharmaceutical industry, Pharmacy informatics, Poison control/Toxicology, Psychiatry/Mental health, Public health, Pulmonology, Research, Specialty pharmacy, Substance abuse/Chemical dependence, Surgery/Trauma, Transitions/Continuity of care, Transplant pharmacy, Veterinary pharmacy
APPE Timing	Completion Prior to ASHP Midyear Clinical Meeting: Required community pharmacy APPE, Required hospital/health system pharmacy APPE, Required inpatient general medicine patient care APPE, Required ambulatory patient care APPE, Elective APPEs considered desirable, Elective APPEs considered necessary
APPE Preceptor References	Number of APPE preceptor references: Only one APPE preceptor, Two APPE preceptors, All APPE preceptors APPE Preceptor Reference Sources: College or school of pharmacy faculty preceptor, Residency preceptor, Organization similar to participant's organization, Personally known to participant, Alumni of participant's residency

Abbreviations: APPE=advanced pharmacy practice experiences, HIV/AIDS=human immunodeficiency virus/acquired immune deficiency syndrome, ASHP=American Society of Health-System Pharmacists

participant rather than using a group distribution method. On January 4-5, 2018, the invitation with a link to the survey was redistributed to all participants who had not previously responded. The final email invitation was sent on January 11-12, 2018. The survey was closed on January 22, 2018. Descriptive statistical analyses were conducted on the survey data using SPSS, version 24 (Armonk, NY).

## RESULTS

Of the 1,280 potential participants, 375 completed the survey, resulting in an overall response rate of 29%. Response rates of previously published studies involving national surveys of residency program directors have ranged from 16%-36%.<sup>7-9,11,13</sup> The participating residency program directors used a broad range of factors to describe their residency programs (Table 2). Approximately 85% of respondents reported having four or fewer residency positions, with an average of 2.9 residency positions per

program. This average is identical to the number of residencies per PGY1 program in the ASHP database (S Ford, PharmD, ASHP Accreditation Services Office, email communication, June 17, 2019). Over 90% of respondents reported receiving up to 100 applications annually for their program's residency positions. More than 70% of respondents reported conducting 20 or fewer on-site interviews. Years of ASHP accreditation were evenly distributed throughout the respondents. The most commonly reported organization or institution type was community/public teaching hospital or health system. Respondents reported the location of their residency program by state, which was recoded to allow categorization by United States Census region classifications. The highest number of responses were from the Midwest (n=114) and the South (n=107). The most commonly reported residency type, "PGY1 Pharmacy with any focus other than ambulatory care," accounted for 63% of responses. When available, comparable data from

the ASHP Accreditation Services Office are presented in Table 2.

The descriptive and frequency statistics indicating the rank of influence of each category of APPE-related factors are presented in Table 3. The most influential category was APPE preceptor reference letters. Over 65% of respondents ranked APPE preceptor reference letters as having the highest or second-highest influence in their assessment of a candidate. The APPE location and structure were the second and third most influential factors, respectively. Location of the APPE had a higher mean score, but structure had a higher mode score. A higher percentage (49.2%) of respondents ranked APPE location as having either the highest or second-highest influence on their decisions as compared to APPE structure (45.4%). The second-lowest ranked category of APPE-related factors was APPE elective types, followed by the lowest-ranked category of APPE timing relative to the ASHP Midyear Clinical Meeting.

The APPE-related factors considered either more desirable or less desirable for each of the five categories are presented in Table 4. The APPE locations (described as organization types) ranked by respondents as the most desirable were also the APPE locations most frequently self-reported as the respondents' APPE locations. Conversely, APPE locations ranked as less desirable were infrequently reported as the respondents' APPE location. APPE locations that had residency programs were also considered more desirable. Three types of APPE structures were examined. Completing longitudinal APPEs was more desirable when the APPE was completed at the respondent's organization or at an organization similar to the respondent's organization. Candidates who had completed more inpatient electives than outpatient electives and who completed a balanced mix of inpatient and outpatient electives were reported as either desirable or very desirable by an equal percentage of respondents. However, completing more inpatient electives than outpatient electives received almost twice as many highly desirable responses than the balanced elective mix. Participants' responses regarding APPE grading structure indicated a strong preference for letter grades over pass/fail grading, with residency directors preferring that candidates had received a letter grade for each APPE completed. Approximately four times more respondents found letter grades either desirable or very desirable as compared to pass/fail grades. Desirable APPE elective types based on mode rating included anticoagulation, cardiology, critical care, diabetes/endocrinology, drug information, geriatrics, infectious disease, medication therapy management, pain management/palliative care, research, and transitions/continuity of care. Finally, the

desired number of reference letters from APPE preceptors was two. All preceptor reference sources were considered desirable.

