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Authors

Okelo, Sande O
Siberry, George K
Solomon, Barry S
[et al.](#)

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Asthma Treatment Decisions by Pediatric Residents Do Not Consistently Conform to Guidelines nor Improve with Level of Training

Sande O. Okelo, MD, PhD¹, George K Siberry, MD, MPH², Barry S. Solomon, MD, MPH³, Andrew L. Bilderback, MS⁴, Michiyo Yamazaki, MHS, PhD⁵, Theresa Hetzler, MD⁶, Cynthia L. Ferrell, MD, MEd⁷, Nui Dhepyasuwan, MEd⁸, Janet R. Serwint, MD³ for the CORNET Investigators⁸

¹Division of Pediatric Pulmonology, The David Geffen School of Medicine at UCLA, Los Angeles, CA

²Pediatric, Adolescent, and Maternal AIDS (PAMA) Branch, Eunice Kennedy Shriver National Institute of Child Health and Human Development, National Institutes of Health, Bethesda, MD

³Division of General Pediatrics & Adolescent Medicine, The Johns Hopkins University School of Medicine, Baltimore, MD

⁴Department of Medicine, The Johns Hopkins University School of Medicine, Baltimore, MD

⁵Department of Family, Population and Reproductive Health, The Johns Hopkins Bloomberg School of Public Health, Baltimore, MD

⁶Department of Pediatrics, New York Medical College, Valhalla, NY

⁷Department of Pediatrics, Oregon Health & Science University, Portland, OR

⁸Academic Pediatric Association, McLean, VA

Abstract

Objective—To compare asthma treatment decisions by pediatric residents to current asthma guidelines and to learn if treatment decisions vary by post-graduate year (PGY) in training.

Patients and Methods—We conducted a web-based survey of residents from 10 training programs through the Continuity Research Network of the Academic Pediatric Association (CORNET). Surveys included 6 vignettes of patients on low-dose inhaled steroids with guideline- and non-guideline-based indicators of asthma status and one stable patient on high-intensity medication.

Corresponding author: Sande Okelo, MD, PhD, Division of Pediatric Pulmonology, Department of Pediatrics, David Geffen School of Medicine at UCLA, 10833 Le Conte Ave, MDCC 3878, Los Angeles, CA 90095, Tel: 310.825.5930, Fax: 310.794.7338, sokelo@mednet.ucla.edu.

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The findings and conclusions in this report are those of the authors and do not necessarily represent the views of the National Institutes of Health or the Department of Health and Human Services.

Results—There were 369 resident respondents (65% response rate), 26% PL-1, 38% PL-2, and 36% PL-3. 75% of each resident group reported seeing less than one asthma patient per continuity clinic session. A majority of residents made appropriate treatment recommendations in 2 of 4 vignettes of guideline-based indicators of asthma status: 1) 97% overall stepping-up treatment for mild persistent asthma; 2) 52% overall stepping-down treatment for a patient with well-controlled asthma on high-intensity medications. Inconsistent with guideline recommendations: 1) 82% of residents overall did not step-down treatment for a patient with well-controlled asthma on low-intensity therapy; 75% of residents did not step-up treatment for a patient with a recent hospitalization for asthma. Of the 3 vignettes evaluating non-guideline-based indicators of asthma status, a majority of residents (60%) stepped-up treatment for parental reports of worse asthma, while a minority did so for a parental report of being bothered by their child's asthma (27%) or when wheezing was reported on physical exam (43%). There were no statistically significant differences for any of the comparisons by year in training.

Conclusions—Pediatric residents' management of asthma are consistent with national guidelines in some cases, but not in others. There were no differences in the outpatient asthma management decisions between residents by years in training. Educational efforts should be focused on strategies to facilitate pediatric resident adherence to national asthma guideline recommendations for outpatient asthma management.

