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Access and Utilization of Asthma Medications Among Patients Who Receive Care in Federally Qualified Health Centers

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Abstract

Objectives: To describe access to and use of prescription asthma medications, and to assess factors associated with asthma exacerbation, healthcare utilization, and health status among asthma patients treated at Federally Qualified Health Centers. **Methods:** This is a retrospective cross-sectional study. We analyzed data from the 2014 National Health Center Patient Survey. This data is publicly available from the Health Resources and Services Administration. Data was collected from patients receiving face-to-face care from health centers funded under Section 330 of the Public Health Service Act. Data from patients was collected between October 8, 2014, and April 17, 2015. We included adult participants who reported having a diagnosis of asthma and confirmed that they still have asthma. Association between explanatory variables (access to prescription medications and use of asthma controller medications) and outcome variables (asthma exacerbations, asthma hospitalizations or emergency department visits, and self-rated health) was assessed using multivariable regression analyses while adjusting for demographics. **Results:** A total of 919 participants with asthma were included. Approximately 32% of the participants experienced delays in getting prescription medications, 26% were unable to get them, 60% experienced an asthma exacerbation last year, 48% rated their health as fair/poor, and 19% visited a hospital or an emergency department last year. Multivariable results showed that participants who were currently taking controller medications were more likely to have experienced an asthma exacerbation (OR = 4.02; 95% CI 1.91 to 8.45; $P < .01$), or visited a hospital or an emergency department (OR = 3.07; 95% CI 1.39 to 6.73; $P < .01$) in the last year compared with those who had never taken controller medications. Experiencing difficulties in accessing asthma medications was associated with lower self-rated health ($\beta = -.51$; 95% CI −0.94 to −0.08; $P = .02$). **Conclusions:** Future interventions should seek to improve asthma patient care and health outcomes using innovative strategies that act at multiple levels of the healthcare system (eg, individual, interpersonal, community levels).

Keywords

asthma, underserved, Federally Qualified Health Center (FQHC), health services, access, prescription medications

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Introduction

Asthma affects over 25 million Americans and asthma-related costs are approximately $81.9 billion per year in the United States (US).[1,2] The yearly per-person incremental medical cost is $3266, and prescription medications account for $1830 of that medical cost.[2] Poorly controlled asthma is associated with diminished quality of life, increased emergency department utilization and hospitalizations, and significant mortality.[1,3-13] The appropriate use of asthma controller (ie, medications taken daily on a long-term basis

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to achieve and maintain control of persistent asthma) and rescue medications helps patients achieve asthma control, prevents exacerbations, and improves patients' quality of life.[14-17] However, more than 50% of patients with asthma have problems using prescribed treatment regimens.[18,19]

Socioeconomically disadvantaged and medically underserved patients with asthma face health disparities which contribute to diminished quality of life, increased morbidity, and significant mortality. Individuals who have a yearly income below $50 000 are at a higher risk for asthma.[20] Low-income patients with asthma have higher rates of clinical deterioration and exacerbations in comparison with high-income patients.[21,22] In addition, research has found that lower household income was associated with poorer adherence to prescribed asthma medication regimens.[23]

Federally Qualified Health Centers (FQHC) are federally funded healthcare systems that provide care to socioeconomically disadvantaged and medically underserved patients. FQHCs are full service medical homes for people regardless of their ability to pay for healthcare. They serve as the primary care safety net for low income and uninsured populations.[24] FQHCs serve more than 28 million Americans, including 1 in 3 individuals who live in poverty, 1 in 5 rural residents, and 1 in 8 children.[25]

A recent study found that 66% of adult patients with asthma who received care in an FQHC were non-adherent to their prescribed asthma medication regimens.[26] Adult asthma patients who receive care in FQHCs also face barriers related to low self-efficacy regarding self-management and cost that may affect medication use and health outcomes.[27] Clinicians practicing in FQHCs identified access to affordable medications as a barrier to providing asthma management services.[28] Additional studies are needed to identify modifiable factors in order to design interventions to improve health services and outcomes among socioeconomically disadvantaged and medically underserved patients with asthma. The objectives of this study are to: (1) describe access to prescription medications and use of asthma medications, and (2) examine modifiable factors associated with health outcomes (ie, asthma exacerbation, healthcare utilization, health status) among patients with a diagnosis of asthma who receive healthcare within FQHCs.