No APPE-related factors were considered necessary to receive an interview invitation. All study variables were neutral in terms of their degree of necessity (mode=3). The variables with the highest mean score for being a necessity were a candidate having two APPE preceptors as reference sources (M=3.4, SD=0.8) and completing the inpatient general medicine patient care APPE before the ASHP Midyear Clinical Meeting (M=3.4, SD=0.9). Although the participant's residency site and a residency location were both considered desirable, these locations did not demonstrate necessity, with mean scores for necessity on these factors of 2.8 (SD=0.7) and 3.0 (SD=0.8), respectively. Regarding APPE grading structure, the mean rating for necessity of a letter grade for each APPE (M=3.1, SD=0.8) was higher than the necessity for pass/fail grading (M=2.7, SD=0.9). Means indicating the necessity for specific APPE electives ranged from 2.6-3.1. Finally, although all preceptor reference sources listed in survey were considered desirable (M=4.0-4.1), none were considered necessary (M=2.8-3.0).

## DISCUSSION

The purpose of this study was to determine how PGY1 residency program directors perceive APPE-related factors when selecting residency candidates for interviews. The pursuit of person-environment fit was evident in these survey results. Specifically, desirability of various APPE-related factors demonstrated pursuit of person-organization fit as these factors provide opportunities for applicants to demonstrate stronger fit than other applicants. Conversely, these APPE-related factors were not required to demonstrate person-job fit since no factors were determined to be necessary.

Survey respondents ranked APPE preceptor reference letters as the most influential category of factors. This result is consistent with previous studies which found that reference letters were the most frequently cited influential factor in the resident selection process.<sup>7-16</sup> However, those studies did not seek to determine how many reference letters should be submitted by APPE preceptors versus by other sources.<sup>11,13,15</sup> The results of our study suggest that it is desirable and perhaps necessary for a pharmacy residency candidate to have at least two reference letters submitted by APPE preceptors. Favorable reference letters from APPE preceptors provide information regarding APPE performance that program directors can use to assess an applicant's ability to perform the skills and duties required during residency.

Table 2. Demographics of US Pharmacy Residency Programs Represented in a Survey of US Pharmacy Residency Directors to Identify the Influence of Factors Related to Advanced Pharmacy Practice Experiences When Selecting Candidates for Residency Interviews

<b>Variables</b>	<b>No. (%)</b>	<b>ASHP Database (%)<sup>b</sup></b>
<b>Residency positions (n=358)</b>		
1 position	74 (20.7)	
2 positions	151 (42.2)	
3 positions	36 (10.1)	
4 positions	42 (11.7)	
5-7 positions	36 (10.1)	
8 or more positions	19 (5.3)	
<b>Annual applications (n=352)</b>		
1-50 applications	248 (70.5)	71.0
51-100 applications	78 (22.2)	19.0
101-150 applications	14 (4.0)	6.3
151-200 applications	7 (2.0)	2.4
201 or more applications	5 (1.5)	1.2
<b>Annual on-site interviews (n=355)</b>		
1-10 interviews	118 (33.2)	
11-20 interviews	145 (40.8)	
21-30 interviews	61 (17.2)	
31 or more interviews	31 (8.8)	
<b>Years of ASHP accreditation (n=356)</b>		
Seeking but not fully accredited	46 (12.9)	
1-3 years	54 (15.2)	
4-6 years	58 (16.3)	
7-10 years	65 (18.3)	
11 or more years	133 (37.4)	
<b>Description of institution or organization (n=357)</b>		
Federal government hospital/health system	41 (11.5)	
University-based hospital/health system	64 (17.9)	
Community/public teaching hospital/health system	100 (28.0)	
Community/public non-teaching hospital/health system	61 (17.1)	
Private teaching or non-teaching hospital/health system	27 (7.6)	
Independent or chain community pharmacy	20 (5.6)	
Managed care organization, health plan or PBM organization	13 (3.7)	
Other	31 (8.7)	
<b>Geographic region<sup>a</sup> (n=353)</b>		
Northeast	55 (15.6)	16.5
Midwest	114 (32.3)	27.0
South	107 (30.3)	35.8
West	77 (21.8)	20.7
<b>Residency type (n=375)</b>		
PGY1 pharmacy	236 (62.9)	72.1
PGY1 pharmacy with an ambulatory care focus	53 (14.1)	4.2
PGY1 community-based Pharmacy	47 (12.5)	14.3
PGY1 managed care pharmacy	12 (3.2)	3.4
PGY1/PGY2 combination residency	27 (7.2)	6.0