Keywords

asthma; vignettes; treatment; survey; pediatric resident education; decision making; CORNET

INTRODUCTION

Despite the availability of NIH asthma guidelines since 1991, many children continue to experience poor asthma care,⁽¹⁾ particularly under-use of anti-inflammatory medications. Sub-optimal care may stem from the persistence of barriers precluding physician adherence to guidelines (e.g., lack of awareness of specific recommendations).^(2;3) Furthermore, physicians may use clinical criteria not incorporated into asthma guideline algorithms, considering factors other than asthma control in their treatment decisions.^(4;5) Lastly, sub-optimal asthma care may also be the result of inadequate preparation of providers during their training. Unfortunately, examinations of asthma care quality have tended to focus on providers currently in practice and not pediatric residents.⁽⁶⁾

The assessment and management practices of pediatric residents are important to consider because many residents care for inner-city, poor and/or minority children who are at highest risk for poor asthma care and poor asthma control.⁽⁷⁾ Evaluating resident practices is essential for determining if we are training residents effectively and emphasizing the correct information for their future roles in the pediatric workforce. Ideally, residents are exposed to the most up-to-date asthma information and trained to practice using an evidence-based approach. If it is evident that residents display poor asthma assessment and management behaviors, then interventions to improve asthma care should target training environments.

There is little information about the quality of asthma care delivered by pediatrics residents, nor what their knowledge-base is regarding the assessment and treatment of asthma. Ozuah

et al examined pediatric residents' abilities to classify asthma severity correctly using standardized patients and found no difference by year in training.⁽⁸⁾ However, this study did not assess asthma management behaviors, which would provide a deeper understanding of how those in training provide asthma care. Furthermore, an implicit assumption in residency training is that those with more experience (e.g., senior residents) have more expertise in disease management than more junior residents (e.g., interns). However, this volume-competence relationship has not been examined in asthma care.

We sought to further study these issues through the CORNET network. CORNET is a national practice-based research network of pediatric resident continuity clinic practices.⁽⁹⁾ This network is endorsed by the Academic Pediatric Association (APA) and its research goals include: 1) healthcare issues of minority and underserved patients, 2) health care disparities, and 3) resident education (e.g., the continuity practice of residents). The evaluation of practice behaviors is important since pediatric residents constitute our future work force and one of the purposes of the continuity experience is to prepare residents to serve as primary care providers. The CORNET network provides an opportunity to learn about asthma treatment from a diverse and representative spectrum of residents (e.g., by geography, residency size, and setting). Compared to those in private practice, CORNET practices provide health care to a larger proportion of low income, African American and Medicaid insured patients.⁽⁹⁾

The objectives of this study, among a national sample of pediatric residents, were to: 1) compare asthma treatment decisions by pediatric residents to current asthma guidelines; 2) learn if non-guideline based clinical criteria are influential in treatment decision-making; and 3) determine if asthma management practices vary by post graduate year of training. Our goal was to study a large, representative sample of pediatric residents to enhance the generalizability of our findings. We hypothesized that PGY-3 residents would be more likely to recommend appropriate treatment than PGY-1 residents.

SUBJECTS AND METHODS

Procedures

A cross-sectional survey of pediatric residents was conducted between May 2008 – July 2008. Participation was limited to those who were residents at the time the study started (May, 2008). An email with a web-based link to an online survey was emailed to prospective residents whose continuity clinic practices were enrolled in the Continuity Research Network (CORNET) (see below). Completion of the survey served as consent to participate in the study. Survey responses were anonymous. Institutional review board approval was obtained from each clinical site that participated.

Study Population

Categorical pediatrics residents or residents in medicine-pediatrics combined programs were eligible if their continuity site was enrolled in CORNET and the resident agreed to participate in the study. At the time of this study, CORNET included 77 pediatric training programs in 95 enrolled clinical practice sites, representing all regions of the United

States. An invitation to participate was e-mailed to the continuity clinic directors of all 77 CORNET programs. Demographic and practice characteristics, including the year into residency training (postgraduate year [PGY] 1 [PGY1], 2 [PGY2], 3 or higher [PGY3+]), were collected.