Methods

Study Design and Setting

This study was a secondary analysis of the publicly available 2014 National Health Center Patient Survey (HCPS).[29] The HCPS was sponsored by the Health Resources and Services Administration (HRSA), and collected information from patients who received care at health centers funded under Section 330 of the Public Health Service Act in the US. This study used data obtained from patients of health centers funded through the Bureau of Primary Health Care's Community Health Center Program. The goal of the results from the HCPS is to guide and support the mission of the BPHC to improve the health of underserved communities and vulnerable populations by assuring access to comprehensive and quality primary health care services.[29] We used this data because it provided information that help address the aims of our study which align with the BPHC's mission and highlights patients' access to medications and their relationship with health outcomes. Institutional Review Board (IRB) approval was not obtained for this study as we utilized publicly available de-identified patient data from HRSA website. The HCPS used a three-stage sampling design. The first-stage sampling units were health center organizations which received funding from HRSA, the second-stage sampling units were health center sites within health center organizations, and the third-stage sampling units were eligible patients who had at least 1 visit to an eligible health center site in the past 12 months. A total of 163 health center organizations were recruited in the first stage, and 403 Community Health Center sites were recruited in the second stage. Field interviewers randomly selected patients for survey interviews as they entered sites and registered with receptionists for services. A total of 4451 eligible patients were selected and 3965 of those completed interviews.

Participants

Individuals who received face-to-face services from a Community Health Center clinical staff member who exercised independent judgment in the provision of services, and who received services from a Community Health Center at least once in the past 12 months were eligible to participate in the HCPS. For the present study, we included adult (18 years and older) patients who reported being told they had asthma and confirmed that they still have asthma. Individuals who responded to the following questions were included: "Have you ever been told by a doctor or other health professional that you had asthma?" And "do you still have asthma?"

Variables

Three self-reported outcomes that reflect asthma morbidity were assessed: asthma exacerbations, asthma hospitalizations or emergency department (ED) visits, and self-rated health.[30] To assess asthma exacerbations, participants were asked "During the past 12 months, have you had an episode of asthma or an asthma attack?" To assess asthma hospitalizations or ED visits, participants were asked "In the past year, have you been in the hospital or visited an emergency room because of asthma?" To assess self-rated health, participants were asked "Would you say your health in general

Table 1. Study Variables.

Variables	Question from the HCPS
Outcome	
Asthma exacerbations	"During the past 12 months, have you had an episode of asthma or an asthma attack?"
Asthma hospitalizations or emergency department (ED) visits	"In the past year, have you been in the hospital or visited an emergency room because of asthma?"
Self-rated health	"Would you say your health in general is excellent, very good, good, fair, or poor?"
Explanatory	
Access to prescription medications	1. Inability to access "In the last 12 months, were you unable to get prescription medicines you or a doctor believed necessary?" and 2. Delayed access "In the last 12 months, were you delayed in getting prescription medicines you or a doctor believed necessary?"
Use of asthma controller medications	"Have you ever taken (oral or inhaler) the kind of medicine used every day to protect your lungs and prevent asthma attacks?" and "Are you now taking this medication that protects your lungs daily or almost daily?"

is excellent, very good, good, fair, or poor?". Asthma exacerbations, and asthma-related hospitalizations or ED visits were classified as dichotomous (yes/no) variables, and self-rated health was classified as a continuous variable ranging from 1 to 5 (1 for poor health and 5 for excellent health) (Table 1).

