Recognition of Advanced Pharmacy Practice Experience Student Participation Within Antimicrobial Stewardship Activities

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Abstract

Background: Antimicrobial stewardship is important in managing patients with infectious diseases. Limited data exist documenting the extent of pharmacy student involvement within antimicrobial stewardship activities. **Objectives:** The purpose of this study was to document the types of hospital-based antimicrobial stewardship activities in which Advanced Pharmacy Practice Experience (APPE) students are involved. **Methods:** A questionnaire was developed using the most current guideline for developing an institutional antimicrobial stewardship program. It was designed to collect preceptor-reported perceptions and APPE student involvement in antimicrobial stewardship activities. Pharmacist preceptors of APPE students from 2 Florida Colleges of Pharmacy were surveyed in October 2011. Questionnaires fully completed by hospital pharmacists currently serving as an APPE preceptor were included. **Results:** Forty-eight questionnaires met all inclusion criteria, collectively reporting APPE student participation within every element of antimicrobial stewardship. The most common areas of student participation were dose optimization based on patient characteristics ($n = 40$, 83%), acquiring patient information for prospective audit with feedback ($n = 39$, 81%), intravenous to oral conversion ($n = 37$, 77%), and pharmacokinetic services ($n = 36$, 75%). Anti-infective subcommittee participation ($n = 3$, 6%) was uncommon. Respondent perceptions were overall favorable regarding student participation in antimicrobial stewardship activities. **Conclusion:** With supervision from pharmacist preceptors, APPE students from 2 Florida colleges of pharmacy were reported to participate in each element and activity of antimicrobial stewardship as set forth by current guidelines. The role and value of such involvement is not fully understood. Future research investigating activity-specific outcomes and policy creation are needed to guide appropriate use of APPE students as a resource for optimizing antimicrobial use in hospitals.

Keywords

infectious diseases, pharmacy student, antibiotic

Antimicrobial stewardship programs (ASPs) are and will continue to be an important component within health systems as a means for combating the progression of antimicrobial resistance, improving patient outcomes, lessening drug toxicities, and reducing costs.¹ To support previous recommendations and provide evidence-based updates, the Infectious Diseases Society of America (IDSA) and Society for Healthcare Epidemiology of America (SHEA) published guidelines for developing an institutional ASP in 2007. Within this document, an infectious diseases (ID)-trained physician and an ID-trained pharmacist are identified as core members of an interdisciplinary ASP team. Additionally, a detailed description of potential antimicrobial stewardship activities is provided.

As interest in antimicrobial stewardship grows, a lack of ASP resources (eg, personnel, equipment) has been identified as a common barrier to intervention implementation.²

Within the profession of pharmacy, students supervised by a licensed pharmacist have long been used to expand the reach of pharmacy department services. The role of students as pharmacist-extenders is a recognized characteristic of contemporary pharmacy practice models and advocated by the American Society of Health-System Pharmacists (ASHP) Pharmacy Practice Model Initiative (PPMI) principles.^{3,4} A number of studies support pharmacy student participation in clinical activities, including those that may

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fall under the antimicrobial stewardship umbrella (eg, intravenous to oral conversion of medications).⁵⁻¹² However, a dearth of literature currently recognizing the extent of pharmacy student involvement within antimicrobial stewardship activities persists.

The purpose of this study was to document the types of hospital-based antimicrobial stewardship activities in which Advanced Pharmacy Practice Experience (APPE) students are involved. APPE preceptor perceptions of student contributions are secondarily assessed.

Methods

An electronic 38-item questionnaire was developed using OPINIO on-line survey software (Version 6.4.4, Object-Planet, Inc: Oslo, Norway) and distributed via e-mail to all preceptors of APPE students for 2 Florida Colleges of Pharmacy in October 2011. A reminder e-mail communication was sent 2 weeks following the original notification, and responses were collected at week 6. Responses were excluded if the questionnaire was incomplete, or if the respondent was not a pharmacist, did not currently precept APPE students, or was not hospital-based. All institutional review board policies were followed, and no monetary incentives were provided.

The questionnaire was designed to identify APPE student incorporation into antimicrobial stewardship initiatives via preceptor-reported activities. Preceptors were asked to identify via checkboxes which activities their APPE students participated in based on those described as potential elements of an ASP per the 2007 IDSA/SHEA guidelines.¹ In addition, demographic data and preceptor perceptions were collected. Responses were evaluated using descriptive analysis.

