Published in final edited form as:

Res Social Adm Pharm. 2015 ; 11(6): 909–914. doi:10.1016/j.sapharm.2014.12.004.

Barriers to medication use in rural underserved patients with asthma

Henry N. Young, PhD¹, Shada Kanchanasuwan, PharmD¹, Elizabeth D. Cox, MD, PhD², Megan M. Moreno, MD, MEd, MPH³, and Nadra S. Havican, RN, BCPS⁴

¹Department of Clinical and Administrative Pharmacy, University of Georgia, Athens, GA, USA

²Department of Pediatrics, University of Wisconsin School of Medicine and Public Health, Madison, WI, USA

³Seattle Children's Research Institute, Seattle, WA, Department of Pediatrics, University of Washington, Seattle, WA, USA

⁴Family Health Center Pharmacy of Marshfield, Inc., Marshfield, WI, USA

Abstract

Background—Asthma control is especially challenging for underserved populations.

Medication use is critical to asthma control, but patients with asthma can experience barriers to using these medications.

Objectives—To assess the nature, frequency and impact of barriers to medication use in rural underserved patients with asthma.

Methods—A retrospective review of documentation from pharmacists' initial consultations with asthma patients was conducted. Pharmacist classified barriers in the following categories: knowledge, beliefs and practical issues. The Asthma Control Test (ACT) was used to assess disease control. Descriptive statistics and multivariate analyses were conducted.

Results—Documentation from 46 consultations were examined. Eighteen participants (39%) had knowledge barriers, 18 (39%) had belief barriers and 16 (35%) had practical barriers. In bivariate analyses, only belief barriers were related to significantly worse asthma control ($t=1.83$, $p=0.04$). Adjusted analyses found that participants with both belief and practical barriers had significantly worse asthma control ($\beta = -3.44$, $p=0.03$) in comparison to others without both barriers.

Conclusions—Barriers around medications beliefs were frequent and associated with worse asthma control. Programs that identify and tailor interventions to address these patient-specific barriers may improve outcomes in rural underserved patients with asthma.

Corresponding Author: Henry N. Young, PhD, Kroger Associate Professor, UGA Clinical and Administrative Pharmacy, Robert C. Wilson Pharmacy, 250 W. Green Street, Rm: 270-J, Athens, GA 30602, USA, hnyoung@uga.edu, Office Phone: (706) 542-0720, Fax: (706) 542-5228.

Publisher's Disclaimer: This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Keywords

asthma; medication use; rural; underserved

Introduction

Asthma affects approximately 25 million people in the US and is associated with morbidity and mortality, as well as poor quality of life.^{1–3} Although the prevalence of asthma is increasing at similar rates in urban and rural US populations, asthma care is problematic for rural and low-income residents.^{1,4,5} Self-management, including the use of medication, plays an important role in the control of asthma.⁶ Rescue and long-term controller asthma medications prevent exacerbations and help patients achieve asthma control and improve quality of life.⁷

Patients face barriers that hinder the safe and effective use of asthma medications, resulting in the common problem of poor adherence.^{8,9} The occurrence of barriers can vary from patient to patient and can be particularly burdensome in chronic disease management.¹⁰ Previous literature illustrates that barriers can include lack of knowledge, asthma-related beliefs and practical issues such as costs.⁷ Researchers have examined the relationships between barriers encountered by vulnerable inner-city/urban populations and adherence to asthma medication regimens. For example, Apter et al found that less knowledge regarding inhaled steroids was associated with non-adherence.¹¹ Sofianou et al found that illness and treatment beliefs influenced adherence to asthma controller medication in older asthmatics living in New York and Chicago.¹² Additionally, Halm et al found that an acute disease belief (i.e., “I only have asthma when I am having symptoms”) was associated with poor adherence to asthma controller medications in low-income New Yorkers with asthma.¹³

Less is known about barriers that affect specific at-risk patients such as low-income patients in rural areas.¹³ Moreover, scant research has examined whether patients encounter multiple asthma self-management barriers at once or whether specific barriers are associated with asthma outcomes.¹⁴ This study assesses low-income rural asthmatics’ barriers to adherence and how those barriers are associated with asthma control. It was hypothesized that individuals who experience barriers, particularly those with multiple barriers, will have worse asthma control than individuals who do not experience those barriers.

