Identification of Factors Associated With the Desire to Participate in a Pediatric Pharmacy Practice-Based Research Network

Jeremy S. Stultz, PharmD; Chad A. Knoderer, PharmD; Kalen B. Manasco, PharmD; Jill A. Morgan, PharmD; and Hanna Phan, PharmD

OBJECTIVES To evaluate the practice-based research network (PBRN) potential within the Pediatric Pharmacy Advocacy Group (PPAG) membership and to identify characteristics associated with member willingness to join a PPAG PBRN.

METHODS In October 2016, a 21-question survey was sent by email to approximately 900 PPAG pharmacist members (excluding students) using contact information contained in the PPAG membership database. The survey elucidated information regarding training, clinical and research experience, practice site information, and willingness to participate in a PPAG PBRN. Descriptive statistics described the potential PBRN and multivariate logistic regression determined respondent characteristics associated with willingness to join the PBRN.

RESULTS Of 145 survey respondents (a 16% survey response rate), 92 selected “yes” regarding their willingness to participate in the PPAG PBRN. Acute care general pediatrics was the most common area where respondents desired to perform research (44.6% of “yes” respondents), with over 2500 patients/day collectively available. The most common selected limitations to research were time and size of available patient populations (59.8% and 47.8% of “yes” respondents, respectively). Cumulative hours/week members would be willing to devote to the PBRN was approximately 77 to 206. Publication of a retrospective study (OR 10.4, 95% CI 2.1–51.9, $p = 0.004$), research protected time (OR 4.9, 95% CI 1.4–17.8, $p = 0.015$), and affiliation with an academic medical center (OR 3.32, 95% CI 1.05–10.45, $p = 0.04$) were independently associated with willingness (a “yes” response) to join a PPAG PBRN.

CONCLUSIONS Within the PPAG membership, there is sufficient interest, expertise, patient exposure, and member time to develop a PBRN focused on pediatric pharmacotherapy. The identified characteristics associated with willingness to join the PBRN can help focus efforts for member involvement, education, and recruitment to ensure sustainability of the PPAG PBRN.

ABBREVIATIONS AHRQ, Agency for Healthcare Research and Quality; AMC, academic medical center; BCPPS, board certified pediatric pharmacy specialist; BPS, board of pharmacy specialties; CI, confidence interval; ICU, intensive care unit; IQR, interquartile range; IRB, institutional review board; OR, odds ratio; PBRN, practice-based research network; PGY, postgraduate year; PI, primary investigator; PPAG, Pediatric Pharmacy Advocacy Group

KEYWORDS pediatrics; pharmacy practice; practice-based research network; research

J Pediatr Pharmacol Ther 2018;23(6):479–485

DOI: 10.5863/1551-6776-23.6.479

Introduction

The mission of the Pediatric Pharmacy Advocacy Group (PPAG) is to promote safe and effective medication use in children through collaboration, advocacy, research, and education.¹ Practice-based, collaborative research can provide the translational connection between research, practice, and quality improvement of patient care. It has the potential to make a 2-way connection between evidence-based practice and evidence based on practice.^{2,3} A practice-based research network (PBRN) can facilitate research among

practitioners in any central theme. Pediatric pharmacotherapy is fraught with inadequate drug information, leading to the pediatric population historically being known as “therapeutic orphans.”^{4,5} A PBRN within the PPAG membership could help PPAG achieve its mission and help overcome some of the barriers to providing evidence-based pediatric pharmacotherapy.

The Agency for Healthcare Research and Quality (AHRQ) has focused largely on development of PBRNs in the primary care setting and current PBRNs largely reflect this focus. A PBRN without a primary care focus can register with the AHRQ and be recognized as an

Affiliate PBRN.⁶ There are several AHRQ registered PBRNs that have a pediatric or pharmacy focus, although none has a sole focus of pediatric and pharmacy combined.^{7,8} The PPAG membership is uniquely suited to create a PBRN focused on pediatrics and pharmacy, but an assessment of project feasibility within the PPAG PBRN is needed.

Pharmacy-based PBRNs exist in various settings including community practice, acute-care, and even to foster residency training.⁹ A common challenge cited by others who created PBRNs is increasing membership and engaging and sustaining membership.¹⁰ Characteristics associated with willingness to join a PBRN would be of benefit when developing the PPAG PBRN to target future membership increases and ensure membership engagement.

This study had 2 primary aims. The first was to quantify the PBRN potential within the PPAG membership. The second was to identify characteristics associated with willingness to join a PPAG PBRN.

