The Effect of Patient Race on Patient-Provider Communication with Pediatric Asthma Patients

Deidre Washington

A dissertation submitted to the faculty of the University of North Carolina at Chapel Hill in partial fulfillment of the requirements for the degree of Doctor of Philosophy in the Division of Pharmaceutical Outcomes and Policy

Chapel Hill
2010

Approved by:

Susan Blalock, Ph.D.
Stephanie Davis, M.D.
Jaya Rao, M.D.
Betsy Sleath, Ph.D.
Dennis Williams, PharmD

ABSTRACT
DEIDRE WASHINGTON: The Effect of Patient Race on Patient-Provider Communication with Pediatric Asthma Patients
(Under the direction of Dr. Susan Blalock)

Asthma is one of the most common chronic pediatric conditions in the United States. African-Americans and other racial/ethnic minority groups are disproportionately affected, having a higher prevalence and suffering more adverse health outcomes. The National Asthma Education and Prevention Program has issued guidelines to assist physicians and other healthcare providers with the diagnosis and management of asthma. In addition to specific topics of asthma management, such as symptom monitoring and pulmonary function tests, the guidelines also emphasize the importance of effective communication when discussing topics of asthma management. Effective patient-provider communication is an important aspect of quality of care and has been linked with improved health outcomes. The objective of this research was to determine whether patient race was associated with differences in patient-provider communication about selected asthma management topics.

This was a cross-sectional secondary analysis of survey and clinic visit audiotape data collected in North Carolina from 2006 to 2009 from physicians at pediatric and general practice clinics, patients with asthma, and their caregivers (parents). An instrument developed specifically for this research was used to code communication information from transcripts of the audiotapes. Multivariate analyses were used to examine the association of patient race with communication about four selected asthma management topics.

Overall, selected topics of asthma management were shown to be discussed to varying degrees during the course of these medical visits, not necessarily in accordance with the recommended guidelines. The results from multivariate analysis did not show any significant association between patient race and communication regarding the selected asthma management topics. The interaction between patient race and the reason for the visit was also not significantly associated with communication regarding the selected topics. Patients visiting the doctor for annual check-ups and other reasons unrelated to asthma were generally less likely to discuss asthma management than those visiting the doctor for an asthma-related reason.

The results from this study suggest that patient-provider communication regarding asthma management topics is not associated with patient race, and is not contributing to disparities in this population. Additional research is needed to understand the source of observed health disparities in pediatric asthma patients.

ACKNOWLEDGEMENTS

I am indebted to the many people who helped me to reach this tremendous milestone. Throughout my time at UNC, I have been very fortunate to have had an abundance of both professional and personal support, and I am eternally grateful to all who have assisted me along the way.

Firstly, I would like to thank Dr. Susan Blalock, my dissertation advisor, for her direction and guidance throughout this entire process. I feel privileged to have worked with Dr. Blalock, and know that I will be a better researcher thanks to her. I would also like to thank Dr. Betsy Sleath for her mentorship from the time I started here, and for allowing me the opportunity to develop this research from her study. Thanks to the other members of my committee, Drs. Stephanie Davis, Jaya Rao and Dennis Williams for offering their time, clinical expertise and enthusiastic support.

I have learned so much during my time here in DPOP, and I thank the faculty, staff and students for providing such a rich and fun learning environment.

Thanks to the National Heart, Lung, and Blood Institute and the PhRMA Foundation for providing financial support for this dissertation research.

I could not have completed my dissertation with the efforts and dedication of the hardworking project manager and research assistants involved with this project. A special thanks to Brenda, Allison, Maurice and Chris for putting up with me, especially when I was constantly bugging you for this and that.

To my friends and family, words cannot express my gratitude for your constant love and support. You've been right with me from the beginning, through all the highs and lows along the way. The good times and laughter we shared helped me keep going when the times weren't so good. Thanks to you all, especially Renita, Chandra, Erica, Adeola, Dwana, Monique, Amica, and Holly. And an extra special thanks to my biggest cheerleaders, the Alston and Ingram families.

Finally, to Mom, Dad and Steven, your love, support, and encouragement have made all the difference in the world. I feel truly blessed to have you as my family, and will never be able to re-pay everything that you have done for me. However, please know that I love you all very much, and would not have achieved this without you.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

CSD	Comprehensiveness of the Symptom Discussion
ED	Emergency Department
FEF	Forced Expiratory Flow
FEV	Forced Expiratory Volume
FVC	Forced Vital Capacity
NAEPP	National Asthma Education and Prevention Program
NHLBI	National Heart, Lung, and Blood Institute
PCI	Primary Coding Instrument
QoL	Quality of Life
RIAS	Roter Interaction Analysis System
SCI	Supplemental Coding Instrument

CHAPTER ONE: INTRODUCTION

Asthma is a chronic lung disease characterized by the inflammation and narrowing of the airways (NHLBI 2008). Approximately 6.7 million children in the United States are affected by asthma, making it one of the most common chronic pediatric conditions in the country (Akinbami, Moorman et al. 2009). It is a major cause of childhood disability, and can place significant burdens on the child and their family, including missed school days, limitations in activities, such as sports and play, and increased medical costs (Juniper 1997; Newacheck and Halfon 2000; Braman 2006).

Although there is no cure for asthma, with appropriate management it can be well-controlled, significantly reducing the burden experienced by the patient and family. The National Asthma Education and Prevention Program (NAEPP), an initiative of the National Institutes of Health, has issued comprehensive guidelines for physicians and other health care providers, which include recommendations for the ongoing management and treatment of asthma (NHLBI 2007). These guidelines, which rely on clear and effective communication between the patient, their caregiver (parent/legal guardian), and the healthcare provider, can help physicians manage asthma effectively in their patients, thereby reducing the burden for the patient and their family.

Asthma, being one of the most prevalent chronic conditions in children, is a serious public health concern, and as such, has been studied extensively by the research and medical communities. Over the past several years, a convincing body of research has emerged to

indicate that the burdens of asthma are not experienced equally among all children diagnosed with this condition (Akinbami, LaFleur et al. 2002; Canino, Koinis-Mitchell et al. 2006). Specifically, racial disparities in asthma prevalence and outcomes have been reported for several years, and continue to persist today (Targonski, Persky et al. 1994; Evans, Sadowski et al. 2009). African-American children, as well as children of other racial minority groups, are more likely to experience adverse outcomes related to asthma, including emergency department visits, hospitalizations, and death, compared to white children (Erickson, Iribarren et al. 2007). These disparities in adverse outcomes cannot be attributed to racial disparities in prevalence alone, suggesting that other contributory factors need to be identified (Cabana, Lara et al. 2007).

Racial disparities are complex, and likely have multiple contributing factors, such as environmental and socioeconomic factors (Srinivasan, O'Fallon et al. 2003; Adler and Rehkopf 2008). As stated above, the persistence of racial disparities in asthma has been well established; however, less is known concerning exactly how they arise. Disparities are not specific to asthma; several conditions, including hypertension, diabetes, and certain cancers, are associated with racial disparities (Hertz, Unger et al. 2005; Viswanath and Emmons 2006; Peek, Cargill et al. 2007). Some causes of racial disparities, especially those outside of the health care system, may be common across conditions and disease states (e.g., socioeconomic conditions may contribute to disparities across many conditions) (Williams and Jackson 2005). However, others may be more specific to certain diseases (e.g., a delay in mammography screening for African-American women leading to higher breast cancer mortality) (Peek and Han 2004).

Specific causes of racial disparities in pediatric asthma patients have not been conclusively identified. In particular, research has not determined whether recommendations outlined in the national guidelines are adhered to equally, independent of the patient's race. Optimal asthma control based on the guidelines is dependent on the ability of the patient, their caregiver, and the physician to communicate effectively about the child's asthma, including asthma symptoms, lung function, quality of life, and medication use. If differences in communication concerning these topics are associated with patient race, it will contribute to the body of knowledge on possible causes of disparities in this population. The observed racial disparities in health outcomes (emergency visits, hospitalizations, etc) would suggest that optimal asthma control is not being achieved equitably.

Identifying the causes of health disparities is an important first step in reducing these disparities. From this information, effective interventions may be designed and implemented to reduce and eventually eliminate disparities in pediatric asthma, as well as other conditions. In order to determine whether patient-provider communication contributes to disparities in this population, this study was designed to determine whether patient race is associated with differences in communication regarding four asthma management topics: 1) symptoms, 2) lung function, 3) quality of life, and 4) control medication adherence.