Methods

As part of a larger study, a retrospective review of the electronic documentation from pharmacists’ first telephone consultations with patients who received their asthma medications from the Family Health Center of Marshfield Inc.’s (FHC) 340B mail-order pharmacy was conducted.¹⁵ The FHC is a federally funded community health center that partners with a rural Wisconsin clinic to provide services to low-income patients (individuals living at or below 200% of the federal poverty level) who reside in medically underserved and/or health professional shortage areas. The FHC’s service area includes 14 counties. The FHC is based in a non-Metro county as designated by the Office of Rural Health Policy (Health Resources and Services Administration).¹⁶

Potential study participants were identified from electronic health records (medical and pharmacy). Patients were included if they were English-speaking, 19 years of age and older, and had a confirmed asthma diagnosis. Because the study focused on barriers to asthma medication use, patients who 1) had a medication possession ratio of less than 80% or over 120% for long-term controller asthma medications across a 6-month period or 2) received 3 acute or rescue asthma inhalers within a 3-month period were selected as the pool of potential study participants.

Research assistants mailed letters to prospective participants to introduce the study. Within a week of the mailings, research assistants called prospective participants to determine their willingness to enroll in the study. If an individual was willing to participate, then the research assistant obtained oral consent and conducted a baseline survey to obtain demographic information (age, gender, marital status, race/ethnicity, education, and smoking status). The Marshfield Clinic Research Foundation Institutional Review Board and the Health Sciences Institutional Review Board at the University of Wisconsin-Madison approved this study.

Study pharmacists used a standardized communication tool consisting of open-ended and probing questions to identify participants' barriers associated with the use of asthma medications during the consultations. Pharmacists electronically documented barriers that arose during the consultations. During the consultation, pharmacists classified the barriers in the following three categories: knowledge (e.g., misconceptions about drug purpose, doses, duration, routine, and technique), beliefs (e.g., low self-efficacy, doubt benefit, fear of long-term effects, and stigma) and practical (e.g., difficulty taking multiple drugs, administration, recall, tolerance/side effects, payment). The Asthma Control Test (ACT) was used to assess participants' control of asthma.¹⁷ The ACT consists of 5 items measured on a 5-point scale. ACT scores can range from 5 (not controlled) to 25 (completely controlled). An ACT score 20 is indicative of well-controlled asthma, ACT scores 16 to 19 indicate somewhat controlled, and ACT scores 15 indicate poorly controlled.¹⁸ Previous research has found the ACT to have good scale reliability and validity, and low patient burden and risk.¹⁹

Analysis

Descriptive statistics were calculated to characterize study participants, barriers, and asthma control. Bivariate analyses were conducted to examine the relationships between study variables. Multivariate regression analyses were used to examine the associations between asthma control and presence of the three specific categories of barriers (yes/no) adjusting for participant characteristics. To construct the most parsimonious models, a recommended approach of including covariates with associations of $p < 0.20$ with asthma control was implemented.²⁰ STATA MP version 13.0 was used to conduct the analyses.

Results

Documentation from pharmacists' consultations with 46 participants was examined in this study. The mean age of participants was 43.9 years old (SD=15.0), 74% were female and 96% white. Fifty-three percent of participants obtained less than a high school degree or

high school degree only, and approximately 25% were current smokers. The mean ACT score was 16.4 (SD=4.6).

Nature and Frequency of Barriers

Of 46 participants, 32 (70%) had at least one type of barrier (Table 1). Eighteen participants (39%) had at least one knowledge barrier, 18 (39%) had at least one belief barrier and 16 (35%) had at least one practical barrier. Participants often had more than one issue in the same barrier category (Table 2). The most common knowledge barriers included a lack of information about prescribed medications and/or asthma, misconceptions about inhaler technique, misunderstanding drug package insert information and the purpose of the medication (Table 3). Common belief barriers were low self-efficacy regarding asthma self-management and doubting the benefits of the medications. Regarding practical barriers, participants found difficulties with medication costs and forgetting when to take the medication. In addition, many participants had barriers across multiple categories. For example, ten participants (22%) had knowledge and belief barriers, 10 (22%) had practical and belief barriers, and 5 (11%) had knowledge and practical barriers. Five participants (11%) had all three types of barriers.