Methods

Survey Administration. In October 2016, a 21-question survey was distributed to all non-student PPAG pharmacist members ($n =$ approximately 900) by an email containing a link for online completion via Qualtrics (Qualtrics, LLC, 2016, Provo, UT). A reminder email was sent a month after the first email and the survey was available for approximately 7 weeks.

Questions contained in the survey aimed to garner information regarding the respondent's clinical experiences, research experience, training, and affiliated institution. An "Academic" center was defined in the survey for the respondents as "a teaching institution that utilizes medical residents in the majority of their service lines and is generally affiliated with a School of Medicine and/or School of Pharmacy." The survey contained numerous question types including multiple choice, multiple selection, and free text response. Skip logic was used to prevent the presentation of irrelevant questions to respondents. The survey questions can be obtained by contacting the corresponding author (JSS). The survey was voluntary and anonymous unless a respondent was willing to provide their name and email for future contact regarding the PBRN. A statement to this effect was included on the first screen of the survey. Respondent contact information, if provided, was only used to identify location in order to describe the geographic distribution of the network in an aggregate and de-identified manner.

Data Analysis. After querying survey responses, duplicates were identified and only the most recent completed survey was included for analysis. Respondents who did not answer the question related to their willingness to participate in the PBRN were also excluded. Additional certifications, postgraduate training, and research experience were multiselect options.

For certifications, respondents with board certification as a pediatric pharmacy specialist (BCPPS) were categorized as BCPPS regardless of other certifications. Respondents with other board certifications without BCPPS certification were considered board of pharmacy specialties certified in a non-pediatric specialty. The highest degree of postgraduate training and research experience selected by the respondent was used to categorize the training and research experience for that respondent. For postgraduate training, the respondent selections were categorized from lowest to highest as follows: none, postgraduate year (PGY)-1, PGY-2, clinical fellowship, doctor of philosophy or a master's degree. Research experience selections were categorized from lowest to highest as follows: none, quality improvement, studies only presented in abstract/poster form, publications resulting from retrospective studies, and publications resulting from prospective studies. For example, if a respondent selected PGY-1 and PGY-2 for training and quality improvement projects and publications resulting from retrospective studies for research, they were categorized as PGY-2 trained and their research experience was publishing a retrospective study. Regional categorizations within the United States were based on the United States Census Bureau–designated regions, and any respondents outside the United States were considered international.

Descriptive statistics such as median, interquartile range (IQR), and percent were used to describe respondent characteristics. Respondents could answer "yes," "no," or "maybe" regarding their willingness to participate in the PPAG PBRN. Univariate and multivariate logistic regression determined independent characteristics correlating with willingness to participate in the PBRN, or a "yes" response. Those responding "no" and "maybe" were combined into a single group for the regression analysis. The authors identified and included respondent characteristics, which could influence the respondent's willingness to participate in the PBRN, and included those characteristics in the regression model. Characteristics with a $p \leq 0.25$ on univariate analysis were included in the multivariate regression model. Statistical analyses were performed using IBM SPSS Statistics version 24 (IBM Corp, 2016, Armonk, NY).

The Virginia Commonwealth University institutional review board (IRB) deemed the survey research methods exempt from review.

Results

There were 177 survey responses. One response was a duplicate and 31 respondents did not answer the question related to their willingness to participate in the PBRN. This left 145 respondents who answered all questions related to the characteristics included in the regression model and thus were included for analysis. There were estimated to be 900 non-student PPAG members when this survey was administered, resulting

Table 1. Characteristics of Potential PBRN Members (N = 137)