The Survey

The survey was designed to evaluate asthma assessment and management behaviors through clinical vignettes representing ambulatory experiences specific to asthma. Standardized vignettes of patients between 5 and 10 years of age returning for a 3-month follow-up clinical visit were used as a means of evaluating pediatric resident treatment practices. Seven vignettes were presented in the same order for all respondents, each with a specific clinical factor (Table 1):

1. No risk factors and on a low-intensity regimen of Fluticasone 44mcg (2 puffs twice daily). This was created to provide a comparison for the influence of other risk factors on resident recommendations to step-up treatment.
2. Wheeze: the presence of faint wheeze on physical examination: “Good air movement, with faint wheeze”
3. Acute Care: “Patient was hospitalized for asthma 6 months ago”
4. Bother: parental report of being bothered by the child’s asthma;
5. Poor asthma control: wheeze and Albuterol use 4 to 5 days per week; Poor asthma control: “Wheezing 4–5 days/week. Albuterol use 4–5 days/week”
6. Direction (“worse”): subjective parental report of the child’s asthma is now doing worse compared to the last clinic visit three months earlier: “Symptoms worse since last visit”;
7. No risk factors and on a high-intensity regimen of Fluticasone 220mcg (2 puffs twice daily); long-acting inhaled β -agonist and leukotriene modifier. This was created to provide a comparison for the influence of other risk factors on resident recommendations to step-down treatment.

The clinical factors included in each vignette were developed from prior work by the first author in 2003 at Johns Hopkins University and Howard University,^(10;11) and involved recruiting focus groups of patients, primary care physicians and asthma specialists to learn what factors are important to incorporate into asthma treatment decision-making.^(5;10;10;11) From these focus groups emerged some clinical factors reflective of existing asthma guidelines (acute asthma care; poor asthma control), but also some clinical factors not included in existing asthma guidelines (direction, bother, risk—[the focus groups were held prior to the 2007 EPR-3 guidelines, which is when the concept of risk was introduced into the guidelines]). Case vignettes of patients with asthma were constructed to incorporate each of the clinical factors that emerged from the focus groups. (The online appendix contains all vignettes used in this study.) A survey of practicing pediatricians, family practitioners and pulmonologists revealed that these concepts were influential in treatment decision-making.^(5;12) The case vignettes were reviewed by local physicians for clarity and content.

Three of the clinical factors (“poor asthma control”; “acute care”, “wheeze”) directly map onto guideline concepts of impairment and risk, while three other clinical factors were non-guideline-based (“direction”; “bother”, and “worse”). Patients were treated with Fluticasone [44mcg two puffs twice daily] except for one vignette in which Fluticasone 220mcg with long-acting inhaled beta agonist (LABA) two puffs twice daily and a leukotriene modifier (LTM) was used (vignette #7). For each vignette, residents were asked if they would step-up medications, step-down medications or leave medications unchanged (Figure 1 for example; Table 1 for Concept Map). No restrictions were placed on resident respondents regarding sources of information used to answer the survey.

Vignette #1 represented a baseline comparison for stepping-up treatment (well-controlled symptoms, low-intensity therapy, and no risk factors), while vignette #7 represented a reference comparison for stepping-down treatment (similar patient without risk factors on high-intensity therapy). Based on current asthma guideline recommendations, we expected residents to: 1) step-up treatment in vignettes #3 and #5); 2) step-down treatment in the vignettes without any risk factors (vignettes #1 and #7).

To demonstrate a 20% difference in treatment recommendations between residents of two different years-in-training, with $\alpha=0.05$ and power=0.80, we estimated a sample size of 91 resident respondents per class or a total of 273 residents.

Analysis

Means and proportions were calculated for descriptive characteristics. A chi-square test for trend was used to determine if descriptive characteristics and treatment recommendations varied significantly by resident year in training. We then used logistic regression to examine the effect of each clinical factor on the odds of residents stepping up or stepping down treatment. The responses of the PGY1 group to vignettes #1 and #7 served as the reference groups (to step-up and step-down treatment, respectively) for the logistic regression analyses. Variability in multiple responses from a single respondent was taken into account to estimate the odds using robust variance estimation. P-values of <0.05 were considered statistically significant. Analyses were performed using STATA 11 (College Station, TX).

RESULTS

Respondent Characteristics

Of the 568 surveys sent to pediatric residents in the 10 participating programs, we received 367 complete responses (overall 65% response rate). Three hundred twenty seven (89%) were categorical pediatric residents and 40 (11%) respondents were internal medicine-pediatric residents. Year in training was unrelated to demographic and practice characteristics except for self-rated asthma experience (Table 2), where PGY1 residents were less likely than PGY2 or PGY3+ residents to report “moderate” or “extensive” asthma experience ($p<0.001$). We observed a trend suggesting that PGY2 (21.4%) and PGY3+ (25.2%) residents were more likely to report having at least one asthma patient in every continuity clinic session when compared to PGY1 (12.5%) residents ($p = 0.06$) (Table 3).