Associations between Barriers and Asthma Control

Bivariate analyses showed that participants with belief barriers had worse asthma control (lower ACT scores) in comparison to those without belief barriers ($t=1.83$, $p=0.04$). The existence of knowledge or practical barriers alone was not associated with asthma control. Examining the impact of experiencing barriers across more than one category, participants who had a combination of belief and practical barriers had worse asthma control compared to those who did not endorse barriers in both of these categories ($t=2.01$, $p=0.03$). After adjusting for participant characteristics, multivariate analyses showed that participants who had belief and practical barriers had worse asthma control ($\beta = -3.44$, $p=0.03$) in comparison to others.

Discussion

The present study details the nature and frequency of barriers that are encountered by low-income rural patients with asthma and the impact of these barriers on asthma control. Within a sample of adults with less than optimal adherence to asthma maintenance medications, the majority of participants had knowledge and beliefs barriers related to the use of asthma medication. However, only participants with barriers related to beliefs were associated with significantly worse asthma control. The recognition of the unique barriers each individual faces in adhering to medications calls for approaches that take into account patient-specific problems and implement solutions targeted toward resolving these problems.

Results from this study suggest that beliefs (cognition) may play an important role in asthma self-management and outcomes. According to the Social Cognitive Theory, cognition including self-efficacy (beliefs about one's ability to perform the behavior) and outcome expectancy (beliefs about the likely outcomes of enacting specific behaviors) greatly influence individuals' performance of behaviors.²¹ In this study, participants who

encountered barriers related to beliefs such as low self-efficacy and concerns about negative long-term effects had lower asthma control in comparison those without such barriers.

Addressing beliefs that influence behavior may be challenging in clinical practice. Clinicians could use motivational interviewing (MI) to address problems related to beliefs. MI is a theory-based skillful clinical method and style of counseling and psychotherapy designed for assessing patients' source of beliefs and assisting patients to commit to behavior change.²² MI has been found to help patients overcome barriers and adhere to prescribed regimens.²³ Additionally, future intervention research could focus on changing beliefs in an effort to support self-management behavior and improve subsequent outcomes. For example, the use of mobile health technologies such as smartphone applications could be constructed to support self-efficacy by providing role models of desired behaviors, mastery experiences of tracking personal outcomes, and feedback regarding the attainment of personal goals.²⁴

Study findings show significant relationships between the presence of multiple types of barriers to asthma medication use and health outcomes. Participants who had both belief and practical barriers had worse asthma control than those who did not. Previous researchers have found that perceived benefits of the medication, concerns about the adverse effects, cost issues and forgetfulness influence patients' adherence to asthma medications.^{14,25} To the best of the researchers' knowledge, this is the first study to show that barriers to asthma medication use, including combinations of those barriers, are associated with asthma outcomes. Within this sample of participants with questionable adherence to asthma medications, asthma on average was somewhat controlled (mean ACT score of 16.4). Results suggest that patients with suboptimal adherence may not only face certain barriers (including combinations of barriers) when using asthma medications, but also that those barriers may contribute to their control over the disease.

Similar to previous studies, many of the barriers documented in this study were related to knowledge deficits and beliefs about medicines. Participants had misunderstandings about the purpose of the medication and inhaler technique.²⁶ In addition, some participants indicated doubts in their abilities to management asthma and questioned the benefits of using asthma medication.¹² These barriers may stem from poor patient-provider communication regarding how to use the medications appropriately and the role medications play in the self-management of asthma (e.g., controller medication to treat underlying inflammation).²⁷ Patient education and counseling that addresses common knowledge and belief barriers may be of benefit in the health education of adults with asthma.²⁸

This study has limitations that warrant mention. First, the relatively small sample size may limit the ability to detect associations between adherence barriers and asthma control. However, despite the sample size, significant associations were found between adherence barriers and asthma control. Next, the data were abstracted from pharmacists' documentation of their interactions with participants, thus results could be influenced by pharmacists' interpretation of patients' barriers. However, study findings are similar to previous study results based upon participants' self-reports. Third, this study only examined barriers to asthma self-management in a low-income rural population that consisted

primarily of white participants. Thus, study results may not be generalizable to asthma patients broadly or to specific underserved groups. For example, future studies could validate these findings in low-income rural populations consisting of ethnic and racial minorities.