Characteristic	“Yes” to PBRN (n = 92), n (%)	“Maybe” to PBRN (n = 45), n (%)
Site interested in research (multiselect)		
Acute care		
General pediatrics	41 (44.6)	7 (15.6)
Pediatric ICU	23 (25)	10 (22.2)
Neonatal ICU	21 (22.8)	7 (15.6)
Infectious diseases	12 (13)	3 (6.7)
Subspecialty teams	12 (13)	0
Cardiology/cardiovascular ICU	6 (6.5)	6 (13.3)
Other acute care	6 (6.5)	7 (15.6)
Hematology/oncology	3 (3.3)	3 (6.7)
Ambulatory care		
Pulmonology/cystic fibrosis	5 (5.4)	1 (2.2)
General pediatrics	4 (4.3)	0
Infectious diseases	3 (3.3)	0
Hematology/oncology	2 (2.2)	2 (4.4)
Other	4 (4.3)	3 (4.4)
Other areas		
Pharmacokinetics/pharmacogenomics	20 (21.7)	3 (6.7)
Emergency medicine	13 (14.1)	2 (4.4)
Informatics	8 (8.7)	0
Administration	6 (6.5)	1 (2.2)
Other	4 (4.4)	2 (2.2)
Research support services available at institution (multiselect)		
IRB and/or compliance staff support	66 (71.7)	25 (55.6)
Statistical analysis support	44 (47.8)	13 (28.9)
Access to a data collection repository (e.g., RedCap)	30 (32.6)	14 (31.1)
Research coordinators/nurses	29 (31.5)	14 (31.1)
Laboratory instruments are available for research activities	15 (16.3)	5 (11.1)
Most common limitations (multiselect)		
Insufficient time to complete research activities	55 (59.8)	21 (46.7)
Small sample sizes	44 (47.8)	10 (22.2)
Limited research experience/training	19 (20.7)	14 (31.1)
Lack of laboratory instruments needed to perform studies	16 (17.4)	4 (8.9)
Limited collaboration within my institution	15 (16.3)	6 (13.3)
Lack of statistical support	14 (15.2)	8 (17.8)
Data access limitations	11 (12)	7 (15.6)
Other	3 (3.3)	2 (4.4)
Region* (data not available for all respondents)		
South	38 (41.3)	13 (28.9)
Midwest	23 (25)	6 (13.3)
Northeast	14 (15.2)	3 (6.7)
West	4 (4.3)	3 (6.7)
International	2 (2.2)	1 (2.2)
Unknown	11 (12)	19 (42.2)

ICU, intensive care unit; IRB, institutional review board; PBRN, practice-based research network

* Regions were based on the United States Census Bureau–designated regions.

in a completed survey response rate of approximately 16%. The median (IQR) time after completion of a final degree or training was 7 years (3–14.5). The most common postgraduate training was a PGY-2 residency (46%) followed by a PGY-1 residency only (30.3%). Respondents were most commonly associated with academic medical centers without a freestanding children’s hospital (39.3%) followed by academic medical centers with a freestanding children’s hospital (36.6%).

Table 1 provides characteristics of those with interest in joining the PBRN. Acute care general pediatrics, the neonatal intensive care unit, and the pediatric intensive care unit represented the most common practice areas where respondents would want to perform research. Of those with interest in the PBRN, 66% had a local IRB. Insufficient time and small study sample sizes were the most common limitations to performing research. The South geographic region represented the highest pro-

Table 2. Attributes of Potential PBRN Members (N = 137)

Attribute	"Yes" to PBRN	"Maybe" to PBRN
Number of accessible patients*		
Acute care-general pediatrics, patients/day	2589 (n = 48)	802 (n = 15)
Acute care-pediatric ICU, patients/day	367 (n = 21)	182 (n = 9)
Acute care-neonatal ICU, patients/day	619 (n = 20)	446 (n = 7)
Pharmacokinetics/pharmacogenomics, consults/wk	236 (n = 15)	120 (n = 4)
Ambulatory care-pulmonary, patients/wk	35 (n = 4)	30 (n = 1)
Time willing to dedicate to PBRN*	n = 66	n = 29
None, n	4	6
1 to 3 hr/wk, n	57	21
4 to 7 hr/wk, n	5	2
Cumulative PBRN hr/wk, range	77–206	29–77
Data querying capabilities (multiselect)	n = 92	n = 45
Inpatient medical record querying capabilities, n (%)	80 (87)	35 (77)
Outpatient medical record querying capabilities, n (%)	64 (69.6)	25 (55.6)

ICU, intensive care unit; PBRN, practice-based research network

* Not all answered.

portion of respondents followed by the Midwest. Table 2 illustrates the potential attributes of the PPAG PBRN. Importantly, 87% of respondents could query inpatient medical records and the PBRN would potentially have access to thousands of patients per day with nearly 100 hours a week collectively to devote to the PBRN.

Table 3 illustrates the different characteristics associated with willingness to join the PBRN. On multivariate analysis, the respondents involved in a research project that was retrospective and resulted in a publication, with protected research time, and with a practice site at an academic medical center without a freestanding children's hospital had higher odds of being willing to join the PBRN independent of other characteristics. Of those responding "yes" or "maybe" to being involved in the PBRN, 108 (78.8%) voluntarily provided their name and email for future correspondence for the network.

Discussion

These data illustrate the potential attributes of a PPAG PBRN. The network would be a candidate for affiliate membership in the AHRQ PBRN registry with completion of this study as a first project. Acute care general pediatrics encompasses the most common area potential PBRN members were interested in performing research and may be an ideal setting for an initial collaborative study. Research experience, research protected time, and type of institution were associated with willingness to join a PBRN. These data can be used to justify the development of the PPAG PBRN, assist with membership maintenance, and help identify those likely to join in the future.