<sup>a</sup> Recoded from state to region based on US Census classification

<sup>b</sup> S Ford, PharmD, ASHP Accreditation Services Office, email communications, June 17, 19, and 20, 2019

Abbreviations: ASHP=American Society of Health-System Pharmacists; PBM=Pharmacy Benefit Management; PGY1=postgraduate year one; PGY2=postgraduate year two

Table 3. Rankings Reported in a Survey of US Pharmacy Residency Directors to Identify the Influence of Factors Related to Advanced Pharmacy Practice Experiences When Selecting Candidates for Residency Interviews (N=313)

APPE Variables	Descriptive Statistics		Influence Scale Frequency Statistics				
	Mean (SD)	Mode	1, %	2, %	3, %	4, %	5, %
Preceptor references	3.9 (1.23)	5	6.1	9.9	16.9	19.5	47.6
Location	3.4 (1.25)	3	8.9	15.7	26.2	25.6	23.6
Structure	3.2 (1.28)	4	13.1	18.5	23.0	28.8	16.6
Elective types	2.8 (1.22)	2	14.1	30.7	23.3	21.4	10.5
Timing	1.7 (.96)	1	57.8	25.2	10.5	4.8	1.6

Abbreviations: APPE=advanced pharmacy practice experience

Recorded influence scale: 1=fifth rank, 2=fourth rank, 3=third rank, 4=second rank, 5=highest rank

Providing two APPE preceptor reference letters was the factor that residency directors ranked as having the highest level of necessity in the survey. Residency programs should consider whether submission of two letters from APPE preceptors is advantageous for applicants to their program. If so, the program should instruct applicants that submission of two reference letters from APPE preceptors is either required or preferred. In terms of sources for APPE preceptor references, preceptors with personal connection to the applicant’s desired residency program and preceptors who practice at a residency program similar to the program to which the candidate is applying may be more desirable (M=4.0-4.1) but preceptor reference letters from these sources were not considered necessary (M=2.8-3.0).

The location (described as organization type) of the APPEs that a candidate had completed was the second most highly ranked influence, with nearly 50% of respondents ranking APPE location as the highest or second-highest ranked influence. The most desirable APPE locations were those reported by respondents to describe their own residency locations, suggesting residency directors’ pursuit of person-environment fit. A candidate having completed an APPE at the respondent’s residency site was ranked as the second most desirable location, confirming previous findings.<sup>9,15</sup> The APPE locations reported as less desirable and less necessary rarely matched the respondents’ organization types.

The influence of APPE structure was ranked third, just slightly lower than APPE location. Although the study found some desirability among residency directors for a candidate to have completed a longitudinal APPE, they did not view it as a necessity. Longitudinal APPEs were more desirable when completed at the residency director’s organization or an organization similar to the residency director’s organization, demonstrating further pursuit of person-environment fit. A necessity for candidates to have completed a longitudinal APPE was not found, supporting the findings of Prisco and colleagues.<sup>18</sup> Preferences for the mix of elective APPEs a candidate had

completed was the second APPE structure factor examined in the survey. While the mean scores for desirability were equal, completing more inpatient electives than outpatient electives received almost twice as many responses of “highly desirable” than a balanced mix of electives. In other words, respondents with a preference for more inpatient electives reported stronger desire for this elective mix as compared to respondents with other preferences.