This study is a secondary analysis of data collected as part of a larger National Heart, Lung and Blood Institute funded study examining patient-provider communication and health outcomes in pediatric asthma patients. The data were collected from five pediatricians' offices in North Carolina from June 2006 through August 2009. The study involved audio-recording medical visits between pediatric asthma patients, their parents, and healthcare providers. The patient and their caregiver also completed questionnaires immediately

following the visit. Patients took a spirometry test if one was not administered during the visit. During a home visit approximately one month after the office visit, questionnaires and spirometry were re-administered to the patient, and caregiver also completed another questionnaire as well.

This dissertation is organized into six chapters. Chapter Two provides background information on pediatric asthma management, and a review of the literature on patient-provider communication and racial disparities in pediatric asthma. Chapter Three describes the conceptual model constructed to guide this study. Chapter Four outlines the research methods involved in data collection and analysis. Chapter Five provides the results of the analyses. Finally, Chapter 6 reviews the major study findings, and discusses the implications of study findings, study limitations, and directions for future research.

CHAPTER TWO: BACKGROUND AND SIGNIFICANCE

Overview

This chapter introduces the problem of pediatric asthma in the US, and outlines previous research on both patient-provider communication and racial disparities in pediatric asthma. The chapter concludes by reviewing previous research to identify the causes of racial disparities, and notes that patient-provider communication and its association with race has not been extensively studied in a pediatric asthma population, providing the rationale for this study. This chapter is organized into the following five sections:

- Pediatric Asthma Overview
- Asthma Management
- Communication About Asthma and Asthma Management
- Racial Disparities in Pediatric Asthma
- Causes/Contributors to Racial Disparities

The **Pediatric Asthma Overview** section provides a brief overview of pediatric asthma in the United States, including prevalence and outcomes, demonstrating that it is a serious public health concern. It also introduces select topics from the national guidelines for the treatment of asthma that have been developed by the National Asthma Education and Prevention Program (NAEPP). The **Asthma Management** section discusses the topics of asthma management which were the focus of this research: asthma symptom monitoring, pulmonary function, asthma-related quality of life, and control medication adherence. The

Communication and Asthma Management section outlines the importance of patient-provider communication in the management of asthma, including relevant recommendations included in the NAEPP guidelines, and previous research that has been conducted to understand and improve communication with pediatric asthma patients. The **Racial Disparities in Pediatric Asthma** section provides information concerning the racial disparities that have been observed in pediatric asthma, focusing on health outcomes. Finally, the **Causes/Contributors to Racial Disparities** section summarizes previous research to understand the factors that contribute to health disparities. Patient-provider communication emerges as an area that warrants further research as a potential contributor to disparities in this population. This section also highlights the need to determine the mechanisms through which communication may contribute to disparities, in order to aggressively address the problem.

Pediatric Asthma Overview

Introduction

Asthma is a chronic lung disease characterized by the inflammation and narrowing of the airways (NHLBI 2008). It is one of the most common chronic pediatric diseases in the U.S. (Galant, Crawford et al. 2004; Camargo Jr, Ramachandran et al. 2007). In 2005, almost 9% of children in the U.S. (aged 2-17), or 6.5 million children, were reported to have current asthma (Akinbami 2006). In 2006, this number increased to 6.8 million (Bloom and Cohen 2009). Asthma is a major cause of childhood disability and can place a heavy burden on children and their families (Newacheck and Halfon 2000; Williams 2006). In the most severe cases, asthma may be fatal. For these reasons, the Centers for Disease Control and Prevention

asserts that asthma continues to be a significant public health problem and should remain a priority for the research and medical communities (Akinbami 2006).

Health Outcomes, Healthcare Utilization, and Costs

Children who have been diagnosed with asthma are likely to experience associated symptoms at some point. The most common symptoms associated with asthma are shortness of breath, cough, wheezing, and chest pain or tightness (Akinbami 2006; Bailey, Castro et al. 2008) The onset of these symptoms, especially when severe, can lead to adverse outcomes, including limitations in functional activities, decreased quality of life, and missed school days (Diette, Markson et al. 2000). The onset of severe symptoms may also be associated with increased healthcare utilization, including primary care visits, emergency department (ED) visits, and hospitalizations; in turn, increased healthcare utilization may lead to increased costs for the family. Since 2000, outpatient care *for pediatric asthma* has increased, even though during this time the overall rates of outpatient care for children did not increase (Hing, Cherry et al. 2006). In 2004, children with asthma made approximately 6.5 million visits to physician offices and 500,000 visits to hospital outpatient departments, resulting in a total of seven million outpatient visits. Although outpatient visits can be time-consuming and costly, effective outpatient care may prevent additional, even more costly healthcare use, such as ED visits and hospitalizations (Lieu and Quesenberry Jr 1997). Annually, pediatric asthma is responsible for 658,000 to 754,000 ED visits (Camargo Jr, Ramachandran et al. 2007; Coffman, Cabana et al. 2008), and an additional 200,000 hospitalizations.

Together, ED visits and hospitalizations account for almost three-fourths of the direct costs of asthma (Lieu and Quesenberry Jr 1997). Based on a review of Medical Expenditure Panel Survey data in 1996 (using 2003 dollars), direct medical expenditures from pediatric asthma amounted to $1009.8 million ($401 per child with asthma) and included payments for prescribed medicine, hospital inpatient stays, hospital outpatient care, emergency room visits, and office-based visits (Wang, Zhong et al. 2005). In addition to direct medical costs, several indirect costs, which are more difficult to quantify, may be incurred. For example, asthma is the most reported cause of school absenteeism for children, accounting for 10-15 million missed school days annually (O'Connell 2004; Newcomb 2006; Burkhart, Rayens et al. 2007). In general, children with asthma miss 1.5-2 more days per school year than children without asthma (Bonilla, Kehl et al. 2005; Moonie, Sterling et al. 2006). Finally, asthma may affect quality of life for the child and his/her family through missed time from work, inability to play and decreased family time.

National Guidelines

The National Asthma Education and Prevention Program (NAEPP) was initiated under the National Heart, Lung, and Blood Institute of the National Institutes of Health to address issues relating to asthma management. The NAEPP expert panel has issued *Guidelines for the Diagnosis and Management of Asthma* to provide comprehensive guidance to health care providers regarding four specific aspects of asthma care: 1) assessment and monitoring, 2) patient education, 3) control of factors contributing to asthma severity, and 4) treatment with medication. Only those aspects that directly relate to this

research are referenced here, including severity classification, pharmacotherapy (medications), and patient-provider communication.

The first version of the guidelines was published in 1991, with updates released in 1997 (selected topics updated in 2002) and 2007. The 1997/2002 report was the most current when data collection began under the protocol of the parent grant. All references to the NAEPP guidelines refer to the 1997/2002 version, unless otherwise noted. The major differences between the 1997 and 2007 guidelines is an increased emphasis on assessing asthma control rather than severity in the latest report.

Asthma Severity Classifications

The 2007 guidelines classify asthma into 4 distinct severity groups based on several impairment criteria, including symptoms, nighttime awakenings, rescue medication use, activity limitations and lung function. In order of increasing severity, the four groups are: 1) intermittent, 2) mild persistent, 3) moderate persistent and 4) severe persistent. A more detailed example is presented in Appendix 1.

Medications

Most asthma can be managed with the proper use of medications. Several classes of medications are available and are prescribed to manage/reduce asthma symptoms, improve quality of life, reduce the frequency and severity of exacerbations, and reverse airflow obstruction (NHLBI 2007). Medications are categorized into two groups: long-term preventive (control) medications and quick-relief (rescue) medications. Control medications, normally prescribed to use everyday, are indicated to maintain control of persistent asthma,

and rescue medications are indicated to treat acute symptoms and exacerbations (NHLBI 2007). Daily control medication use can reduce exacerbations, as well as over-dependence on rescue medications, which has been observed in pediatric asthma patients (Butz, Tsoukleris et al. 2006). Also, according to NAEPP guidelines, patients who have been diagnosed with persistent asthma require a medication from both groups. Below, Table 1 lists some common classes of medications, along with some commonly recognized brand names. Table 1 was constructed from the most recent version of the NAEPP guidelines and the master medication list from the parent grant. Many pediatric patients with asthma also have allergies, and antihistamines may be prescribed, in addition to asthma medications, to help alleviate certain asthma and/or allergy symptoms (Reicin, White et al. 2000; Baki 2002).

