

**REFERRAL PATTERNS TO PEDIATRIC PULMONOLOGY
FOR ASTHMA-LIKE SYMPTOMS**

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Referral patterns to pediatric pulmonology for asthma-like symptoms

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Abstract

Objective: This study aimed to characterize referrals for asthma-like symptoms to a pediatric pulmonology clinic, evaluate consult interventions, and identify opportunities for improving access.

Methods: A retrospective chart review examined patients ages 5-18 years, referred to the pulmonology clinic at Phoenix Children's Hospital between July 2016 and July 2019. Descriptive statistics summarized demographics, prior asthma diagnosis, ICS use and compliance, reason for referral and intervention during consult. An appropriate referral was defined as prior asthma and ICS Step 3.

Results: The total 171 study subjects had mean (standard deviation) age of 9.4 (3.8) years, with 100 (58%) males, and prior asthma diagnosis in 105 (61%). The most common reason for pulmonology referral was asthma in 90 (53%) patients, of which 70 (78% of 90) had prior asthma. Among 105 patients with asthma, 79 (76%) had a history of ICS, with 33 (42% of 79) patients reporting spacer compliance issues. The rate of appropriate referrals was 0.11 (95% confidence interval: 0.06-0.16). During the pulmonology consult, nearly half 10 (53%) of 19 patients appropriately referred received an ICS step up. Among 151 inappropriate referrals, ICS was initiated for 91 (60%) and increased for 45 (30%). Education was provided to all patients during pulmonology consult.

Conclusions: Mild-to-moderate asthma can be effectively treated by primary care providers (PCPs) with implementation of ICS, thus prioritizing healthcare resource

utilization by enabling the pulmonologist to see higher acuity patients sooner. Further study is warranted to identify strategies and tools for PCPs to optimize asthma management.

Keywords: asthma; referral; primary care; pulmonology specialty; inhaled corticosteroids; pediatrics.

Introduction:

The decision to refer a sick child to a pediatric specialist is very important for health care quality, however access to specialty care is worsening, with wait times for some specialties longer than 6 months (1). This is partly due to a shortage of specialty physicians, and greater ambulatory visits resulting in referral to a specialty physician, which have more than doubled from 1999 to 2009, increasing from 4.93 to 10.5 million (2). Long wait times to see the specialist adversely impact families and result in foregone care, and adverse health consequences.

Referrals from primary to specialty care are a critical first step in coordinating specialty care, but there are often shortcomings in the appropriateness, clarity, and completeness of referrals (3-10). Primary care providers (PCPs) vary in their threshold for referring a patient, which results in both the underuse and the overuse of specialists. Some specialty centers have implemented referral guidelines to help screen children for referral and develop criteria for when children are well enough to return to primary care (11). However, these referral initiatives have not been evaluated to understand compliance and consistency. For asthma, there are documented differences in asthma guidelines for referral and strategy documents, and the lack of knowledge on referral guidelines can impact the rate of referrals (12). Although the National Asthma Education and Prevention Program (NAEPP) and Global Initiative for Asthma suggest a child should at least be on Step 3 of treatment before referral to a specialist, the lack of diagnostic equipment, and uncertainty of diagnosis prompts some referrals to happen before this criteria is met (13, 14). While several studies suggest overutilization of specialists, some studies suggest asthma patients suffer worse outcomes due to lack of specialist referral (12, 15).

The purpose of this study was to describe referrals for asthma-like symptoms to a pediatric pulmonology clinic, evaluate results of the pulmonology consult, and identify opportunities for improving access to care.

Methods & Procedures:

This retrospective chart review examined patients ages 5-18 years, who were referred to the pediatric pulmonology clinic at Phoenix Children's Hospital between July 2016 and July 2019. Patients with any comorbid medical conditions, such as developmental delay, cystic fibrosis and chronic respiratory failure were excluded. Eligible patients were identified through the IT department and charts were reviewed to extract data on demographics (age, gender), insurance type, history of asthma diagnosis, prior inhaled corticosteroids (ICS) prescription by PCP, compliance with ICS, reason for referral, and post-referral treatment. ICS Step at the time of referral was determined according to the NAEPP guidelines. An appropriate referral was defined as patients with prior asthma and ICS at Step 3, implementation of medium dose ICS, or higher. Irrespective of prior asthma, all patients without prior ICS were classified as an inappropriate referral, given that ICS can be initiated by the PCP.

The Phoenix Children's Hospital Institutional Review Board (IRB) determined that the study was quality improvement and therefore exempt for IRB approval.