The final APPE structure factor examined was grading structure. This study found that residency directors had a strong preference for letter grades for each APPE over pass/fail grades. This preference has been documented in other studies; however, one study’s findings suggested that pass/fail grading had no impact on residency match rate.<sup>13,18,30</sup> Residency directors’ preference for letter grades may be due to their perceived ability to use grades to differentiate between applicants. However, experiential education program directors at pharmacy schools may prefer that pass/fail grading be used for APPEs. The AACP Experiential Education Section appointed a task force to make recommendations on grading strategies that meet the needs of residency programs as well as schools and colleges of pharmacy.<sup>31</sup>

The role of person-environment fit in the residency placement process was demonstrated by the APPE elective types considered less desirable by respondents. Less desirable elective types were those that occurred in unique practice environments that are not typically found in pharmacy residency programs. The need for candidates to have completed specific APPEs prior to the ASHP Midyear Clinical Meeting was the lowest ranked influence on the resident selection process. This supports previous studies finding APPE timing did not influence pharmacy residency match rates, and although residency program directors placed some importance on APPE timing, this importance was significantly less than students perceived.<sup>18,32</sup> Although APPE timing was considered the least influential of the five categories, desire for completing specific APPEs before ASHP Midyear

Table 4. Perceptions Reported in a Survey of US Pharmacy Residency Directors to Identify the Desirability of Factors Related to Advanced Pharmacy Practice Experiences When Selecting Candidates for Residency Interviews

Variables	Mean (SD)	Mode	Desirability Scale Frequency Statistics <sup>a</sup>				
			1 (%)	2 (%)	3(%)	4 (%)	5 (%)
<b>APPE Locations: More Desirable</b>							
University-based hospital/health system (n=368)	4.0 (.75)	4	0.3	0.0	28.3	46.5	25.0
Participant's residency site (n=369)	3.9 (.77)	4	0.3	0.8	30.9	45.0	23.0
APPE location with a residency program (n=366)	3.8 (.73)	4	0.5	0.0	36.9	45.1	17.5
Community/public teaching hospital/health system (n=368)	3.8 (.68)	4	0.0	0.0	34.5	50.3	15.2
<b>APPE Locations: Less Desirable</b>							
Pharmaceutical industry (n=363)	2.9 (.56)	3	3.0	9.1	80.2	6.9	0.8
International site (n=358)	3.0 (.57)	3	2.5	6.7	79.3	10.1	1.4
<b>APPE Structure: More Desirable</b>							
Balanced inpatient and outpatient electives (n=348)	3.6 (.75)	4	0.3	3.4	40.5	43.7	12.1
More inpatient than outpatient electives (n=348)	3.6 (1.00)	4	2.6	9.5	32.8	33.6	21.6
Letter grade for each APPE (n=347)	3.6 (.79)	3	0.6	2.0	46.1	35.2	16.1
Longitudinal APPEs at participant's residency site (n=352)	3.6 (.76)	3	0.9	2.3	42.3	41.8	12.8
<b>APPE Structure: Less Desirable</b>							
One letter grade for all APPEs (n=346)	2.5 (.79)	3	13.3	24.0	58.1	4.3	0.3
Pass/Fail grading (n=348)	2.7 (.89)	3	11.5	25.6	51.1	9.2	2.6
More outpatient than inpatient electives (n=350)	2.8 (.92)	3	7.7	29.7	44.3	14.9	3.4
<b>APPE Elective Types: More Desirable</b>							
Transitions/Continuity of care (n=339)	3.9 (.65)	4	0.0	0.3	27.7	57.5	14.5
Infectious Disease (n=337)	3.9 (.70)	4	0.0	0.3	27.9	51.3	20.5
Critical Care (n=337)	3.9 (.83)	4	0.6	2.4	31.2	41.5	24.3
<b>APPE Elective Types: Less Desirable</b>							
Veterinary pharmacy (n=335)	2.8 (.63)	3	6.9	14.6	75.2	3.3	0.0
Nuclear pharmacy (n=333)	2.9 (.59)	3	3.9	12.9	78.1	4.2	0.9
Pharmaceutical industry (n=335)	2.9 (.65)	3	4.8	13.1	74.3	6.6	1.2
<b>APPE Timing: More Desirable</b>							
Inpatient General Medicine Patient Care APPE (n=333)	3.9 (.80)	4	0.3	1.2	32.1	41.4	24.0
Elective APPEs considered desirable (n=336)	3.8 (.68)	4	0.0	0.6	31.8	52.1	15.5
<b>APPE Preceptor References: More Desirable</b>							
Personally known to the participant (n=331)	4.1 (.77)	4	0.3	0.6	23.6	44.1	31.4
Alumni of participant's residency (n=331)	4.1 (.78)	4	0.3	1.2	21.5	45.0	32.0
Two APPE preceptor references (n=330)	3.9 (.78)	4	0.6	2.4	25.8	50.3	20.9
<b>APPE Preceptor References: Less Desirable</b>							
Only one APPE preceptor (n=329)	3.0 (1.04)	3	5.5	18.5	24.3	23.4	18.2