Results

Ninety-five unique questionnaires were completed by pharmacists. Of these, 8 respondents were not an APPE preceptor and 39 were nonhospital based. This resulted in 48 questionnaires meeting all inclusion criteria. The practice site was reported as a community hospital ($n = 26$, 54%), teaching hospital ($n = 16$, 33%), or other hospital type ($n = 6$, 13%). An existing ASP was reported by 50% ($n = 24$) of respondents, with 35% ($n = 17$) noting plans to implement one and 15% ($n = 7$) documenting no formal ASP. Additional participant characteristics are listed in Table 1.

Data reflecting APPE student participation in specific antimicrobial stewardship activities are represented in Figure 1. Forty-six respondents (96%) reported student participation in at least one ASP initiative. Students were reported to participate in each element of antimicrobial stewardship. The most common areas of student participation were dose optimization based on patient characteristics

Table 1. Participant Demographics^{a,b}.

Demographic	n (%)
Type of pharmacist	
Clinical	39 (85)
Administrative	11 (24)
Academic	6 (13)
Education and training	
Doctor of pharmacy	41 (89)
Bachelor of science in pharmacy	12 (26)
Postgraduate year 1 residency	24 (52)
Postgraduate year 2 residency	8 (17)
Fellowship	3 (7)
Board certification	13 (28)
Specialty	
Internal/family medicine	12 (26)
Infectious diseases	8 (17)
Critical care	8 (17)
Antimicrobial stewardship	5 (11)
Administration	3 (7)
HIV/AIDS	3 (7)
Administration	3 (7)
Cardiology	3 (7)
Medication use safety	3 (7)
Nephrology	2 (4)
Nutrition support	2 (4)
Pediatrics	2 (4)
Pharmacotherapy	2 (4)
Solid organ transplantation	2 (4)
Ambulatory care	1 (2)
Community pharmacy	1 (2)
Emergency medicine	1 (2)
Psychiatry	1 (2)
No specialty reported	11 (24)

Abbreviations: HIV, human immunodeficiency virus; AIDS, acquired immunodeficiency syndrome.

^aN = 48.

^bRespondents could indicate multiple answers.

($n = 40$, 83%), acquiring patient information for prospective audit with feedback ($n = 39$, 81%), intravenous to oral conversion ($n = 37$, 77%), and pharmacokinetic services ($n = 36$, 75%). The least common areas for student participation were within formulary restriction with preauthorization prior to drug approval and anti-infective subcommittee involvement ($n = 3$, 6% for both).

Respondent perceptions of APPE student involvement in antimicrobial stewardship activities were positive overall, as shown in Table 2. Most responded positively that their students contributed to antimicrobial stewardship ($n = 32$, 70%) and that their students were capable of participating in these activities ($n = 38$, 82%). The latter of these had the greatest quantity of "strongly agree" responses to any perception item. Respondents believed their APPE students contributed to enhancing patient care ($n = 37$, 80%)

Figure 1. Percentage of preceptor respondents reporting participation of their advanced pharmacy practice experience students within antimicrobial stewardship activities^a.

Abbreviations: ID, infectious diseases; EHR, electronic health record; CPOE, computerized physician order entry; CDS, computerized decision support.

^aN = 46.

Table 2. Respondent Pharmacist Perceptions Regarding the Contributions of Their APPE Students to Antimicrobial Stewardship Activities on a Likert-Type Scale^a.

Perceptions	Response ^b						Median ^c
	1	2	3	4	5	6	
I believe my students contribute to ASP activities	4.3%	13.1%	13.1%	26.1%	21.7%	21.7%	4
I believe my students are capable of participating in ASP activities	4.3%	4.3%	8.7%	28.3%	24%	30.4%	5
I believe my students contribute to enhancement of care in patients with infectious diseases	4.3%	4.3%	10.9%	34.8%	26.1%	19.6%	4
I believe my students contribute to educating health care practitioners and patients about appropriate antimicrobial use	6.5%	6.5%	10.9%	32.6%	30.4%	13.1%	4

Abbreviations: APPE, advanced pharmacy practice experience; ASP, antimicrobial stewardship program.

^aN = 46.

^b1 = strongly disagree; 6 = strongly agree.

^c25th to 75th interquartile range from 3 to 6.

and education of health care practitioners (n = 35, 76%) in infectious diseases.

Discussion

Responses to this questionnaire reveal APPE student participation within each potential antimicrobial stewardship

element and activity. While some level of involvement was expected based on available published literature, the extent documented here is noteworthy.