Conclusion

Findings from this study show that low-income rural asthmatics encounter different barriers to asthma self-management and suggest that barriers related to beliefs are associated with problematic disease control. These findings support the need for programs to identify patient-specific barriers and tailor interventions to reduce or eliminate those barriers in an effort to improve asthma self-management and ultimately outcomes.²⁹

Acknowledgments

This project was supported by grant 1UL1RR025011 from the Clinical & Translational Science Award (CTSA) program of the National Center for Research Resources, National Institutes of Health.

References

1. Akinbami LJ, Moorman JE, Liu X. Asthma prevalence, health care use, and mortality: United States, 2005–2009. *Natl Health Stat Report*. 2011;1–14. [PubMed: 21355352]
2. American Lung Association. Trends in Asthma Morbidity and Mortality. 2010.
3. Chen H, Gould MK, Blanc PD, et al. Asthma control, severity, and quality of life: quantifying the effect of uncontrolled disease. *J Allergy Clin Immunol*. 2007; 120:396–402. [PubMed: 17561244]
4. Jackson, JE.; Doescher, MP.; Hart, LG. [Accessed September 14, 2010] A national study of lifetime asthma prevalence and trends in metro and non-metro counties, 2000–2003. Jan. 2007 http://depts.washington.edu/uwrhrc/uploads/RHRC_WP108_Jackson.pdf
5. Ownby DR. Asthma in rural America. *Ann Allergy Asthma Immunol*. 2005; 95(5 Suppl 1):S17–22. [PubMed: 16312158]
6. Horne R. Compliance, adherence, and concordance: implications for asthma treatment. *Chest*. 2006; 130(1 Suppl):65S–72S. [PubMed: 16840369]
7. Howell G. Nonadherence to medical therapy in asthma: risk factors, barriers, and strategies for improving. *J Asthma*. 2008; 45:723–729. [PubMed: 18972285]
8. Bender BG, Bender SE. Patient-identified barriers to asthma treatment adherence: responses to interviews, focus groups, and questionnaires. *Immunology and allergy clinics of North America*. 2005; 25:107–130. [PubMed: 15579367]
9. Gillisen A. Patient's adherence in asthma. *J Physiol Pharmacol*. 2007; 58(Suppl 5)(Pt 1):205–222. [PubMed: 18204131]
10. Cox ED, Fritz KA, Hansen KW, et al. Development and validation of PRISM: A survey tool to identify diabetes self-management barriers. *Diabetes research and clinical practice*. 2014; 104:126–135. [PubMed: 24552680]
11. Apter AJ, Reisine ST, Affleck G, Barrows E, ZuWallack RL. Adherence with twice-daily dosing of inhaled steroids. Socioeconomic and health-belief differences. *Am J Respir Crit Care Med*. 1998; 157(6 Pt 1):1810–1817. [PubMed: 9620910]
12. Sofianou A, Martynenko M, Wolf MS, et al. Asthma Beliefs Are Associated with Medication Adherence in Older Asthmatics. *Journal of General Internal Medicine*. 2013; 28:67–73. [PubMed: 22878848]
13. Halm EA, Mora P, Leventhal H. No symptoms, no asthma: the acute episodic disease belief is associated with poor self-management among inner-city adults with persistent asthma. *Chest*. 2006; 129:573–580. [PubMed: 16537854]