The distribution of demographics and clinical factors was summarized overall and according to prior asthma diagnosis, using count and percent for categorical variables, and the mean and standard deviation (SD) or median and interquartile range for continuous measures. Differences between groups with and without prior asthma were assessed using the Fisher exact, the Fisher-Freedman-Halton test (estimated using Monte Carlo simulations based on 10000 random samples) or the Kruskal-Wallis test, as appropriate for the data distribution. Similar

analyses examined factors by prior ICS use among children with asthma. The rate of appropriate referrals was estimated with the corresponding 95% confidence interval (CI) to indicate variability. Additional comparisons examined factors between appropriate and inappropriate referrals. All statistical tests were 2-sided with significance evaluated at the 5% level.

Results:

The total 171 study subjects had mean (SD) age of 9.4 (3.8) years and included 100 (58%) males and 71 (42%) females. A prior asthma diagnosis was present in 105 (61%) patients. Asthma was the most common reason for pulmonology referral in 90 (53%) patients, of which 70 (78% of 90) had prior asthma. Those with a prior asthma diagnosis were significantly more likely than patients without prior asthma to be referred for asthma treatment (67% vs 30%), and to have public Arizona Health Care Cost Containment System (AHCCCS) vs private (66% vs 42%) insurance (Table 1).

Table 1: Factors according to previous asthma diagnosis among 171 pediatric patients referred to pulmonology.

Factor	All Patients N=(171)	Prior Asthma		P-value
		Yes N=(105)	No N=(66)	
Age, Mean (SD) Median (Q1, Q2)	9.4 (3.8) 9.0 (6.0, 12.0)	9.3 (3.8) 9.0 (6.0, 12.0)	9.6 (3.8) 9.5 (6.0, 12.0)	0.68 ¹
Gender, N (%) Female Male	71 (42) 100 (58)	42 (40) 63 (60)	29 (44) 37 (56)	0.64 ²
Insurance, N (%) AHCCCS Private (Missing N=1)	97 (57) 73 (43)	69 (66) 35 (34)	28 (42) 38 (58)	0.003 ²
Referral reason, N (%) Allergies Asthma Bronchitis Chest pain Cough	1 (0.5) 90 (53) 2 (1) 2 (1) 60 (35)	0 (0) 70 (67) 1 (1) 1 (1) 28 (27)	1 (1.5) 20 (30) 1 (1.5) 1 (1.5) 32 (48)	< 0.0001 ³

Dyspnea	1 (0.5)	0 (0)	1 (1.5)	
Pneumonia	3 (2)	1 (1)	2 (3)	
Shortness of breath	8 (5)	2 (2)	6 (9)	
Wheezing	4 (2)	2 (2)	2 (3)	
Prior ICS, N (%)				
Yes	79 (46)	79 (76)	0 (0)	< 0.0001 ²
No	91 (54)	25 (24)	66 (100)	
(Missing N=1)				
Intervention, N (%)				
ICS	91 (54)	25 (24)	66 (100)	< 0.0001 ³
None	22 (13)	22 (21)	0 (0)	
Step Down	2 (1)	2 (2)	0 (0)	
Step Up	55 (32)	55 (53)	0 (0)	
(Missing N=1)				
Education, N (%)				
Yes	171 (100)	104 (100)	66 (100)	1.00 ²
No	0 (0)	0 (0)	0 (0)	
(Missing N=1)				

¹ P-value from Kruskal-Wallis test

² P-value from Fisher exact test

³ P-value from Fisher-Freedman-Halton test (using simulations of 10000 random samples)

A history of ICS was documented in a majority 79 (76%) of 104 children with prior asthma and with data on ICS. Spacer compliance issues were reported in 33 (42% of 79) of patients on ICS. No significant differences in age, gender or insurance type were detected between children with asthma with and without prior ICS (Table 2). The patients referred on ICS included 60 (76%) at Step 2 and 19 (24%) patients at Step 3.

Table 2: Factors according to prior ICS use among 104 pediatric patients with asthma and ICS data referred to pulmonology.