APPE preceptors from an assortment of educational backgrounds, pharmacy specialties, institution types, and practice settings with or without an ASP oversee student participation within these activities to varying degrees.

While support exists for such practices, this occurs despite no clearly defined role for students within antimicrobial stewardship activities from major published guidelines or statements.^{1,13-15} The 2007 IDSA/SHEA guidelines minimally refer to students, mentioning they can be included as passive recipients in educational activities.¹ In 2009, the Society of Infectious Diseases Pharmacists (SIDP) and SHEA published insights into the 2007 guidelines, but do not incorporate students.¹³ The 2010 ASHP statement on the role of the pharmacist in antimicrobial stewardship acknowledges students, but limits their recommendation to the need for student exposure to principles of antimicrobial stewardship and infection control.¹⁴

While major organizations with vested interest in antimicrobial stewardship do not call attention to pharmacy students as a specific resource for ASPs, the ASHP PPMI and data available in the literature support such involvement. Current data in this area are limited, but students do appear to be a potentially valuable resource. Pharmacy students' ability to participate in intravenous to oral conversion of antimicrobial agents, patient and provider education, screening for vaccinations, dose optimization, streamlining/de-escalation of antimicrobial therapy, and reporting of adverse drug events have all been demonstrated.⁵⁻¹² A literature review from Mersfelder and Bouthillier in 2012 noted studies investigating student-generated recommendations (including, but not exclusive to, antimicrobial stewardship activities) frequently find improved clinical productivity of pharmacy services.⁵ Another literature review published in early 2014 by Chahine et al proposes pharmacy student involvement within ASPs, suggesting they be incorporated into the majority of ASP activities.¹⁶

The current questionnaire was designed to capture a wide variety of potential antimicrobial stewardship activities based on established guidelines. While previous literature explores the role of pharmacy students in select aspects of antimicrobial stewardship, this is the first study we are aware of to document student participation within every antimicrobial stewardship activity identified in published guidelines. Additionally, preceptors' overall favorable perception of student capability and contribution in these roles supports rationalization for their widespread integration.

There are limitations to consider for this study, including recall bias inherent to survey research. First, respondents appeared to have an interest in antimicrobial stewardship, which likely contributed to the frequency of activity involvement and proportion of favorable perception findings. Conversely, preceptors not involved in ASP activities or harboring unfavorable student perceptions may have been less likely to respond. Second, data presented by this exploratory questionnaire are not qualitative in nature, nor meant to be representative of all hospital-based APPE preceptors. It serves to provide insight into the important issue of students as a resource for ASPs and does not examine

related outcomes. Third, "participation" was not explicitly defined, and a positive response may not represent the same level of involvement between respondents. As variability exists between institutions and ASPs, variation in the extent of student participation is also expected. Finally, the data presented here do not account for initial student training, periodic assessment and feedback, or other tasks in need of consideration prior to engaging in these activities. Quality assurance initiatives and appropriate supervision must be maintained to direct our developing workforce. Based on results from this survey alone, recommendations for the most appropriate and beneficial use of students within antimicrobial stewardship activities cannot be made; however, this work may serve as a stepping stone toward initiating related future studies and policy development.

Looking forward, ASPs appear to be developing into a permanent fixture within the health care landscape, which was evident in our results. Half of all respondents reported a current ASP in place at their institution and an additional 35% reported known plans to implement one. Under the supervision of a properly trained pharmacist, APPE students may provide an extension of pharmacy services where resources are otherwise limited. Incorporating students in such a way can allow for patient-centered medication management and ultimately empower pharmacists as direct patient care providers. Additionally, early exposure to an ASP and strategies for facilitating optimal antimicrobial use sets a foundation for future practice. Literature indicates insufficient numbers of adequately trained pharmacists exist to support widespread ASP implementation and the potential coming of a second *pre-antibiotic era*; thus, establishing good antimicrobial use habits among all future practitioners is imperative.^{12,17}

Conclusion

With the supervision of pharmacist preceptors in Florida, APPE students from 2 Florida colleges of pharmacy were reported to participate in each element and activity of antimicrobial stewardship as set forth by current guidelines. The role and value of such involvement requires further investigation. Future research exploring activity-specific outcomes and policy creation are needed to guide appropriate use of APPE students as a resource for optimizing antimicrobial use in hospitals.

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Declaration of Conflicting Interests

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