Summary

In summary, pediatric asthma is a common and serious problem. For the millions of children in the U.S. who are affected by asthma, consequences of the disease may include increased health-care utilization, increased family costs, missed school, and missed work for parents/caregivers. The National Heart, Lung, and Blood Institute of the NIH has developed and updated comprehensive guidelines that physicians and other health care providers can use to diagnose and treat asthma. These guidelines include information on asthma severity and appropriate medications for management.

Table 1. Common Classes of Asthma Medications (from 2007 NAEPP guidelines and parent grant Medication List)

Class	Generic Name	Common Brand Name
Rescue (Quick-Relief)		
Short-acting beta agonists	Albuterol, Levalbuterol, Pirbuterol	Proventil®, Xopenex®, Maxair®
Control (Preventive)		
Inhaled Corticosteroids (ICS)	Budesonide	Pulmicort®, Rhinocort®
	Fluticasone	Flovent®, Flonase®
	Mometasone	Asmanex®, Nasonex®
	Triamcinolone	Azmacort®, Nasocort®
Systemic Corticosteroids	Prednisone	Deltasone®
Long-acting Beta Agonist	Salmeterol	Serevent®
Inhaled corticosteroid and long-acting beta agonist	Salmeterol and fluticasone	Advair®
Leukotriene Modifiers	Montelukast	Singulair®
Mast-cell Stabilizer	Cromolyn sodium, Nedocromil	Intal®, Tilade®
Immunomodulators/ Monoclonal antibodies	Omalizumab	Xolair®
Methylxanthines	Theophylline	Slo-bid®, Theo-Dur®

Asthma Management

This section introduces four important aspects of asthma management: 1) asthma symptom monitoring, 2) pulmonary function monitoring, 3) asthma-related quality of life and 4) control medication adherence. The next section describes the importance of patient-provider communication for asthma management overall, with an emphasis on these four topics.

Asthma Symptom Monitoring

An integral part of asthma management involves the ability of the patient and parent to identify and control asthma symptoms (coughing, wheezing, chest pain or tightness, and shortness of breath). The guidelines recommend that every patient who has asthma should be taught by their physician to recognize symptom patterns that indicate inadequate asthma control. The guidelines also recommend that symptoms and clinical signs of asthma should be assessed at each health care visit through physical examination and appropriate questions, preferably over a short (2-4 week) recall period. Many children with asthma experience symptoms. In one study of 121 children with asthma, 51% of the children reported one to four symptoms days during the last month (Butz, Walker et al. 2007). Nighttime symptoms and exercise-induced symptoms are specific indicators of inadequate asthma control (Diette, Markson et al. 2000; Fiese, Winter et al. 2007; Henry and Robert 2008). Determining symptom frequency is also an important element of asthma management. It is often used to make an initial diagnosis of asthma, as well as to determine severity (Magzamen, Patel et al. 2008; Thorsteinsdottir, Volcheck et al. 2008).

Pulmonary Function Monitoring

Spirometry

A second important aspect of asthma management includes monitoring pulmonary function. One method of measuring pulmonary function is spirometry. Spirometry is a physiological test that measures how an individual inhales or exhales volumes of air as a function of time (Miller, Hankinson et al. 2005). The administration of a spirometry test includes having the subject take a big breath in, inhaling as much air as possible until lungs

are as full as possible, followed by having the subject immediately blow all the air out as hard and fast as possible until no more air comes out. Finally, the subject inhales again as forcibly and fully as possible, completing one test cycle. This procedure should be repeated until three acceptable tests are obtained (Sleath, Ayala et al. 2006; Council-Australia 2009). Acceptability criteria is extensive, and includes, but is not limited to: no premature termination, no cough, and no evidence that the patient took an additional breath during expiration (Council-Australia 2009). Three common measurements from spirometry are the forced vital capacity (FVC), the forced expiratory volume in one second (FEV_1), and forced expiratory flow between 25% and 75% of the FVC (FEF_{25-75}). The forced vital capacity (FVC) is the maximal volume of air forcibly exhaled from the point of maximal inhalation. The forced expiratory volume in one second (FEV_1) is the volume of air forcibly exhaled during the first second of the FVC. The forced expiratory flow between 25% and 75% of the FVC (FEF_{25-75}) is the mean volume of air exhaled over the middle half of the FVC, and is regarded as a sensitive measure of small airway narrowing, and may be more relevant for patients with mild asthma (Council-Australia 2009). The subject's scores are compared against expected values to assess possible airway obstruction. Expected spirometry values vary, and depend on the patient's height, age, sex, and racial or ethnic background (Margolis, Montoya et al. 1997; Petty 2001). For example, when the FEV_1/FVC ratio is lower than normal (<70%), there may be airflow obstruction. Assessment by spirometry is not necessarily indicated at every asthma visit. A spirometry test should be administered every 1-2 years to assess the maintenance of airway function, according to the NAEPP guidelines (NHLBI 2007). However, the test may be administered more often, depending on asthma severity and response to management. A spirometry test is administered in a medical office

by a nurse, or other trained healthcare professional. Not all primary care clinics have the capability to administer spirometry.

Peak Flow Meter Use

A second method of monitoring pulmonary function is a peak flow assessment with a hand-held peak flow meter. A peak flow meter measures peak expiratory flow, which is how fast one can exhale air after a maximum inhalation. A peak flow meter measures airway constriction and can detect lung airway narrowing hours or days before symptoms occur (Burkhart, Rayens et al. 2007). Unlike spirometry, peak flow measurements can be taken at home, as well as in a medical office. As with spirometry, normal "expected" values depend on patient characteristics such as age, height, etc. The 1997/2002 guidelines recommend that daily peak flow monitoring should be considered for patients with moderate or severe persistent asthma, as well as for those with mild asthma who do not perceive their symptoms until airway constriction is severe. Peak flow meter use is almost always accompanied by an asthma action plan. This action plan has instructions about what should be done for the patient (e.g use of rescue inhaler or seeking immediate medical treatment), based on where the results fall along a continuum. Peak flow monitoring has been associated with improved health outcomes in school-aged children (Burkhart, Rayens et al. 2007). Poor peak flow measurements may indicate that the asthma is not being managed very well by the patient in between medical visits (e.g., poor adherence to preventive medications).

As stated above, in earlier editions of the NAEPP guidelines, daily peak flow monitoring was recommended for patients with moderate-to-severe asthma (NHLBI 1997). The use of peak flow meters was somewhat deemphasized in the 2007 guidelines (NHLBI

2007). The 2007 edition of the guidelines states that "although peak flow monitoring to guide chronic asthma management has been reported to be valuable….the results are not consistent enough for this tool to be recommended uniformly for all asthma patients. Thus, the relative usefulness of peak flow measurements as monitoring tools can be individualized…" In addition the 2007 edition also cites a systematic review of the evidence, conducted in 2002, concluding that previous studies did not clearly show that a peak-flow monitoring-based action plan was better than a symptom monitoring-based plan in improving asthma outcomes. Therefore, the 2007 edition is different from the 1997/2002 editions in that the recommendation for daily peak flow monitoring was deleted.

Asthma-Related Quality of Life

In addition to symptoms, children with asthma may also be bothered by the physical, social, educational and emotional impairments that they experience as a result of having asthma (Usherwood, Scrimgeour et al. 1990; Nocon 1991; Townsend, Feeny et al. 1991; Christie, French et al. 1993). Asthma-related quality of life measures can indicate how much the patient's disease interferes with daily life, and how well the patient is adapting to living with asthma. As such, physicians may use quality of life (QoL) in their decisions about treatment planning and medication use (Everhart and Fiese 2009). Decreases in quality of life, particularly activity limitations, are associated with poor asthma control (Mudd, Bollinger et al. 2006). Children with asthma often report lower quality of life compared to children without asthma, meaning children with asthma are more likely to report activity limitations due to asthma, report negative emotions, and miss more school (Marsac, Funk et al. 2007; Van Gent, Van Essen et al. 2007). As stated earlier, asthma is also associated with

missing time from work (for parents/caregivers), and exemplifies how asthma may impact the quality of life for the patients' family.

There are validated instruments available that can assess quality of life, including asthma-related quality of life specifically for pediatric asthma patients, such as the Pediatric Asthma Quality of Life Questionnaire (Juniper, Guyatt et al. 1996). However, these instruments may be long and time-consuming too complete. These validated instruments are normally used for research purposes rather than in everyday visits, during which physicians may verbally ask similar questions to assess the patient's quality of life.