Explanatory variables included access to prescription medications and use of asthma controller medications. Access to prescription medications within the last year included: inability to access "In the last 12 months, were you unable to get prescription medicines you or a doctor believed necessary?" and delayed access "In the last 12 months, were you delayed in getting prescription medicines you or a doctor believed necessary?" Both variables were classified as dichotomous variables. Use of asthma controller medications was assessed using 2 questions: "Have you ever taken (oral or inhaler) the kind of medicine used every day to protect your lungs and prevent asthma attacks?" and "Are you now taking this medication that protects your lungs daily or almost daily?" Responses to use of asthma controller medications variable were categorized into: ever taken a controller medication and currently taking them, ever taken controller medications but currently not taking any, and never taken controller medications.

Other variables included demographics and reasons for inaccessibility to prescription medications. Demographic variables included race/ethnicity (non-Hispanic White, non-Hispanic Black, Hispanic, and non-Hispanic others), age (categorized into 18-44, 45-64, and 65 years and older), gender (male/female), education (less than high school, high school, and more than high school), insurance status (insured/uninsured), federal poverty level (FPL) ($\leq$100%, 101%-138%, 139%-199%, 200%-299%, 300%-399%, $\geq$400%), geographic landscape (urban/rural). Reasons for inability or delayed access to prescription medications included: not being able to afford prescription medications (cost), insurance company would not pay/pharmacy refused to accept family insurance (insurance), and other.

Statistical Analyses

Descriptive statistics were calculated to characterize study variables. We conducted multiple logistic regression analyses to assess the association between the explanatory variables (controller medication use, and delayed/unable to get controller medications) and the dichotomous outcome variables: asthma exacerbation, and asthma hospitalizations or ED visits. We conducted multiple linear regression analysis to assess the association between the explanatory variables and self-rated health. All models were adjusted for demographic variables and weighted to account for the complex survey design. Complete case analysis was conducted since missing data was $<$10%.[31] Odds ratios (OR), beta coefficients, 95% confidence intervals (CI), and P values were reported. Statistical significance was set at $P < .05$. Statistical analyses were conducted using STATA V.14.2.

Results

A total of 919 participants who indicated having a diagnosis of asthma were included in the study. Approximately, 75% of participants were female, 55% were non-Hispanic White, 57% were within the age group 18 to 44 and 41% were 65 years or older (Table 2). Almost 83% of participants were living at less than 200% of the FPL, 57% had an education level of high school or less, and 50% were from rural areas. About 60% of participants experienced an asthma exacerbation in the past year, 48% rated their health as fair/poor, and 19% had been in the hospital or visited the ED in the last year (Table 2).

Table 2. Characteristics of Patients Diagnosed With Asthma Treated at FQHCs (N = 919).

Variables	N	%*
Race/ethnicity		
Non-Hispanic White	270	55.15
Non-Hispanic Black	266	20.01
Hispanic	241	17.82
Non-Hispanic Others	141	7.02
Age		
18-44	360	56.97
45-64	17	2.29
65 and older	542	40.73
Gender		
Male	276	25.06
Female	643	74.94
Education		
Less than high school	393	34.06
High school	249	23.53
More than high school	272	42.41
FPL		
≤100%	643	55.05
101%-138%	121	18.98
139%-199%	79	9.29
200%-299%	44	9
300%-399%	12	4.94
≥400%	16	2.72
Insurance status		
Uninsured	162	15.82
Insured	753	84.18
Insurance type		
No insurance	162	18
Medicare	81	9
Medicaid	460	51.11
Medicare and Medicaid	137	15.22
Other	60	6.67
Geographical location		
Urban	658	49.81
Rural	261	50.19
Experienced an asthma exacerbation in the last year		
No	369	40.29
Yes	547	59.71
Asthma-related hospital or ED visits in the last year		
No	669	80.75
Yes	249	19.25
Self-rated health		
Excellent	22	2.92
Very good	68	9.62
Good	253	39.32
Fair	379	30.68
Poor	197	17.46

*Weighted percentages.