Factor	Prior ICS for Asthma		P-value
	Yes N = (79)	No N = (25)	
Age, Mean (SD) Median (Q1, Q2)	9.2 (3.8) 8.0 (6.0, 12)	9.3 (3.9) 10 (6.0, 12)	0.88 ¹
Gender, N (%)			
Female	31 (39)	10 (40)	1.0 ²
Male	48 (61)	15 (60)	
Insurance, N (%)			0.81 ²

AHCCCS	53 (67)	16 (64)	
Private	26 (33)	9 (36)	
Reason for referral, N (%)			
Asthma	54 (68)	16 (64)	0.32 ³
Bronchitis	0 (0)	1 (4)	
Chest pain	0 (0)	0 (0)	
Cough	22 (28)	6 (24)	
Pneumonia	1 (1)	0 (0)	
Shortness of breath	1 (1)	1 (4)	
Wheezing	1 (1)	1 (4)	
ICS step at referral, N (%)			
1	0 (0)		-
2	60 (76)		
3	19 (24)	-	
4	0 (0)		
5	0 (0)		
6	0 (0)		
Intervention, N (%)			
ICS	0 (0)	25 (100)	< 0.0001 ³
None	22 (28)	0 (0)	
Step Down	2 (2)	0 (0)	
Step Up	55 (70)	0 (0)	
Education, N (%)			
Yes	79 (100)	25 (100)	1.00 ²
No	0 (0)	0 (0)	
Spacer compliance/issues, N (%)			
Yes	33 (42)	0 (0)	-
No	46 (58)	0 (0)	

¹ P-value from Kruskal-Wallis test

² P-value from Fisher exact test

³ P-value from Fisher-Freedman-Halton test (using simulations of 10000 random samples)

During the pulmonology visit, ICS was increased for 55 (70%), remained unchanged for 22 (28%) and decreased for 2 (2%) subjects (Table 2). ICS was initiated for all 66 patients without prior asthma, and all 25 patients with prior asthma but not previously on ICS. Education was provided to all patients as part of the pulmonology consult.

The rate of appropriate referrals was estimated as 0.11 (95% CI: 0.06 - 0.16) including only 19 (11% of 170 with data) patients with ICS Step 3 or greater. The total 151 of inappropriate referrals included 66 (44%) without asthma, 25 (16%) with asthma but without prior ICS and 60 (40%) children with asthma with ICS Step 2. Patients appropriately referred

were more likely to be older, male and have public AHCCCS insurance than inappropriate referrals, but these differences were not statistically significant (Table 3). Asthma as the reason for referral was more likely among appropriate referrals, whereas cough was the reason for referral almost exclusively among inappropriate referrals. The most frequent intervention among appropriate referrals was a step up in ICS for 10 (53% of 19) patients. Most of the 151 inappropriate referrals had ICS initiated in 91 (60%) and increased in 45 (30%) patients (Table 3).

Table 3: Factors according to appropriate referral among 170 pediatric patients referred to pulmonology with ICS data.

Factor	Referral		P-value
	<i>Appropriate</i> N = (19)	<i>Inappropriate</i> N = (151)	
Age, Mean (SD) Median (Q1, Q2)	10.5 (4.0) 10 (8.0, 13)	9.2 (3.8) 8 (6.0, 12)	0.13 ¹
Gender, N (%) Female Male	7 (37) 12 (63)	63 (42) 88 (58)	0.81 ²
Insurance, N (%) AHCCCS Private	14 (74) 5 (26)	83 (55) 68 (45)	0.14 ²
Reason for referral, N (%) Allergies Asthma Bronchitis Chest pain Cough Dyspnea Pneumonia Shortness of breath Wheezing	0 (0) 14 (74) 0 (0) 0 (0) 4 (21) 0 (0) 0 (0) 0 (0) 1 (5)	1 (1) 76 (45) 2 (1) 1 (1) 56 (37) 1 (1) 3 (2) 8 (5) 3 (2)	0.54 ³
Intervention, N (%) ICS None Step Down Step Up	0 (0) 8 (42) 1 (5) 10 (53)	91 (60) 14 (9) 1 (1) 45 (30)	< 0.0001 ³
Spacer compliance/issues, N (% of 79) Yes No	6 (32) 13 (68)	27 (45) 33 (55)	0.42 ²

¹ P-value from Kruskal-Wallis test

² P-value from Fisher exact test

³ P-value from Fisher-Freedman-Halton test (using simulations of 10000 random samples)

Discussion:

In this cohort of pediatric patients referred to the pulmonology clinic for evaluation of asthma, most patients could have been treated by their primary care provider (PCP) instead of a specialist. Asthma was already diagnosed in more than half of the children. Although the majority of these patients with asthma were already prescribed ICS, many were below Step 3 of asthma treatment. More than half of the patients who were already on ICS needed a step up in therapy, with very few patients receiving a step down in ICS therapy. Of most concern were patients with a prior diagnosis of asthma who were not started on ICS prior to referral. All patients received asthma education including spacer technique and compliance required by almost half of the children with asthma on ICS.