Medication Adherence

Control Medication Adherence

Adherence to control medications is an important component of asthma control. Adherence requires the patient taking the medication according to the instructions of the physician. Under ideal circumstances, a physician will always prescribe a control medication to a patient for whom it is indicated, communicate to the patient the importance of taking it daily, and demonstrate proper technique; afterwards, the patient will hopefully take the medication accordingly. A breakdown of any of these steps can lead to adverse health outcomes for the patient. These adverse outcomes can include increased symptoms, exacerbations, physician visits, increased rescue medication use, emergency room visits, and hospitalizations (Wennergren, Kristjansson et al. 1996; Blias, Ernest et al. 1998; Adams, Fuhlbrigge et al. 2001; Smith, Rascati et al. 2004; Smith, Mildenhall et al. 2005; Stern, Berman et al. 2006).

Non-Adherence

Non-adherence with prescribed asthma treatment causes compromised treatment effectiveness, including greater morbidity, mortality, and health care utilization costs (O'Connor, Bender et al. 2004). Non-adherence to a medication may take various forms, including not filling/refilling prescriptions, patient taking an incorrect dosage, improper dosing intervals, and premature discontinuation. In addition, incorrect inhaler technique is an important example of non-adherence, usually leading to sub-optimal dosing (Milgrom 1997; Kelly 2001). Poor medication adherence has been documented extensively, including in pediatric asthma patients (DeMore, Adams et al. 2005; Camargo Jr, Ramachandran et al. 2007; Burgess, Sly et al. 2008). In a study of a group of children aged 8-12 years old taking both beta agonists and inhaled corticosteroids, adherence (defined in this study as taking doses within the correct time window) was 48% and 32%, respectively (Milgrom, Bender et al. 1996). Another study of 171 children with persistent asthma found that adherence rates over a mean observation period of 203 days was 59% (95% CI: 48-65%) with montelukast and 44% (90% CI: 35-50%) with fluticasone, both control medications; adherence in this study was calculated from pharmacy refill data (Sherman 2001).

Contributors to Non-Adherence

Both patient and physician behaviors may contribute to non-adherence. Additionally, in this population, factors that impact adult adherence may also affect children's adherence, because adults (caregivers) often have responsibility for their children's medication, especially at younger ages. Lemanek identified several issues that have been associated with non-adherence in the pediatric asthma population, including the complexity of the medical

regimen, medication side effects, the presentation of symptoms, and satisfaction with care (Lemanek 1990). In one study, the two most common reasons parents cited for their child's non-adherence were 'simply forgetting,' or their child's reaction to being given medication (Burgess, Sly et al. 2008). Beliefs that parents have about asthma medications can also impact their child's adherence. Studies have shown that parents of children with asthma may believe that control medications are to be used only when symptoms appear, that their child may become too dependent, or that their child may experience side effects; all of these beliefs are associated with poor adherence (Farber, Capra et al. 2003; Bender and Bender 2005).

Communication About Asthma and Asthma Management

Patient-Provider Communication

Effective patient-provider communication has long been recognized as an integral component of high quality care, and as such, has been studied extensively. Communication during medical visits serves multiple purposes, including creating an effective inter-personal relationship, exchanging information, and making treatment-related decisions (Ong, de Haes et al. 1995). More recently, researchers have been using increasingly sophisticated techniques to study and analyze communication between physicians and their patients, including audiotapes, videotapes, and advanced coding systems (Wissow 1998; Tates and Meeuwesen 2000; Tates, Elbers et al. 2002; Wissow and Kimel 2002; Roter 2003). Wissow, an expert in pediatric communication, especially advocates methods of direct observation (recording) of provider-patient communication as opposed to recall. Direct observation is, in principle, less subject to bias; can be assessed by multiple observers to insure inter-rater reliability, and

preserves the maximum amount of raw data for re-analysis as new hypotheses are developed (Wissow and Kimel 2002).

Importance of Communication for Asthma Self-Management and Improving Outcomes

Communication about asthma is a vital component of disease management; the NAEPP guidelines stress the importance of effective communication between physicians and patients in order to achieve optimal asthma control (NHLBI 1997). Patients and/or parents must effectively communicate to the physician how well they believe the child's asthma is being controlled; this can be conveyed by reporting the frequency of symptoms, results of at-home lung function monitoring, or any impact on the patient or family's quality-of-life (i.e negative feelings, activity limitations, missed school days). In addition, effective communication between the patient (child), the parent and the physician is necessary to ensure the proper use of and adherence to control medications; it is primarily the responsibility of the physician to emphasize the role and importance of these asthma medications (Rachelefsky 2007). Patients/families and physicians need to have a common understanding of the nature of asthma, treatment goals, the role of medications and self-management practices (Peterson-Sweeney, McMullen et al. 2003).

Overall, effective communication with health care providers may lead to better health outcomes. Studies have shown an association between physician communication and adverse asthma-related outcomes (Cabana, Slish et al. 2006). For example, in a randomized trial in which physicians participated in an education program that included reviewing asthma guidelines, specific communication techniques, and key asthma educational messages, children of physicians in the intervention group reported a significant decrease in days where

activity was limited by asthma, and fewer visits to the emergency room because of asthma in the year follow-up period, compared to children of control group physicians (Cabana, Slish et al. 2006). Clark, who has extensively studied methods to improve patient-provider communication, recently reported results from a 2-year follow-up of parents of pediatric asthma patients whose physicians underwent training to improve their asthma-related clinical and counseling skills in a randomized trial (Clark, Cabana et al. 2008). Compared to parents whose physicians did not undergo the training, parents from the intervention group were more likely to report that their children were less likely to have sleep disruption due to asthma symptoms (OR: 0.25, p=0.033). Children in the intervention group also had, on average, fewer ED visits in the two years after baseline (p=0.04) (Clark, Cabana et al. 2008). In another study, a 30-minute individualized session where a nurse explained asthma and its implications to the patient improved adherence, and was associated with improved clinical outcomes, including medication adherence, self-reported control, and quality of life (Janson, Fahy et al. 2003). Results from these studies suggest that improving physicians' communication skills can be associated with improved outcomes for pediatric asthma patients.

The remainder of this section will briefly outline the importance of communication on the aforementioned aspects of asthma management: 1) symptom assessment, 2) pulmonary function, 3) quality-of-life, and 4) medication adherence.

Communication – Symptoms

As stated in the guidelines, communication about symptoms is an important aspect of asthma management. In the previously mentioned Butz study of 121 asthma patients, the

majority of whom were experiencing symptoms, the authors noted that the majority of these parents and children only communicated symptom experience to the doctor after prompting (by the doctor). Additionally, parents of children with moderate-to-severe asthma symptoms may underestimate the seriousness of their child's symptom experience. If such underestimations are communicated to the physician, it could adversely influence treatment decisions (Halterman, Yoos et al. 2006). Symptom reporting has also been shown to be influenced by the way that questions are asked (Cabana, Slish et al. 2005). In a study by Cabana and colleagues, they report that when parents of children with asthma were asked a global assessment question (e.g., How well controlled is your child's asthma at the moment?), the answers given regarding symptoms were indicative of 'good' asthma control. This was a multiple choice question, with 4 responses: 1) very well controlled, 2) somewhat well controlled, 3) not very well controlled, and 4) not controlled at all. Responses were dichotomized, with the first two responses categorized as 'good' control, and the latter two categorized as 'poor' control. However, when the same parents were asked more specific symptoms questions (e.g., In the past 2 months, how often did symptoms such as coughing, wheezing, chest tightness or shortness of breaths interfere with sleep?), their responses indicated that their child had 'poor' asthma control. These different issues highlight the need for effective, accurate, and comprehensive communication of symptom experience between the physician and the parent and/or patient. Table 2 gives several recommendations for the ways that physicians should assess asthma symptoms and adherence to medicines; this table was adapted from the 1997 NAEPP guidelines (NHLBI 1997).

Table 2. Examples of Questions Physicians May Ask to Assess Symptoms Experienced by the Patient (adapted from NAEPP guidelines)

(Global Assessment) Has your asthma been better or worse since your last visit?
(Recent Assessment) In the past 2 weeks, how many days have you:
Had problems with coughing, wheezing, shortness of breath, or chest tightness during the day?
Awakened at night from sleep because of coughing or other asthma symptoms?
Had symptoms while exercising or playing?

Communication – Pulmonary Function (Spirometry & Peak Flow*)*

No studies were identified that examined communication about spirometry test results. However, if a spirometry test is performed, it is the responsibility of the physician to communicate the results, in lay terms, to the parent and/or patient, including what the results indicate about overall asthma control. A poor spirometry test may indicate that the asthma is not being managed very well in between medical visits.