14. Unni E, Farris KB. Determinants of different types of medication non-adherence in cholesterol lowering and asthma maintenance medications: a theoretical approach. *Patient Educ Couns*. 2011; 83:382–390. [PubMed: 21454030]
15. Young HN, Havican SN, Griesbach S, Thorpe JM, Chewning BA, Sorkness CA. Patient and pharmacist telephonic encounters (PARTE) in an underserved rural patient population with asthma: results of a pilot study. *Telemed J E Health*. 2012; 18:427–433. [PubMed: 22656403]
16. The Office of Rural Health Policy (HRSA). [Accessed November 25, 2012] List of rural counties and designated eligible census tracts in metropolitan counties. 2009. <ftp://ftp.hrsa.gov/ruralhealth/eligibility2005.pdf>
17. Nathan RA, Sorkness CA, Kosinski M, et al. Development of the asthma control test: A survey for assessing asthma control. *Journal of Allergy and Clinical Immunology*. 2004; 113:59–65. [PubMed: 14713908]
18. Schatz M, Sorkness CA, Li JT, et al. Asthma Control Test: reliability, validity, and responsiveness in patients not previously followed by asthma specialists. *J Allergy Clin Immunol*. 2006; 117:549–556. [PubMed: 16522452]
19. Cloutier MM, Schatz M, Castro M, et al. Asthma outcomes: Composite scores of asthma control. *Journal of Allergy and Clinical Immunology*. 2012; 129:S24–S33. [PubMed: 22386507]
20. Maldonado G, Greenland S. Simulation study of confounder-selection strategies. *Am J Epidemiol*. 1993; 138:923–936. [PubMed: 8256780]
21. Bandura, A. *Social foundations of thought and action : a social cognitive theory*. Englewood Cliffs, N.J: Prentice-Hall; 1986.
22. Possidente CJ, Bucci KK, McClain WJ. Motivational interviewing: a tool to improve medication adherence? *Am J Health Syst Pharm*. 2005; 62:1311–1314. [PubMed: 15947131]
23. Borrelli B, Riekert KA, Weinstein A, Rathier L. Brief motivational interviewing as a clinical strategy to promote asthma medication adherence. *J Allergy Clin Immunol*. 2007; 120:1023–1030. [PubMed: 17904625]
24. Bandura, A. *Self-efficacy: the exercise of control*. New York: Freeman; 1997.
25. George M, Freedman TG, Norfleet AL, Feldman HI, Apter AJ. Qualitative research-enhanced understanding of patients' beliefs: results of focus groups with low-income, urban, African American adults with asthma. *J Allergy Clin Immunol*. 2003; 111:967–973. [PubMed: 12743559]
26. Price D, Bosnic-Anticevich S, Briggs A, et al. Inhaler competence in asthma: common errors, barriers to use and recommended solutions. *Respir Med*. 2013; 107:37–46. [PubMed: 23098685]
27. Blaiss MS, Kaliner MA, Baena-Cagnani CE, Dahl R, Valovirta EJ, Canonica GW. Barriers to asthma treatment in the United States: results from the global asthma physician and patient survey. *The World Allergy Organization journal*. 2009; 2:303–313. [PubMed: 23282317]
28. Hand CH, Bradley C. Health beliefs of adults with asthma: toward an understanding of the difference between symptomatic and preventive use of inhaler treatment. *J Asthma*. 1996; 33:331–338. [PubMed: 8827940]
29. Touchette DR, Shapiro NL. Medication compliance, adherence, and persistence: Current status of behavioral and educational interventions to improve outcomes. *Journal of Managed Care Pharmacy*. 2008; 14:S2–S10.

Article Synopsis

This study describes barriers hindering rural underserved patients' use of asthma medications and associations with disease control. A retrospective review of documentation from pharmacists' consultations with patients was conducted. The analyses revealed issues related to knowledge deficits (39%), beliefs about medications (39%), and practical challenges (35%). However, only barriers related to beliefs were associated with significantly worse asthma control. Programs that identify and tailor interventions to address these patient-specific barriers may improve medication use and outcomes in rural underserved patients with asthma.

Table 1

Number of participants who experienced barriers and mean asthma control of participants with respective barriers (N=46)

Barriers	n	ACT Score Mean (sd)
At least one barrier	32	16.0 (0.8)
No barriers	14	17.2 (1.1)
Knowledge Barriers	18	15.8 (5.1)
Belief Barriers	18	14.9 (4.1)
Practical Barriers	16	15.4 (3.5)
Multiple Barriers		
Belief and Practical Barriers	10	13.9 (2.8)
Belief and Knowledge Barriers	10	14.6 (3.0)
Knowledge and Practical Barriers	5	14.2 (1.6)
All three barriers	5	14.2 (1.6)

Table 2

Number of participants with one or more barriers within a category (N=46)

Categories	Participants (n)
Number of Knowledge Barriers	
1	12
2	11
3	10
4	4
Number of Belief Barriers	
1	15
2	3
Number of Practical Barriers	
1	13
2	3

Table 3

Specific barriers identified from electronic records

Participants (N)	
Knowledge Barrier	
Misconception: administration technique	13
Misconception: purpose of medication	7
Misconception: medication dose	3
Misconception: duration of therapy	1
Misconception: medication schedule	1
Belief Barriers	
Low self-efficacy about self-management	7
Doubt benefit of medication	7
Fear long-term effects of medication	5
Others	2
Practical Barriers	
Cost	6
Hard to recall (forgetting)	6
Hard to take so many medications	2
Hard to tolerate	1
Others	3