Abbreviations: APPE=advanced pharmacy practice experience, PGY1=postgraduate year one

<sup>a</sup> Desirability scale: 1=highly undesirable, 2=undesirable, 3=neutral, 4=desirable, 5 = highly desirable

Clinical Meeting was reported. However, desirability for the timing of completing specific APPEs should be placed in context with the lower influence of APPE timing as an overall category.

Selection of APPEs provides students with an opportunity to demonstrate person-environment fit to the

residency programs aligned with their career aspirations. Pharmacy students should consider their entire APPE schedule from the perspective of which APPEs demonstrate greater fit with the residency programs of greatest interest to them. In this study, APPE-related factors with lower desirability and/or necessity generally had little to

no connection with the residency program. Therefore, applicants should thoughtfully consider how their APPEs, as well as other components of their application, fit their desired residency programs and use these study findings to inform those actions within the student's control. As pharmacy students prepare residency program applications, they should plan strategically to avoid sending mixed messages to residency programs of interest. For example, PGY1 pharmacy programs may sense a misfit with applicants completing veterinary pharmacy, pharmaceutical industry, or corporate pharmacy management APPEs. However, because respondents rarely identified any factor as a necessity for a candidate to be invited to interview, pharmacy students are strongly discouraged from using these study results to identify any "fatal flaw" in a residency application. If an application contains information that might make a candidate appear to be a misfit, the candidate's letter of intent to the program director could proactively communicate how APPEs and other activities influenced his or her career aspirations and developed specific competencies that are pertinent to the desired residency environment.

These study findings are not intended to promote a one-size-fits-all approach to the residency application process. Indeed, the Accreditation Council for Pharmacy Education (ACPE) standards support APPEs as a time for professional exploration which would be limited by a uniform approach to APPE selection.<sup>33</sup> Further, person-environment fit is a mutual process, where students and residency programs both benefit from exploring whether the program and student would create a good fit.<sup>20,21</sup> Pharmacy students should seek a residency program that is the best personal fit for them rather than attempting to mold themselves to a position perceived as desirable, particularly as perceptions may be inaccurate.<sup>18</sup> Similarly, these study results must also be placed in the context of the entire residency recruitment process, as APPEs are only one factor considered by programs when evaluating candidates. Many other factors have been described as being influential including: reference letters, pharmacy GPA, work experience, professional leadership, and letters of intent.<sup>7-17</sup>

In the open comment responses, some expressed concern that students may not control their APPE placements. Similar comments were reported by Pick and colleagues.<sup>13</sup> While some survey respondents reported attempts to prevent a factor outside of a pharmacy student's control from potentially disadvantaging a student in the selection process, pharmacy schools must consider that this approach may not be universal. Further, even if residency program directors seek to not intentionally disadvantage applicants related to APPEs,

subconscious and/or unintentional decisions may negatively impact pharmacy students. Hence, because APPEs may provide an advantage to students in this competitive environment, colleges and schools of pharmacy should review their policies and procedures for experiential education placements to determine how student-specific career plans are considered in the APPE placement process. Program capacity limitations of pharmacy schools, such as site availability and financial constraints, may limit the scope of APPE placements at some schools. Pertinent stakeholders, such as residency program directors and pharmacist employers, should critically review pharmacy schools' APPE offerings and provide feedback on potential gaps.