Similarly, no studies were identified that specifically examined communication about peak flow meter technique or results. However, if the doctor has recommended that the patient monitor their asthma with a peak flow meter, it is critical for the patient and/or parent to be able to use the peak flow meter appropriately, understand the results of any tests performed at home, respond appropriately in accordance with the asthma action plan, and communicate all of this to the physician at the next visit. Table 3 gives examples of questions that physicians may pose to assess peak flow results and correct peak flow monitoring technique; this table was adapted from the 1997 NAEPP guidelines (NHLBI 1997).

Table 3. Examples of Questions Physicians May Ask to Assess Peak Flow Results and Peak Flow Technique (adapted from NAEPP guidelines)

What is the highest and lowest your peak flow has been since your last visit?
Has your peak flow dropped below ____ L/min (80% of personal best) since your last visit?
What did you do when this occurred?
Please show me how you measure your peak flow?
When do you usually measure your peak flow?

Communication – Quality of Life

Physicians should also assess asthma-related quality of life for their pediatric asthma patients. In a study of children with asthma, almost 63% of the children reported some activity restriction due to asthma; however, only 30% of parents reported that their child's asthma was out of control from some to all of the time (Butz, Walker et al. 2007). Assessment of different aspects of asthma-related quality of life, such as activity limitations or negative emotions, is another way for the physician to ascertain whether a child's asthma is being well-controlled. Table 4 provides sample questions for monitoring quality of life; this table was adapted from the 1997 NAEPP guidelines (NHLBI 1997).

Table 4. Examples of Questions Physicians May Ask to Monitor Asthma-Related Quality of Life (adapted from NAEPP guidelines)

Since your last visit, how many days has your asthma caused you to:
Miss work or school?
Reduce your activities?
(For caregivers) Change your activity because of your child's asthma?

Communication – Control Medication Adherence

The NAEPP guidelines recommend that a patient's adherence to his or her asthma medication regimen be regularly monitored (NHLBI 1997). This is especially essential if the physician determines that the asthma is not being managed very well through prior assessment of symptoms, quality of life, and pulmonary function. It is important for health care providers to recognize factors associated with adherence and non-adherence, as well as barriers to adherence (Rachelefsky 2007; Burgess, Sly et al. 2008; Howell 2008). Communication has been suggested as a key for improving asthma medication adherence (Broers, Smets et al. 2005; Rachelefsky 2007). One of the most critical aspects of communication involves the physician educating the patient and parent on pharmacotherapy, especially how the use of and adherence to a control medication translates into symptom reduction and better overall asthma management (NHLBI 1997). The guidelines recommend that asthma self-management education, including the role of medications, should begin at the time of diagnosis and continue through follow-up care through repetition and reinforcement. Reviewing the success of the treatment plan with the patient and parent at each visit and making adjustments as needed should also encourage medication adherence. Table 5 provides sample questions for monitoring adherence to control medications; this table was adapted from the 1997 NAEPP guidelines (NHLBI 1997).

Table 5 – Examples of Questions Physicians May Ask to Monitor Adherence to Control Medications (adapted from NAEPP guidelines)

How often do you take each medication?
How much do you take each time?
Have you missed or stopped taking any regular doses of your medications for any reason?
Have you had trouble filling your prescriptions (e.g., for financial reasons)?

Summary

In summary, effective communication is an important component of optimal asthma care. Poor asthma control may manifest in several different ways, and it is vital that any indicators of poor control are communicated clearly between the physician and the patient and/or parent. Interventions to improve physicians' communication skills have been linked with improved outcomes for the patient, underscoring the role communication plays in the health of pediatric asthma patients. Communication may be the key to improving health outcomes for patients most likely to experience adverse health outcomes.

Racial Disparities in Pediatric Asthma

Several adverse health outcomes associated with pediatric asthma occur more frequently within certain racial groups compared to others, exemplifying a racial health disparity. Health disparities can be defined as differences in health status among diverse groups of people and include the disproportionate burden of disease, disability and/or mortality (Bull and Miller 2008). Disparities occur across populations (pediatric, adult, and geriatric) and therapeutic areas (Levy and Sidel 2006). Disparities in pediatric asthma prevalence, outcomes, and healthcare utilization have been well documented (Akinbami 2006; Canino, Koinis-Mitchell et al. 2006; Gupta, Carrión-Carire et al. 2006; Diette and Rand 2007; Kruse 2007; Mangan, Wittich et al. 2007; Moorman, Rudd et al. 2007; Brim, Rudd et al. 2008; Forester, Ong et al. 2008; Ginde 2008; Rand and Apter 2008; Rosenbaum 2008; Evans, Sadowski et al. 2009; Flores, Snowden-Bridon et al. 2009). Several leading national institutions have acknowledged the existence of racial health disparities in asthma, including the National Center on Minority Health and Health Disparities of the National

Institutes of Health, the Office of Minority Health and Health Disparities of the CDC, and the Agency for Healthcare Research and Quality. They suggest that research to reduce and ultimately eliminate disparities become a national priority.

Prevalence Disparities

The prevalence of pediatric asthma has been documented to be higher in many racial and/or ethnic minority groups, especially African-American children, compared with white children (Quinn, Shalowitz et al. 2006; Diette and Rand 2007). The prevalence of asthma in white children is estimated to be between approximately 7.7% - 8.4% (Brim, Rudd et al. 2008; Bloom and Cohen 2009). In contrast, the percentage of African-American children with asthma is reported to be approximately 13%-15.6% (Akinbami 2006; Quinn, Shalowitz et al. 2006; Bloom and Cohen 2009). In children of Hispanic origin, prevalence has been reported to be as low as 5.9% or as high as 9.4% (Rosenbaum 2008; Bloom and Cohen 2009). The wide range is likely due to prevalence differences in children from separate subgroups of Hispanic origin (for example, Puerto Ricans vs. Mexican Americans), because the distribution of these separate subgroups may have varied across studies (Rosenbaum 2008). Less information is known about some other racial groups; specifically, Asian American and American Indian/Alaska Native children have been historically underrepresented in the pediatric asthma literature (Brim, Rudd et al. 2008). Brim and colleagues, using 2001-2005 aggregated data from the National Health Interview Survey, reported that the current pediatric asthma prevalence rate in American Indians /Alaska Natives was 13.0%. Asian Indian and Chinese children have the lowest prevalence rates, 4.2% and 5.1% (Brim, Rudd et al. 2008).

Asthma-Related Outcomes & Healthcare Use

Many studies have found that minorities, and especially African-Americans, experience a disproportionate burden of adverse asthma related health outcomes; minorities (African-American and Latinos) have higher asthma morbidity, mortality and health care utilization (Riekert, Butz et al. 2003; Akinbami 2006; Gupta, Carrión-Carire et al. 2006; Kruse 2007; Ginde 2008). African-Americans are reported to have higher mortality rates from asthma, compared with whites (Lang and Polansky 1994; Targonski, Persky et al. 1994). Researchers in Chicago found that between the years 1968-1991, asthma mortality increased by 337% for African-Americans, while remaining stable for non-Hispanic whites (Targonski, Persky et al. 1994). A recent government report by the Centers for Disease Control and Prevention, *National Surveillance for Asthma-United States, 1980-2004*, reported that rates of emergency department use for the 3-year period of 2001-2003 are higher overall for African-American adults and children compared with white adults/children (21.0 per 100 for African-Americans with current asthma per year compared with 7.0 per whites with current asthma per year) (Moorman, Rudd et al. 2007). Also, in an older, retrospective cohort study using Medicaid claims data from Washington state, African-American children with asthma were more likely than white children with asthma to make emergency department visits or to be hospitalized for asthma; the adjusted odds ratio were 1.7 [95% CI: 1.34 to 2.15] and 1.42 [95% CI: 1.03 to 1.96], respectively (Lozano, Connell et al. 1995).

Results from these studies suggest that disparities in asthma-related healthcare utilization exist independent of the disparities in asthma prevalence. In another study using data from the National Hospital Discharge Survey and the US vital statistics system, asthma

hospitalizations for white children aged 5-18 years decreased from 11.5 to 8.1 (discharges) per year per 10,000 of the population between 1980-1984 and 2000-2002, respectively (Gupta, Carrión-Carire et al. 2006) . In contrast, for African-American children, the rate increased slightly, from 34.3 to 36.5 discharges per year per 10,000 of the population. This finding that the rates of hospitalizations are going in opposite directions for whites and African-Americans, along with no evidence that prevalence rates are following a similar pattern, suggests that this disparity is also independent of prevalence.