Based on the American Academy of Pediatrics (AAP) guidelines, specialty consultation is warranted if certain criteria from the National Asthma Education and Prevention Program (NAEPP) asthma guidelines are met (16). Specifically, referral is required for asthma patients at Step 3 care or higher, after implementation of medium dose ICS (13). Other considerations for referral include suboptimal control after 3-6 months, atypical symptoms, or history of life threatening asthma exacerbation. Therefore, patients should be at least tried on ICS by the PCP before referral to the specialist. Our findings indicate that specialty consultations could have been reduced if ICS medications were initiated or stepped up by the pediatrician.

The decision by pediatricians not to treat, but to refer a patient with asthma to a specialist may be due to lack of familiarity with the NAEPP guideline recommendations including referral guidelines, and/or hesitation to prescribe inhaled corticosteroids due to concern of side effects

(17-25). For new asthma diagnosis, there might be uncertainty and need for further diagnostic testing such as spirometry which is not always available at a primary care office. It is also possible that due to decreasing insurance payouts, pediatricians have a shortage of available office time in order to sustain their profits. With a time limitation of on average 15 minutes per patient, burdens of documentation, refills, phone calls and reviewing lab results, pediatricians may not have time to review inhaler administration technique and review asthma action plans (21, 26).

To improve the comfort of PCPs to prescribe ICS, asthma education programs have been developed that can be delivered in-person by trained educators to PCPs in their office. Studies have shown that asthma education programs are effective in improving guideline-based provider and patient management of asthma, as well as reducing frequency of asthma symptoms in patients (24, 25, 27-30). Findings reported included improvements in rates of appropriate ICS prescriptions, written asthma action plans, use of a spacer, and reduction of ED visits and hospitalizations for pediatric asthma patients (25, 27, 29-32). However, one barrier to this might be the limited availability of PCPs to undergo regular asthma education sessions.

Another possible solution to streamline referrals is to enable PCPs to refer patients to nursing asthma education programs. An initial asthma consultation at local centers equals 2.43 work RVUs (relative value unit; a measure of value used in the United States Medicare reimbursement formula for physician services), whereas the cost of an initial 30-minute asthma education visit is 0.98 work RVUs. Nursing-led asthma education programs have shown to decrease overall healthcare costs by 4.1% (24). One barrier to nursing education is that hiring nurses has an associated cost for the hospital and the education they provide is not always reimbursed. Higher reimbursement could be offered to pediatricians for their time spent in

asthma education. Long-term, these options could save in cost as well as make pediatric pulmonologists more accessible to patients with acute and urgent needs.

Asthma outcomes could also be improved by enhancing the electronic health records to capture information about asthma management. There is a scarcity of asthma elements in EMRs in primary care practices and currently no validated asthma data set (33). In one study, an EMR template prompted family practice residents to document the severity of asthma during ambulatory visits and this resulted in an increased rate of ICS prescriptions from 36.7% to 71.1% (34). Integration of a data set, standardized terminology including the level of severity of asthma, and validated indicators could help outcomes monitoring, improve reliability of care, and eliminate some of the confusion around how to diagnose and treat varying severity of asthma.

Specialty clinics can aid in reducing inappropriate referrals by tracking referrals and follow-up with primary care providers when they could have provided the treatment. This approach does require additional resources for specialty clinics, but is necessary to provide the quality outcome measures for referral processes and outcomes, which are currently lacking.

This study is first to characterize referrals for asthma-like symptoms to a pediatric pulmonology clinic and estimate the rate of inappropriate referrals. Study findings are limited by the retrospective design and single tertiary children's hospital site. As the data were collected during the pulmonology visit from patient families, some information was incomplete and inaccurate documentation is possible.

Future studies identifying factors influencing the reasons for referrals of pediatricians, would guide the development of tools for asthma diagnosis/treatment and make the guidelines for specialist referrals easily accessible. Pediatric pulmonology practices could also screen asthma referrals and ensure patients were trialed on Step 3 asthma treatment before office visits.

Improved reimbursement for asthma education for primary care offices might incentivize providers to optimize treatment for asthma in their offices instead of referring to a specialist.

Conclusion:

The quality of care for children with asthma can be improved through greater concerted efforts of primary care and pulmonology. Primary care providers can effectively treat children with mild to moderate asthma with implementation of inhaled corticosteroids, thus enabling the pulmonologist to see patients with higher acuity, in a more timely manner, and reduce costs for subspecialty evaluations. Further study is warranted to identify effective strategies and tools to optimize asthma management in primary care.

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