Although an APPE-related factor may be desirable, the presence of the factor alone does not ensure the student gained the experience, skills, and/or knowledge desired. For example, while a factor such as completion of an APPE in a specific location may have provided the potential for student development in a specific area, residency program directors also want to see a measure of the student's performance in that setting. The highly ranked influence of preceptor reference letters supports this desire to access performance. Likewise, the desire for APPE letter grades for each APPE may reflect their desire to use grades as a potential marker of performance. However, programmatic grading policies may make it difficult to compare APPE grades among students from different pharmacy schools. Future research examining successful ways to predict performance during residency training would be helpful.

This study has some limitations, including the possibility of non-response bias, positivity bias, and/or social desirability bias. The response rate for this survey was lower than desired but is typical for published studies involving national surveys of residency program directors.<sup>7-9,11,13</sup> A lower survey response rate may increase the risk for non-response bias, with the potential for survey respondents to not be representative of the overall sample. For example, non-responders may have believed that the impact of APPEs on pharmacy students' desirability as a residency candidate was neutral; therefore, they chose to forego the survey. However, available data obtained from the ASHP Accreditation Services Office suggest survey respondents were representative of the ASHP database in terms of average number of residency positions per program, number of applications per program, and geographic region (see Table 2). While there appears to be a difference in response rate for PGY1 pharmacy program directors by focus, the combination of all PGY1 pharmacy programs with any focus accounts for



77% of the survey respondents compared to 76.4% of the ASHP database. Limitations on describing programs by focus and inconsistent reporting of program focus in the ASHP database resulted in underreporting of the ambulatory care focus in the ASHP database in comparison to the survey results.

Another limitation was timing of the survey with respect to the residency recruitment process as this survey was conducted during the time of the year when residency application submissions and interviews were occurring. Because of firewall limitations, some potential participants may have never received the survey or only received two survey requests rather than the four planned requests during the study timeframe. This lack of repetition and limited timeframe for response may have negatively impacted the response rate.

The ASHP database may not have been completely accurate as residency program directors may change or be in transition. In addition, the role of residency program director may have been new to some participants, limiting their ability to accurately describe their perceptions. Furthermore, residency program directors do not exclusively decide which candidates to invite for residency interviews. Thus, the opinions shared by residency program directors may not be representative of the opinions of all participants in the resident selection process at each of the programs.

This study evaluated the impact of APPEs on residency directors' decision to invite candidates for interviews. This study did not describe the influence of APPEs on residency placement or the influence of APPEs when ranking applicants during the match process. While APPEs completed may influence a student's ability to obtain an interview for a residency position, this influence may not continue throughout the interview process. This presents an area for future research. Other areas for future research include exploring potential differences in the resident selection process based on residency type, determining consistent mechanisms to assess and communicate student performance, and determining influential components in letters of intent.

## CONCLUSION

The gap between desire for PGY1 residency placement and the current capacity presents a challenge to graduates of schools and colleges of pharmacy. The purpose of this study was to determine how PGY1 residency program directors perceive the overall influence of categories of APPE-related factors as well as the desirability and necessity of specific APPE-related factors when selecting candidates for interviews. The APPE category of preceptor reference letters was ranked the

most influential, while APPE timing related to the ASHP Midyear Clinical Meeting was the least influential category. Person-environment fit was evident as APPE-related factors that were similar to the respondents' own environments were considered desirable. Specific desirable factors included submission of two APPE preceptor reference letters and letter grading for each APPE. Necessity of APPE factors was rarely identified. Residency applicants should consider person-environment fit when creating their residency application packets. Further, residency programs should consider how these results may apply to their programs and, when applicable, provide specific guidance to applicants. In addition, schools and colleges of pharmacy should consider how student career plans should influence APPE placements.

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