Treatment Decisions Based on Guideline Criteria

A majority of PGY1, PGY2 and PGY3+ residents indicated they would step-up treatment for poor asthma control (frequent symptoms and Albuterol use) (97%, 96% and 98%, respectively; $p = 0.7$). Of the remaining vignettes where guidelines suggested step-up treatment, a minority of residents did so, regardless of year in training. Specifically, the recommendations to step-up treatment among the PGY1, PGY2 and PGY3+ residents among these remaining vignettes included: wheeze on physical exam (45%, 41%, 44%) and recent hospitalization (25%, 25%, 26%)— $p > 0.5$ for both comparisons.

In terms of scenarios in which guidelines suggested residents should step-down treatment, a slight majority of residents overall (52%) recommended this type of treatment for the high-intensity medication vignette without any other clinical factors (53%, 56%, 48%), while 18% of residents overall did so for the low-intensity medication vignette (18%, 13%, 22%)— $p > 0.5$ for all comparisons.

Treatment Decisions Based on Non-Guideline Criteria

A majority of PGY1, PGY2 and PGY3+ residents indicated they would step-up treatment when parents reported that the child's asthma was worse than at the last visit (63%, 58% and 59%, respectively, $P = 0.6$). For the other non-guideline-based vignette, a minority of residents recommended step-up treatment based on parental report of being bothered about the child's asthma (28%, 26%, 27%) and recent hospitalization (25%, 25%, 26%)— $p > 0.5$.

Logistic Regression

Logistic regression models revealed that there were no significant differences in treatment recommendations by year in training of the resident respondent. In particular, 2nd and 3rd year residents were as likely as 1st year residents to step-up treatment for a patient with: a recent hospitalization, a parental report of being bothered by the child's asthma, a parental report of worse asthma, wheezing on physical exam and uncontrolled symptoms ($p > .05$ for the odds of PGY3+ vs PGY1 and for PGY2 vs PGY1 to increase treatment). Similarly, 2nd and 3rd year residents were as likely as 1st year residents to step-down treatment for a patient with well-controlled asthma and: high-intensity treatment or low-intensity treatment ($p > .05$ for the odds of PGY3+ vs PGY1 and for PGY2 vs PGY1 to increase treatment).

DISCUSSION

In this vignette-based survey of a national sample of pediatric residents, we observed that: 1) a majority of residents recommended treatment in accordance with asthma guidelines for two of the four guideline-based vignettes (97% stepping up treatment for mild persistent symptoms; 52% stepping down treatment for well-controlled symptoms); 2) a majority of residents recommended treatment for only one of three focus group-based (non-guideline) indicators of asthma morbidity (60% stepping up for "worse" asthma); 3) there were no differences by year in training for decisions to adjust asthma therapy; and 4) residents were more inclined to step-up treatment than to step-down treatment. These findings suggest that pediatric residents may only sometimes incorporate guideline- and non-guideline-based criteria into their treatment decision-making for asthma.

Stepping-down treatment of patients with well-controlled asthma is another concept that we tested in two vignettes. Interestingly, a majority of residents appropriately suggested step-down treatment for a patient with well-controlled asthma on a high-intensity medication regimen, but not for a similar patient on a low-intensity medication regimen. We believe this differential response may suggest more of a discomfort with the high-intensity medication regimen rather than a recognition that medications should be decreased for those patients who are doing well. Given the widespread problems of sub-optimal asthma care (e.g., under-treatment), it may be that the message to step-down treatment for those doing well has not been equally received. Perhaps the patient population and concerns regarding follow up may also modify the step-down approach. Standards for NCQA Medical Home Qualification that focus on keeping patients with persistent asthma on inhaled corticosteroids without emphasizing step down therapy, may also contribute to this. More education is indicated in this area.