Asthma Care

Racial disparities in health related outcomes may be linked with disparities in asthma-related health care. Asthma care has been shown to be worse for African-Americans compared to whites. Fewer African-American adults reported care consistent with recommendations for medication use, self-management education, avoiding triggers and specialist care compared to white adults (Krishnan, Diette et al. 2001). African-Americans are also more likely to have their asthma severity underestimated by the physician than white patients (Okelo, Wu et al. 2007). Underestimation of asthma severity was then associated with a lower likelihood of: (1) daily use of an inhaled corticosteroid, (2) being told what to do for an asthma flare-up, and (3) being told how to prevent asthma-flare-ups. African-Americans with underestimated severity were also less likely to rate their overall asthma care and communication with their physician as “very good” or “excellent”.

The following sections review reported racial disparities regarding the four aspects of asthma care/management discussed previously (i.e., asthma symptoms, pulmonary function, quality of life and control medication adherence).

Symptoms

There is limited information on racial differences in the ways that children report their asthma symptoms. However, it has been shown that there are racial differences in the way adults with asthma report (experience) asthma symptoms. In one study, African-American adults with asthma were less likely to report nocturnal awakenings, complain of dyspnea (shortness of breath) or experience chest pain than whites with asthma (Trochtenberg, BeLue et al. 2008). It is unclear whether this difference was due to an actual difference in symptoms or if it was due to communication styles. It has also been shown that different methods of symptom assessment can produce differences in the answers (Yoos, Kitzman et al. 2003; Halterman, Yoos et al. 2006). Additionally, Yoos and colleagues found that when asked about their child's symptom experience, minority families appeared to be less accurate ('accuracy' measured by the correlation between objective and subjective measures); however, the association was no longer significant when the model was adjusted for asthma severity.

Pulmonary Function

Racial differences also exist in pulmonary function. For example, a comparison of young children in Detroit (not necessarily with asthma, but adjusted for asthma diagnosis) showed that African-American children had significantly smaller FVC values than white children (Joseph, Ownby et al. 2000). Several additional studies have confirmed the role that race plays when considering normal predicted vales of FVC, FEV1, and other measurements of lung function (Pool and Greenough 1989; Sylevester, Milligan et al. 2005; Trochtenberg, BeLue et al. 2008; Hankinson, Kawat et al. 2010).

Quality of Life

Racial differences have also been observed in asthma-related quality of life. In a study of 2,128 adults with asthma, African-Americans were found to report significantly worse quality of life, even after adjusting for demographic characteristics and asthma severity (Haselkorn, Lee et al. 2008). African-American and Latino children with asthma have been shown to have worse emotional health and miss more school days because of asthma than white children with asthma (Lieu, Lozano et al. 2002; Meng, Babey et al. 2007).

Medication Adherence

Some studies have demonstrated disparities in rates of adherence to asthma medications, primarily in adults. In a one-month study of 86 adults with asthma, adherence was significantly lower among minority patients (29% minority vs. 51% white, $p<.001$) (Le, Bilderback et al. 2008). Adherence was measured by MDILog, an electronic monitoring device. In another study of 85 adults, African-Americans were significantly less likely to be completely adherent than white patients in bivariate analysis (OR; 0.23, CI: [0.10-0.56]) (Apter, Boston et al. 2003). In multivariate analysis, the odds ratios increased to 0.35, yet this was still statistically significant.

Summary

Racial health disparities are evident in many different aspects of asthma, especially in the rates of adverse outcomes. Reducing and eliminating racial health disparities has been identified as a priority for the research community by several national organizations. More

research is needed to understand the causes of racial disparities in health outcomes observed in pediatric asthma populations.

Contributors to Disparities

Understanding how racial disparities in asthma-related health outcomes occur and persist is a critical first step towards the ultimate goal of developing and implementing programs and policies to eliminate them. Racial health disparities are extremely complex, and are hypothesized to be the result of many different factors, including social conditions (e.g., poverty), institutional conditions (e.g., economic system), individual demographics (e.g., education, SES), and biologic/genetic pathways (e.g., genetic ancestry) (Adler and Rehkopf 2008; Warnecke, Oh et al. 2008). Previous research has explored several different sources of the racial disparities that are observed in pediatric asthma outcomes; associated factors have been shown to include socioeconomic status, cultural beliefs and fear of medications (Cabana, Lara et al. 2007; Diette and Rand 2007; Mangan, Wittich et al. 2007; Forester, Ong et al. 2008). Some other potential reasons for the observed disparities observed include differences in access to health care, under-use of control medications, environmental exposures, and differences in quality of care (Erickson, Iribarren et al. 2007). Patient-provider communication, a subset of quality of care, warrants additional research in this population.

Patient-Provider Communication

Patient-physician communication has been considered as a possible source of some of the health disparities that are seen among racial and ethnic minorities, and also as an

important means for addressing these issues (Diette and Rand 2007; Okelo, Wu et al. 2007; Smith, Betancourt et al. 2007; Weiss 2007; Bigby and Ashley 2008; Rand and Apter 2008). Several studies have reported that differences in race and ethnicity between patients and their providers can present important cultural barriers to effective communication (Levy 1985; Kagawa-Singer 2003; Diette and Rand 2007). These cultural barriers include beliefs, practices and medical expectations (Mull 1993). It has been shown, for example, that minority status is associated with more negative medication beliefs (e.g., it is not necessary to take as much medicine as the doctor prescribed) (Mull 1993). Cooper, in particular, has done extensive work in the field of patient-physician relationships and racial health disparities. She and colleagues have shown that communication during medical visits differs between African-American and white patients, with physicians being more verbally dominant and engaging in less patient-centered communication with African-Americans (Johnson, Roter et al. 2004). Cooper stresses the need for more research to understand the mechanisms through which race impacts communication. This may lead to the development of interventions to reduce disparities (Cooper, Hill et al. 2002; Johnson, Roter et al. 2004; Cooper, Beach et al. 2006).

Different characteristics of the patients, physicians, and the health-care system may contribute to poor communication. Some of the patient characteristics that may contribute to poor communication are health literacy and health beliefs (Diette and Rand 2007). For example, it has been reported that among low-income minority patients, beliefs about the effectiveness of their asthma medications, as well as their perception of the quality of their communication with their physician, were associated with poor adherence with control medication (Apter 1998). Also, physicians may be contributing to health disparities through

inadvertent biases and/or stereotyping. An Institute of Medicine report (2003) concluded that inadvertent bias, stereotyping and prejudice are likely important contributing factors to health disparities. Physician beliefs may be driving these stereotypes. For example, van Ryn and Burke interviewed 193 physicians following 618 patient encounters to determine how race and socio-economic status affected physicians' perceptions of patients (van Ryn and Burke 2000). The results show that physicians tended to perceive African-Americans more negatively on a number of dimensions, including beliefs about following medical advice, though not medication adherence specifically. Only 42% of African-Americans were rated by physicians as having no risk for "non-compliance" with medical advice, compared to 57% of whites.