Nearly 95% of participants needed prescription medications within the last year. However, 32% experienced delays in getting their prescription medications, and 26% were unable to get them (Table 3). Of the participants who experienced delays in getting their prescription medications, approximately 40% could not afford them, and 28% experienced insurance related issues (ie, insurance would not pay it, or the pharmacy refused their insurance). Of those who were unable to get their prescription medications, approximately 45% could not afford them, and 39% experienced insurance related issues. Regarding the use of asthma controller medications, approximately 50% reported they had never taken controller medications, 37% were currently taking them, and 13% had taken them but currently were not taking any.

Multiple regression results showed that participants who reported that they were currently taking asthma controller medications were 4 times more likely to report an asthma exacerbation (OR = 4.02; 95% CI 1.91 to 8.45; $P < .01$), and 3 times more likely to report visiting a hospital or an ED (OR = 3.07; 95% CI 1.39 to 6.73; $P < .01$) during last year compared with those who reported that they never taken asthma controller medications (Table 4). Participants who were unable to get their prescription medications had lower self-rated health ($\beta = -.51$; 95% CI −0.94 to −0.08; $P = .02$) compared with those who did not experience such difficulties.

Discussion

Scant information is available regarding prescription medication use and health outcomes in patients with asthma who receive care at FQHCs. The aims of this study were to describe patient access to prescription medications and use of asthma medications, and assess factors associated with asthma exacerbation, healthcare utilization, and self-rated health. Findings from this study showed that participants with asthma faced cost-related barriers in accessing their prescription medications, and poor access to medications was associated with lower self-rated health. Our results also indicated that participants who were currently using asthma controller medications were more likely to experience asthma exacerbations, hospitalizations, and ED visits compared with patients who never taken controller medications. These findings highlight the need for a multi-level approach to support asthma patient care and improve health outcomes.

This study found that approximately one-third of participants with asthma faced barriers in accessing their prescription medications. The primary reasons were related to cost (ie, could not afford them) and insurance. In addition, participants' inability to get prescription medications was significantly associated with lower self-rated health status. Although there have been limited studies conducted in FQHC patients with asthma to assess medication use, our study findings align with previous research. Shepherd et al[32] found that 38% of patients with chronic diseases in an FQHC were unable to fill their medications because they

Table 3. Medication-Related Factors in Patients With Asthma Treated at FQHCs.

Variables	N	%*
You or a doctor believed you needed prescription medicines within the last year	862	94.55
Were unable to get prescription medicines you or a doctor believed necessary within the last year	198	26.33
What was the main reason you were unable to get prescription medicine		
Could not afford prescription medicines	27	45.12
Insurance company would not pay/pharmacy refused to accept family insurance	18	39.14
Other	10	15.74
Were delayed in getting prescription medicines you or a doctor believed necessary within the last year	250	32.05
What was the main reason you were delayed in getting prescription medicine		
Could not afford prescription medicines	25	40.43
Insurance company would not pay/pharmacy refused to accept family insurance	19	28.1
Other	20	31.47
Controller asthma medication use		
Never taken controller asthma medication	390	49.48
Ever taken controller and currently taking controller asthma medication	416	37.33
Ever taken controller but currently not taking controller asthma medication	110	13.18

*Weighted percentages.

Table 4. Multivariable Association Between Explanatory Variables and Health Outcomes in Patients With Asthma Treated at FQHCs.