The lack of difference in treatment recommendations between residents of different years in training was an unanticipated finding. There may be multiple different reasons for this finding. First, there was a relatively similar volume of asthma patients by post-graduate year cared for in the residents' continuity clinic: 80% of residents reported caring for less than 1 asthma patient per clinic session, while 45% reported that they see no more than one asthma patient in 4 clinic sessions—for residents with one ambulatory clinic session per week, this equates to approximately 11 asthma encounters per year. So although we conducted our study between May – July, at which time the PGY1 residents would have had almost a full year of post-graduate training, at their reported level of ambulatory clinic exposure, with such low volumes of exposure, PGY2 or PGY3+ residents may not be more sophisticated in evaluating asthma than their PGY1 counterparts. Other possible explanations include that: 1) residents may not receive appropriate supervision during continuity clinic sessions due to poor knowledge base or teaching skills by their preceptor; 2) the duration of time spent in training is not sufficient to attain a knowledge base or competency level sufficient to practice guideline-consistent asthma care; or 3) better tools/aids are needed to facilitate the training of residents in providing asthma care. We were not able to examine all of these factors in this study.

There are potential limitations to this study. First, we have assessed treatment decisions using vignettes rather than examining actual clinical practice. However, use of clinical vignettes is an established method of measuring physician behavior.^(13;14) We do not know the full extent of information or prior training used by the participants to respond to each vignette. Nor do we have information on what exposure residents have in managing outpatient asthma beyond their reported continuity clinic exposure. However, we have sought to understand how specific and different clinical factors influence the final step of the decision-making process (i.e., making a treatment recommendation), which may be better addressed with a standardized vignette methodology allowing comparison of residents at different stages of training and work in different settings (e.g., different case mix, patient populations, etc.). We also acknowledge that in the “acute care” vignette, the patient had been hospitalized 6 months earlier, with an intervening office visit 3 months after the hospitalization. Therefore, the conditions of this vignette are different than the others, in which there was no intervening office visit. Therefore, we acknowledge that

residents who did not step up treatment for this vignette may not be inconsistent with asthma guidelines depending on the child's status at the intervening visit. Our results may not be representative of non-respondents at CORNET sites or of pediatric residents at sites that are not members of CORNET. However, we did include a national sample of pediatric residents—the largest we know of to date. Participation by CORNET sites is elective, based on interest in the topic and feasibility of participation. The number of participating sites is consistent with other studies conducted within CORNET.^(7;9) We also did observe that resident treatment recommendations were consistent with practicing physicians who have participated in similar studies.^(5;12) Lastly, we do not know how these residents' clinic preceptors would respond to our vignettes, nor what the clinic preceptors taught residents about asthma guidelines and the practice of asthma.

CONCLUSIONS

The findings from this study demonstrate that pediatric residents' management of asthma is consistent with national guidelines in some cases, but not in others. Additionally, there were no meaningful differences in the outpatient asthma management between residents of different years in training. Future efforts should be focused on developing strategies to facilitate pediatric residence adherence to management strategies that conform to national guideline recommendations and to adaptation of other asthma-related parameters for outpatient asthma management.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Abbreviations

ICS	inhaled corticosteroid
LABA	long-acting β -agonist
LTM	leukotriene modifier
NIH	National Institutes of Health

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What's New

Pediatric residents infrequently manage asthma in the outpatient setting, and vary little by level of training in making asthma treatment decisions. Future efforts should focus on strategies to facilitate improvements in resident asthma management.

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A.P. is a 5 year old with asthma who returns to your office for a follow-up appointment 3 months since the last visit. The following information is elicited at the current visit.

Interval History:

- Wheezing **1 time in the past 2 weeks.**
- Albuterol use **1 time in the past 2 weeks.**
- Symptoms **unchanged** since last visit.
- Patient reports full adherence to prescribed medication.
- A.P.'s parents are **not bothered** by these symptoms.

Past medical history:

- **No history of ED visits, hospitalizations, or intubations within the past 6 months.**
- No gastroesophageal reflux disease (GERD), rhinosinusitis, or other co morbidities.

Environment:

Parents are non-smokers, and the family owns no pets.

Current Medications (stable past 6 months):

1. Albuterol PRN
2. **Low dose ICS (e.g., fluticasone 44 mcg 2 puffs bid)**

Examination:

- Good air movement, **no wheeze.**
- Remainder of exam unremarkable.
- FEV₁ 90% predicted.

AP1 Based on this information, what medication changes would you make at this visit?