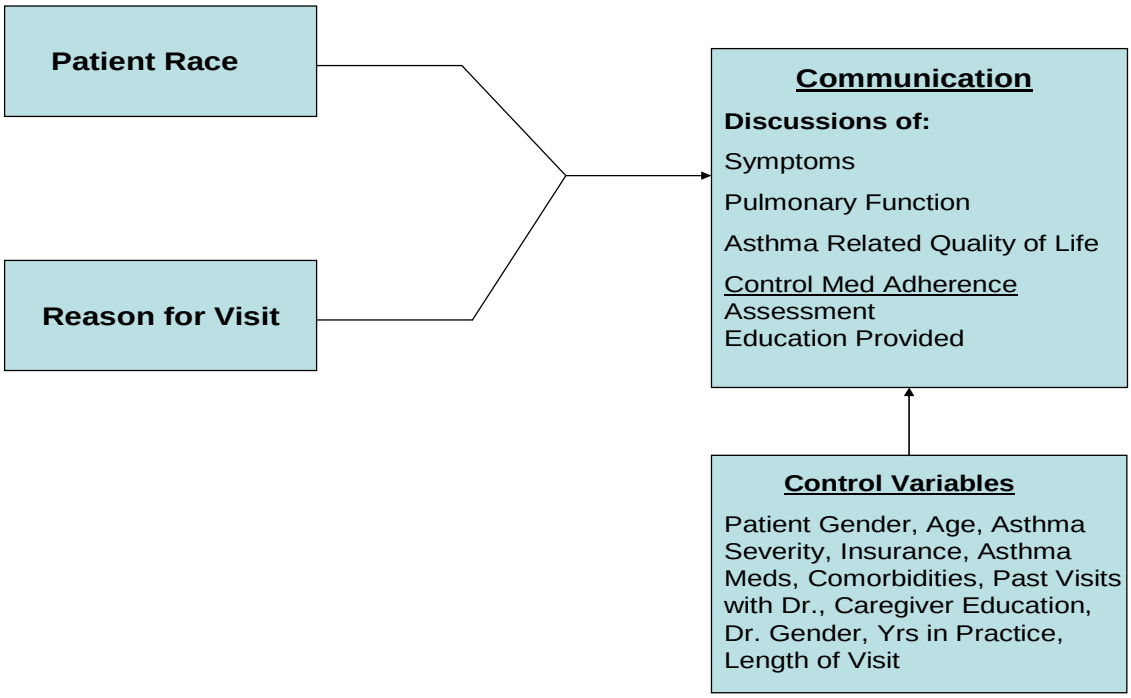
Background Summary

Pediatric asthma is a serious chronic condition, and optimal management involves an ongoing partnership between the physician, patient and parent. Clear and effective communication is an integral part of that partnership. However, minority patients are less likely to achieve optimal management than their white counterparts. Differences in communication may be a significant contributor to health disparities in this population. This research was developed to explore whether there were differences, by patient race, in patient-provider communication concerning four specific aspects of asthma management: symptom monitoring, pulmonary function, asthma-related quality of life, and control medication adherence.

CHATPER THREE: CONCEPTUAL FRAMEWORK

In this chapter, I present the conceptual model that was used to guide this research. Both of the aims of this research attempt to determine if patient-provider communication about the specific asthma-related topics highlighted in the previous chapter (asthma symptoms, pulmonary function, quality of life, control medication adherence) vary as a function of patient race. No adaptable models were identified that address the effect patient race may have on patient-provider communication. Therefore, a conceptual model was constructed from a review of the existing literature to identify characteristics that would likely be associated with the experience of asthma, and/or communication about these experiences. The model proposes that patient race, as well as the interaction of patient race with the reason for the visit, will be associated with patient-provider communication about asthma symptoms, pulmonary function, asthma-related quality of life, and control medication adherence. Figure 1 below presents the conceptual model. The specific aims of the research, as well as the hypotheses for each aim, are presented after Figure 1.

Figure 1. Relationship between Patient's Race, Reason for Visit and Communication about Asthma Symptoms, Pulmonary Function, Quality of Life and Medication Adherence



Specific Aim 1

To examine the relationship between patient race and patient-provider communication, including discussions about asthma symptoms, pulmonary function, quality-of -life, and control medication adherence

H1: A comprehensive discussion of asthma symptoms is less likely to occur if the patient is minority than if the patient is white

H2: Pulmonary function (from peak flow meter or spirometry) is less likely to be discussed if the patient is minority than if the patient is white

H3: A comprehensive discussion of asthma-related quality-of-life is less likely to occur if the patient is minority than if the patient is white

H4: Adherence to control medication is less likely to be discussed if the patient is minority than if the patient is white

H5: The physician will be less likely to provide education about the importance of adherence if the patient is minority than if the patient is white

Specific Aim 2

To determine if the relationship between patient race and the asthma communication variables specified above (asthma symptoms, pulmonary function, quality-of-life, and control medication adherence) varies depending on the primary purpose of the visit (whether the primary purpose of the visit is asthma)

H6: Racial differences on the communication variables will be greatest when the primary purpose of the visit is not related to asthma.

Outcome Variables

All of the outcome variables in the conceptual model and specific aims are aspects of communication regarding asthma management determined to be important based upon previous research and the NAEPP guidelines (NHLBI 1997; Apter 1998; Asmussen, Weiss et al. 2004; Cabana, Slish et al. 2006). Although it is not mandated that physicians follow these guidelines, they provide the most comprehensive collection of evidence-based practices recommended to improve asthma outcomes. Therefore, this research was partially framed as a study of how closely physicians were adhering to the guidelines when treating pediatric asthma patients, and whether there were any differences associated with the race of the patient.

Taken together, communication about the topics of asthma management included in the model, asthma symptoms, pulmonary function, asthma-related quality of life, and control medication adherence, allows the physician to assess the patient's overall asthma control.

Symptom assessment is an important aspect of assessing disease management, and should usually be a part of the communication (NHLBI 1997). Even if the patient and/or parent do not always volunteer this information, it is the responsibility of the physician to inquire (NHLBI 1997). Pulmonary function is a second, more clinical method to assess disease management, either through a discussion of results from at-home monitoring with a peak flow meter, or in-office assessment with spirometry. Asking about quality-of-life is another way that physicians can assess overall disease management, as it involves a discussion about how asthma may be impacting the child (and family) on a daily basis, whether it is preventing them from any activities they would otherwise be able to do, or any negative emotions they may be having. Communication on quality of life may indicate a more patient-centered method of communication by the physician. Finally, according to the NAEPP guidelines, patients with persistent asthma should be actively taking at least one control medication. Physicians should assess the patient's adherence to his or her control medication, especially if prior assessment of symptom experience or pulmonary function monitoring has indicated that the patient does not have optimal disease control. It is also the responsibility of the physician to educate the patient and/or parent about the importance of being adherent to any prescribed medication, especially if non-adherence is reported.

Patient Race

Patient race is the primary independent variable for all hypotheses in Aim 1. Race has been shown to be associated with both asthma prevalence and asthma-related health outcomes, as described in the previous chapter (Akinbami 2006; Gupta, Carrión-Carire et al. 2006; Diette and Rand 2007). Often, patients who identify themselves as belonging to a

racial minority group have a higher prevalence of asthma and worse health outcomes (Kruse 2007; Brim, Rudd et al. 2008). These disparities continue to persist, and in spite of the previous research that has been conducted, the causes of the disparities are not fully understood. This gap in the literature provided the rationale for this research. The model proposes that patient race has a direct effect on patient-provider communication regarding the aforementioned topics of asthma management. Patient-provider communication has been shown to have an effect on health outcomes (Cabana, Slish et al. 2006). Therefore, if the hypotheses are supported, and patient race is shown to be associated with communication about asthma management, it will support the argument that patient-provider communication may be contributing to disparities in health outcomes in pediatric asthma.

Reason for Visit

The interaction between patient race and the reason for the medical visit is the primary independent variable for all hypotheses in Aim 2. As presented in the previous chapter, the aforementioned aspects of asthma management are highlighted as important topics in the NAEPP guidelines (NHLBI 1997). As a chronic condition, pediatric asthma should be monitored closely, and the NAEPP guidelines state that "symptoms and clinical signs of asthma should be assessed at each health care visit through physical examination and appropriate questions." However, the conceptual model hypothesizes that communication about asthma management will be greater for patients being seen for asthma than for a reason other than asthma. Moreover, because discussions of asthma management may be less structured in visits where the primary reason for the visit is not asthma, these visits may provide greater opportunity for biases that affect patient-provider communication about

asthma. Therefore, the model also proposes that the effect of patient race on patient-provider communication regarding the aforementioned topics of asthma management may be moderated by the reason for the visit. Specifically, if there are differences in communication between minority and white patients, these differences may be magnified if asthma is not the primary reason for the visit. Thus, the model hypothesizes that a minority patient visiting the doctor for a non-asthma related reason is less likely to discuss aspects of asthma management than: (1) a white patient being seen for asthma, (2) a minority patient being seen for asthma, or (3) a white patient being seen for a non-asthma related reason. Aim 2 also addresses an important gap in the literature. No studies were identified that examined the interaction between patient race and reason for the visit on patient-provider communication. If there is an association between patient race and communication, and this association varies as a function of the primary nature of the visit, it will provide an important avenue for additional research to explore health disparities in pediatric asthma.

Control Variables

In addition to the primary independent and outcome variables described above, the review of the literature indicated that other patient, caregiver, and physician characteristics should be considered as well when testing the hypotheses above. These characteristics have been shown to be associated with patient-provider communication, or with specific asthma outcomes (e.g. symptom experience).

Patient and Caregiver Characteristics

Basic demographic information, including age and gender, have been shown to influence patient-provider communication in patients with asthma. Patient age has been

reported to influence participation in the conversation at the prompting of the physician, with the physician addressing older children more, in a sample of 4-12 year olds (Tates, Meeuwesen et al. 2002). Girls have also been shown to participate less in some specific types of talk, and physicians are more likely to give more information to boys (Cox, Smith et al. 2007). It has also been reported that women with asthma report a lower quality of life than men (Skobeloff, Spivey et al. 1992).