Outcomes	Asthma exacerbations		ED visits or hospitalizations		Self-rated health	
Variables	OR (95% CI)	*P* value	OR (95% CI)	*P* value	Coefficient (95% CI)	*P* value
Race/ethnicity						
Non-Hispanic White	**1**		**1**		**Base**	
Non-Hispanic Black	0.89 (0.37 to 2.14)	.79	2.72 **(1.15 to 6.43)**	**.022**	−0.41 **(−0.79 to −0.02)**	**.036**
Hispanic	1.10 (0.44 to 2.79)	.84	2.02 (0.83 to 4.91)	.12	−0.32 (−0.66 to 0.02)	.06
Non-Hispanic Others	0.50 (0.12 to 1.24)	.11	0.72 (0.23 to 2.24)	.57	0.16 (−0.39 to 0.72)	.57
Age						
18-44	**1**		**1**		**Base**	
45-64	1.94 (0.33 to 11.40)	.46	2.17 (0.30 to 15.46)	.44	−0.23 (−0.86 to 0.41)	.49
65 and older	0.50 (0.25 to 1.03)	.06	0.69 (0.32 to 1.51)	.36	−0.39 **(−0.63 to −0.15)**	**<.01**
Gender						
Male	**1**		**1**		**Base**	
Female	1.40 (0.67 to 2.90)	.366	0.70 (0.29 to 1.69)	.43	0.01 (−0.28 to 0.29)	.95
Education						
Less than high school	**1**		**1**		**Base**	
High school	1.12 (0.47 to 2.66)	.80	0.59 (0.25 to 1.42)	.24	−0.27 (−0.57 to 0.03)	.08
More than high school	1.37 (0.56 to 3.33)	.49	0.35 **(0.14 to 0.89)**	**0.027**	0.16 (−0.14 to 0.46)	.29
Insurance status						
Uninsured	**1**		**1**		**Base**	
Insured	1.43 (0.49 to 4.11)	.51	1.23 (0.42 to 3.65)	.71	−0.34 (−0.73 to 0.05)	.085
Geographical location						
Urban	**1**		**1**		**Base**	
Rural	0.79 (0.39 to 1.59)	.51	0.66 (0.29 to 1.51)	.32	−0.19 (−0.47 to 0.09)	.19
Were unable to get prescription medicines in the last 12 months						
No	**1**		**1**		**Base**	
Yes	1.71 (0.69 to 4.20)	.24	1.41 (0.65 to 3.08)	.38	−0.51 **(−0.94 to −0.08)**	**.02**
Were delayed in getting prescription medicines in the last 12 months						
No	**1**		**1**		**Base**	
Yes	1.30 (0.56 to 3.07)	.54	2.15 (0.95 to 4.87)	.06	−0.09 (−0.52 to 0.33)	.67
Controller asthma medication use						
Never taken a controller	**1**		**1**		**Base**	
Ever taken a controller and currently taking it	4.02 **(1.91 to 8.45)**	**<.01**	3.07 **(1.39 to 6.73)**	**<.01**	−0.13 (−0.39 to 0.13)	.33
Ever taken a controller but currently not taking it	1.01 (0.35 to 2.92)	.98	1.53 (0.49 to 4.79)	.47	−0.21 (−0.87 to 0.44)	.52

Abbreviations: CI, confidence interval; OR, odds ratio.
Bold font indicates statistical significance.

could not afford them. Cost-related barriers to access prescription medications have shown to negatively affect patients' adherence to medications and health outcomes, including asthma control and quality of life.[27,33-36] FQHCs may implement services such as the 340B drug pricing program (340B) and patient assistance programs (PAP) to reduce medication cost-related barriers and provide patients significant savings.[37,38] Previous research found that the implementation of 340B and PAP were associated with greater adherence to prescription medications in an FQHC setting.[26] Future research should examine factors that affect the broad implementation of cost-reducing strategies in FQHCs in an effort to improve access to prescription asthma medications and health status.