The characteristics of the potential PBRN membership in Table 1 highlights the potential to overcome some challenges referenced in previously developed PBRNs.¹⁰ Mainly, the high rate of institutional IRBs in addition to experience with IRBs by the membership may help facilitate timely research productivity. Although there is a Southern United States predominance, there were respondents willing to join the PBRN from across the nation and in other countries. The high rate of members with the ability to query institutional electronic medical records lends toward rapid completion of retrospective analyses in combination with prospective analyses. Challenges to be further addressed include funding the PBRN if monetary support is needed, finding specific research champions, and creating PBRN infrastructure to prioritize studies and facilitate study execution.¹¹ In light of funding challenges, it may be prudent to initially explore studies not requiring external funding such as multicenter retrospective cohort studies with use of PBRN member available resources for additional support (e.g., biostatistician). These types of studies could help generate data needed to justify grant applications to fund larger, more complex study designs (e.g., prospective trials).

This survey identified a lack of time dedicated to research and inadequate size of patient populations as common barriers to pediatric research within a single institution. Similar barriers served as the impetus for PBRN development in the physician-based primary care and non-pediatric focused pharmacy practice settings.^{6,7,12} Thus, these data highlight the need for a PBRN focused on pediatric pharmacy practice. The AHRQ PBRN registry is geared toward primary care,

Table 3. Characteristics Associated With Willingness to Participate in the PBRN (N = 145 respondents)

Respondent Characteristic	"Yes" to PBRN (n = 92), n (%)	"No/Maybe" to PBRN (n = 53), n (%)	Univariate OR (95% CI)	p value	Multivariate* OR (95% CI)	p value
Years after final degree or completion of training, median (IQR)	6.5 (3–13)	8 (4–15)	0.98 (0.94–1.02)	0.334	N/A	
Highest postgraduate training						
None	8 (8.7)	9 (17)	Reference		Reference	
PGY-1 residency only	22 (23.9)	22 (41.5)	112 (0.37–3.45)	0.837	0.981 (0.25–3.9)	0.979
PGY-2 residency	50 (54.3)	17 (32.1)	3.31 (1.1–9.94)	0.033	2.33 (0.59–9.16)	0.226
Clinical fellowship	10 (10.9)	2 (3.8)	5.62 (0.94–33.76)	0.059	4.3 (0.51–36.52)	0.182
Doctor of philosophy or master's	2 (2.2)	3 (5.7)	0.75 (0.1–5.69)	0.781	0.44 (0.041–4.76)	0.501
Research experience as PI or coinvestigator						
None	11 (12)	17 (32.1)	Reference		Reference	
Quality improvement only	4 (4.3)	7 (13.2)	1.83 (0.33–10.1)	0.486	1.72 (0.24–12.28)	0.586
Project resulting in abstract/poster	22 (23.9)	16 (30.2)	3.18 (0.87–11.67)	0.08	2.51 (0.57–10.99)	0.221
Retrospective study publication	36 (39.1)	6 (11.3)	15.32 (3.78–62.06)	<0.001	10.41 (2.1–51.89)	0.004
Prospective study publication	19 (20.7)	7 (13.2)	6.32 (1.62–24.74)	0.008	2.82 (0.56–14.24)	0.209
Board certifications†					N/A	
None	36 (39.1)	22 (41.5)	Reference			
Other BPS (non-pediatric)	17 (18.5)	10 (18.9)	1.039 (0.4–2.67)	0.937		
BCPPS	39 (42.4)	21 (39.6)	1.14 (0.54–2.4)	0.741		
Research protected time (yes)	29 (31.5)	6 (11.3)	3.61 (1.38–9.39)	0.009	4.93 (1.36–17.84)	0.015
Type of institution						
Non-academic center	14 (15.2)	16 (30.2)	Reference		Reference	
AMC and associated clinics	43 (46.7)	14 (26.4)	3.51 (1.38–8.96)	0.009	3.32 (1.05–10.45)	0.040
Academic freestanding children's hospital and associated clinics	33 (35.9)	20 (37.7)	1.89 (0.76–4.67)	0.171	1.6 (0.52–4.87)	0.412
Other	2 (2.2)	3 (5.7)	0.76 (0.11–5.24)	0.782	0.134 (0.013–1.39)	0.092

AMC, academic medical center; BPS, board of pharmacy specialties; BCPPS, board certified pediatric pharmacy specialist; CI, confidence interval; IQR, interquartile range; OR, odds ratio; PBRN, practice-based research network; PGY, postgraduate year; PI, primary investigator

* Multivariate logistic regression model only contained those variables with $p < 0.25$ on univariate analysis. Regression outcome variable was a respondent selecting "yes" they would join the PBRN.