(Fill in all that apply)

- No medication change
- Increase/Add medication
 - Increase inhaled corticosteroid (ICS) dose
 - Add leukotriene modifier (e.g., montelukast)
 - Add long acting beta-agonist (e.g. salmeterol or replace with combined salmeterol/fluticasone)
 - Add theophylline
- Decrease/Discontinue medication
 - Decrease ICS dose
 - Discontinue ICS
 - Discontinue albuterol
- Other medication change (Please specify)

Figure 1. Sample Vignette

This figure shows an example of one of the vignettes. This vignette represents the “floor” for comparison of studied factors. The **bold and underlined** areas in this vignette highlight where there were variations by vignette (e.g., wheezing one time in the past 2 weeks vs. wheezing 4–5 times per week).

Concept Map of Vignettes

Table 1

Vignette #	Treatment	Acute Care	Bother	Control	Direction	Wheeze	Anticipated Treatment Decision [‡]
1*	Low intensity [§]	no	no	Sx once/2wks	unchanged	no	Step-down
2	Low intensity	no	no	Sx once/2wks	unchanged	yes	Step-up
3	Low intensity	yes	no	Sx once/2wks	unchanged	no	Step-up
4	Low intensity	no	yes	Sx once/2wks	unchanged	no	Step-up
5	Low intensity	no	no	Sx 4-5 times/wk	unchanged	no	Step-up
6	Low intensity	no	no	Sx once/2wks	worse	no	Step-up
7**	High Intensity [£]	no	no	Sx once/2wks	unchanged	no	Step-down

* Vignette provided as a baseline comparison for stepping up treatment. Analyses compared vignettes # 2, 3, 4, 5, and 6 to vignette # 1.

** Vignette #7 was created to evaluate decisions for stepping down treatment.

[§] Low Intensity Treatment = two puffs twice a day of Fluticasone 44 mcg and as-needed Albuterol pm

[£] High Intensity Treatment = two puffs twice a day of Fluticasone 220 mcg with LABA, LTM and as-needed Albuterol.

[‡] These are the anticipated treatment recommendations of the resident respondents, based on:

1. asthma guideline recommendations (vignettes 1, 3, 5, 7); or
2. focus group feedback from patients and physicians regarding information deemed important to determine appropriate asthma treatment (vignettes 2, 4, 6)

Table 2

CORNET Respondents Demographic Characteristics by year in training.

Physician Characteristics	% of CORNET Respondents				p-value	
	All (N=367)	PGY1 (n=96)	PGY2 (n=140)	PGY3+ (n=131)		
Gender						
	Female	76.2	72.9	79.3	75.4	NS
Age: mean years (SD)						
		29.7 (2.8)	29.0 (2.7)	29.4 (2.4)	30.6 (3.0)	<0.001
Race/Ethnicity						
	White	69.5	67.4	70.8	69.8	NS
	Black	7.2	7.4	5.1	9.3	
	Asian	16.6	16.8	16.8	16.3	
	Hispanic	2.8	3.2	2.9	2.3	
	Other	3.9	5.3	4.4	2.3	
Area of Practice						
	Inner City	52.5	45.3	52.1	58.1	NS
	Urban	32.7	37.9	31.4	30.2	
	Suburban	12.4	13.7	14.3	9.3	
	Rural	1.4	1.1	1.4	1.6	
	Other	1.1	2.1	0.7	0.8	
Self-rated Asthma Experience						
	Limited	38.4	66.7	38.6	17.6	<0.001
	Moderate	55.3	32.3	57.1	70.2	
	Extensive	6.3	1.0	4.3	12.2	
Region of U.S.						
	Northeast	33.0	35.4	32.9	31.3	
	South	36.0	36.5	32.9	38.9	
	Midwest	26.2	19.8	28.6	28.2	
	West	4.9	8.3	5.7	1.5	
						NS

Table 3

Physician Practice Characteristics

Practice Characteristics		% of CORNET Respondents				p-value
		All (N=367)	PGY1 (n=96)	PGY2 (n=140)	PGY3+ (n=131)	
Clinic Setting	Academic-based	89.4	87.5	92.1	87.8	NS
	Community Hospital	10.6	12.5	7.9	12.2	
Weekly Volume of Asthma Patients	1 per session	20.4	12.5	21.4	25.2	.060
	< 1 per session	79.6	87.5	78.6	74.8	