Our findings also showed that participants who were currently taking asthma controller medications were more likely to have experienced asthma exacerbations, hospitalizations, and ED visits in the past year compared with those who had never taken controller medications. A plausible explanation for these results is that healthcare providers within FQHCs prescribed asthma controller medications in response to patients' uncontrolled asthma in an effort to improve their health and well-being. Recent data found in the Uniform Data System, an annual reporting system that contains information about health center operations across the nation, showed that 85.95% of patients with persistent asthma received appropriate medications in 2019.[39] However, previous research found that the percentage of patients with persistent asthma receiving appropriate medications was significantly higher in FQHCs recognized as Patient Centered Medical Homes (PCMH) compared with non-PCMH FQHCs.[40,41] PCMH is a medical care model in which health centers strive to provide comprehensive, patient-centered, coordinated, accessible, high-quality, and safe care.[42] As of 2019, approximately 77.7% of FQHCs were recognized as PCMHs.[39] Future research could examine the implementation of innovative care models and educational strategies to support the provision of quality care and improve asthma patients' health outcomes in FQHCs.

Approximately half of study participants had never taken asthma controller medications, and 13% had taken them but currently were not taking them. The secondary data used in this study did not specify classifications of asthma severity, therefore it is not clear whether the participants who never took controller medication had only intermittent asthma that did not require the use of a daily controller medication, or had mild persistent asthma but were not prescribed any controller medications.[43] Clinical guidelines support the use of asthma controller medication to help patients with mild persistent asthma achieve control over the condition. However, previous research has found that patients with mild persistent asthma were sub-optimally prescribed controller medications.[44] Although the percentage of patients with persistent asthma in FQHCs who used appropriate asthma medications ranged between 78.85% and 84.33% in 2014,[40] research in other healthcare settings found that patients with lower socioeconomic status (SES) were at a higher risk of sub-optimal controller prescriptions than those with higher SES.[44] According to our study results most of the participants were from low SES, and half of them were from rural areas. Because services provided by FQHCs are mainly utilized by socioeconomically disadvantaged patients, future research is needed to assess the appropriateness of asthma medication use across different classifications of asthma severity in patients that are being treated in FQHC settings.

Limitations

This study has limitations that warrant mention. First, no causal relations or directionality can be inferred from the results due to the cross-sectional study design. Second, this study was conducted using secondary data which did not include variables that may have influenced findings. For example, information about the severity of asthma was not obtained from survey participants or medical records. Future research should collect additional information about the disease severity and related factors. Also, variables that assessed access to prescription medications were general for all medications and not specific to asthma. Third, the survey was collected by face-to-face interviews with patients who received care at FQHCs which could lead to recall bias and social desirability bias. However, previous research suggested that self-reports of annual infrequent events like hospitalizations and ED visits are mostly valid and reliable when compared to administrative data.[45] Finally, due to study design the results of this study are only generalizable to the population under study and cannot be generalized to other patient populations.

Implications

Our study findings lend themselves to a multi-level approach to supporting asthma care and outcomes in FQHCs. The National Institute on Minority Health and Health Disparities (NIMHD) research framework describes multiple levels of influencing factors that affect health outcomes in minority and underserved populations across different domains.[46] Interventions may target different levels of influencing factors within the healthcare system domain, including (1) individual, (2) interpersonal, and (3) community levels. At the individual patient level, bolstering patient-activation could help asthma patients in underserved communities improve their self-management behavior (eg, medication adherence) and asthma control.[47] Patient activation is the belief that patients have important roles in self-managing their care,

having the knowledge, skills, and behavioral ability to manage their condition, and the ability to collaborate with healthcare providers to maintain and prevent their health from declining.[48] While at the interpersonal level, supporting positive patient-provider relationships and promoting shared medical decision-making in developing asthma self-management plans and prescribing of asthma medications play important roles in ensuring patient centeredness of care and improving health outcomes.[49] Finally, at the community level, FQHCs could provide health services to alleviate barriers that hinder asthma patients' access to and use of prescription medications.

Conclusions

Findings from this study shed light on aspects of asthma medication use that could be improved to help patients achieve better health outcomes within FQHC settings. Efforts are needed to actively assess patients' access to medications and implement strategies to overcome barriers to support medication use and asthma control. FQHCs could benefit from implementing innovative multi-level strategies to ensure continuous improvement in asthma care and health outcomes.

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Research Ethics

This research did not require review by an institutional review board (IRB).

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