† Respondents with board certification as a pediatric pharmacy specialist (BCPPS) were categorized as BCPPS regardless of other certifications and each respondent was only categorized in 1 of the 3 categories.

but a PPAG PBRN could register with the AHRQ as an affiliate PBRN as other pharmacy practice PBRNs have done.^{6,7} In order to ameliorate the “therapeutic orphan” status of the pediatric population, collaboration among institutions is needed. PPAG is the only pediatric specific pharmacy organization, which makes the organization well suited to address this challenge. The current PPAG mission statement also aligns well with the function of a PBRN. Undoubtedly, this survey reaffirms the need for a pediatric pharmacy PBRN and the potential of the PPAG PBRN.

This study uniquely elucidated characteristics associated with respondent willingness to join the PPAG PBRN. These data provide interesting insights into what types of PPAG members are likely to be involved in the PPAG PBRN and those hesitant to be involved (i.e., those who responded “maybe” or “no”). Utilization of this information can help maintain or increase PBRN membership by actively recruiting those likely to be interested and considering additional or different recruiting efforts to facilitate membership of those reluctant to join the PBRN network. Those with protected time for research and with experience publishing retrospective studies were more likely to participate in a PBRN and could be targeted for more involvement in the design and evaluation of a research study. Targeting those PPAG members with affiliations at academic medical centers for PBRN involvement could help maintain membership and interest. The characteristics not associated with membership are also important. Those members without protected time may require incentives for time contributions. Additional research specific training may be needed for those who would like to be involved but lack significant research experience (e.g., human subjects training, research conduct training). Although PGY-2 training was associated with increased involvement on univariate analysis, multivariate analysis suggested this is not an independent characteristic. Thus, training may not be the best predictor of willingness to join a PBRN.

Our study has some limitations. Although we had over 140 responses, this may not accurately reflect all of the PPAG members interested in PBRN membership as reflected by the 16% response rate from the entire PPAG membership. Low response rates are a common limitation of survey research, and the low response could suggest we are underestimating the potential of the PBRN. Additionally, responses to survey questions may not correlate accurately with actual PBRN member involvement. The identified characteristics in this survey are also specific to pediatric pharmacy practitioners and may not translate into PBRNs in other areas or professions. We also could not account for membership in other PBRNs in this analysis, although one could assume respondents accounted for this when suggesting the amount of time they could devote

to the PBRN. Finally, because of the anonymity of the survey, we were not able to determine the impact of one institution having multiple respondents. In light of these limitations, these data provide necessary information needed to develop and maintain a PPAG PBRN.

Conclusions

Within the PPAG membership, there is sufficient interest, expertise, patient exposure, and member time to develop a PBRN focused on pediatric pharmacotherapy. Respondents who have published a retrospective study, have protected time for research, and practice within and academic medical center were more likely to join the PPAG PBRN. These characteristics can be used to help sustain PBRN membership.

ARTICLE INFORMATION

Affiliations Department of Clinical Pharmacy and Translational Science (JSS), The University of Tennessee Health Science Center, Memphis Tennessee; Department of Pharmacy Practice (CAK), Butler University College of Pharmacy and Health Sciences, Indianapolis, Indiana; Department of Pharmacotherapy and Translational Research (KBM), University of Florida College of Pharmacy, Gainesville, Florida; Department of Pharmacy Practice and Science (JAM), University of Maryland School of Pharmacy, Baltimore, Maryland; Department of Pharmacy Practice and Science (HP), Department of Pediatrics, Colleges of Pharmacy and Medicine, The University of Arizona, Tucson, Arizona

Correspondence Jeremy S. Stultz, PharmD;
jstultz2@uthsc.edu

Disclosure All members of the research team are PPAG members. Otherwise, the authors declare no conflicts or financial interest in any product or service mentioned in the manuscript, including grants, equipment, medications, employment, gifts, and honoraria.

Acknowledgments This manuscript is a report from the PPAG Research Committee. We would also like to acknowledge all the PPAG members who took the time to complete the survey. JSS was an Assistant Professor at the Virginia Commonwealth University School of Pharmacy in Richmond, VA when the survey was created and responses collected.

Accepted July 11, 2018

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