Asthma severity may also impact communication. Studies have found that children's ability and accuracy at reporting asthma symptoms decreases as their asthma severity increases (Yoos, Kitzman et al. 2003; Butz, Walker et al. 2007).

A family's socioeconomic status (SES) encompasses many different things, and is normally measured with family income, parental education level, and parental occupation. SES has been associated with communication styles. For example, a review of 12 papers that examined the relationship of patient SES with physician's communication style found that lower SES was associated with a less participatory consulting style, characterized by less information giving and less partnership building (Willems, De Maesschalck et al. 2005). The most economically disadvantaged patients were less likely to report that providers always explained things so that they understood, compared to patients not economically disadvantaged (DeVoe, Wallace et al. 2009). The caregiver's education level may also impact communication; physicians may provide more information if they perceive the caregiver to have a high level of educational attainment (Cabana, Chaffin et al. 2008). If physicians believe that certain patients are not likely to follow their advice, they may be less likely to counsel and educate these patients (Cabana, Lara et al. 2007). A family's SES can

also influence the type of insurance they have, and having health insurance has been associated with better communication (DeVoe, Wallace et al. 2009).

Physician Characteristics

Physicians have different communication styles, and certain characteristics of the physician may be associated with different communication styles. One such characteristic is the number of years since they graduated from medical school. For example, one study showed that recent graduates considered themselves to have a more empathetic communication style, as opposed to a more problem-oriented approach (Barnsley 1999). Gender may also influence communication, as female physicians have been reported to be more empathic communicators, to engage in more active partnership behaviors and to engage in more patient-centered communication (Roter and Hall 2004; Nicolai and Demmel 2007).

Summary

This chapter proposes a conceptual model for examining the relationship between patient race and patient-provider communication, and describes the hypotheses that were tested in this research. Patient race and reason for visit were identified as the primary variables of interest. Any effect of patient race on patient-provider communication regarding the aforementioned topics of asthma management, and any moderating effect that reason for visit has on the relationship between patient race and communication will provide important information about possible contributors to health disparities in this pediatric asthma population.

CHAPTER FOUR: METHODS

In this chapter, I outline the methods and procedures used in the conduct of this study. The chapter begins with an overview of the study and a description of the study setting. Information concerning participant eligibility and data collection procedures is provided next. The following section describes the sources of data for the study, including transcription and coding information. The next section provides information on participation rates, and final patient enrollment. Then, all of the study variables are described in detail. Finally, the data analysis plan is described, including data management, preliminary analyses, and primary analyses for each specific aim of the study.

Overview

The study hypotheses were tested by conducting secondary analyses of data collected pursuant to a larger study funded by the National Heart, Lung and Blood Institute of the National Institutes of Health. The primary study is examining the relationship between patient-provider communication and health outcomes in pediatric asthma patients. Patient enrollment and data collection for the primary study began in June 2006; enrollment closed in September 2009. Six clinics in North Carolina participated in the study. Data were collected in conjunction with a regular clinic visit. Patients were not asked to schedule a doctor's visit specifically for the study. The encounter between the patient, the patient's parent (or caregiver, used interchangeably), and the physician within the examination room

was audio-recorded by a recorder set-up by the research assistant. Data were also collected from patients and parents via questionnaires. The patient also demonstrated asthma devices techniques and completed a spirometry test, if one was not administered as part of the medical visit. A standard operating procedure for administering the spirometry test was part of the study protocol.

A research assistant conducted a follow-up visit in the patient's home approximately one month after the office visit, during which the patient and parent completed questionnaires similar to those completed in the office. Spirometry was also administered at home. However, data from the home visit questionnaires were not used in this analysis and therefore they are not described further.

This secondary analysis was submitted to the Biomedical Institutional Review Board (IRB) of the University of North Carolina at Chapel Hill. It was determined that this research did not constitute human subjects research as defined under federal regulations, and did not require IRB approval (study was exempted from IRB approval).

Study Setting

Physicians were recruited from five pediatric clinics and one general practice clinic located in rural and suburban areas of North Carolina. Physicians were asked to participate based on whether they regularly saw pediatric asthma patients. In total, forty-four providers from the six clinics agreed to participate in the study. Written consent was obtained from each participating physician. All of the medical clinics accepted Medicaid in addition to private insurance. This is advantageous, because clinics that accept Medicaid are more likely to serve a racially diverse patient population (Dubay, Kenney et al. 2002). Therefore, the

patient base from these clinics was likely to support this research, for which a racially diverse sample was necessary.

Enrollment Period

Patient enrollment for the study began in June 2006. The first patients from clinics 1, 2, 3 and 5 were enrolled by September 2006; the first patient from clinic 4 was enrolled in April 2007, and the first patient from clinic 6 was enrolled in December 2007. Patient enrollment officially closed in September 2009, although enrollment had already been stopped at some clinics. Enrollment at clinic 2 ended in October 2007, enrollment at clinic 3 ended in April 2008, and enrollment in clinic 6 ended in October 2008.

Patient Eligibility

Children (between 8-16 years old) with a prior diagnosis of asthma and scheduled for an upcoming office visit during the enrollment window were identified by clinic staff as potential study participants. The upcoming visit did not necessarily have to be asthma-related. When clinic staff called parents prior to the day of their visit to remind them of the visit, they were asked to also briefly mention the primary study, to gauge possible interest. On the day of the visit, after the parent checked-in with clinic staff, a member of the staff asked the parent if they would be interested in participating in the study. If the parent was interested, the staff member connected the parent and patient with a research assistant to explain the study in more detail in the waiting room. After explaining the primary study, the research assistant administered an eligibility screener to determine if the patient and parent met all eligibility criteria.

Patients were eligible to participate in the study if they met the following criteria: (a) were between the ages 8 and 16 years old, (b) were able to speak and read English, (c) were able to read the assent form, (d) had been seen at the clinic at least once before, (e) were present at the visit with an adult caregiver (parent or legal guardian) who was at least 18 years old, and (f) had been previously diagnosed with asthma. The parents' eligibility was determined based upon parent/legal guardian status, age, and ability to read and speak English. If the patient and parent were eligible and agreed to participate, the research assistant obtained written informed consent from the parent and written assent from the child.

Each patient/parent dyad was assigned a unique identification number. This number was based on the clinic the patient attended and the physician the patient saw on the day of enrollment. (For example, patient 020405 was enrolled at clinic 02, saw the physician designated as 04, and was the fifth patient enrolled for that physician).

Data Sources

Data came from the following sources: (1) a patient eligibility screener, (2) the office visit audiotapes (3) the questionnaire administered to patients immediately following the office visit, (4) the questionnaire administered to caregivers immediately following the office visit, (5) patient medical records, and (6) physician questionnaires. Each of these sources is described in more detail below.

Data Collection Procedures

The research assistant administered an eligibility screener to the patient and their caregiver to determine their eligibility for the study. The eligibility screener included

questions about the patient's age, the caregiver's age, the patient's ability to read and speak English, the caregiver's ability to read and speak English, any prior visits at the clinic, and the caregiver's relationship with the patient. Questions were also asked about the patient's asthma medications and frequency of asthma symptoms. Answers to questions about medication and symptoms were used to classify the patient's asthma severity. A copy of the eligibility screener is included as Appendix 2.

If a patient and parent were deemed to be eligible and agreed to participate in the study, the research assistant accompanied them from the waiting room into the examination room. Prior to the physician entering the exam room, the research assistant set up a digital tape recorder and microphone, began recording, and exited the room. Recording may have been stopped and re-started by the physician or research assistant during the visit for certain reasons, such as a prolonged discussion with the patient's sibling, leaving the room for an extended period (e.g., to perform a spirometry test), or discussions of a very personal nature. At the conclusion of the visit, as the physician was leaving, the research assistant re-entered the exam room and stopped the tape recorder.

In addition to the audiotape, data were also collected from patient and parent questionnaires. After the patient exam, the research assistant accompanied the patient and parent to a separate space within the office, usually an empty office or exam room. The parent completed a brief self-administered questionnaire regarding their child's asthma, including medications, their relationship with the physician, and at-home management. The research assistant administered a questionnaire to the patient. If space permitted, the parent and patient were physically separated as far apart as possible, to reduce the amount of parental assistance with the questionnaire. As part of this questionnaire, the research assistant

asked the patient to demonstrate using his or her normal asthma devices. For example, the research assistant asked the patient to demonstrate using an inhaler (with or without a spacer), a diskus, and a turbuhaler, as applicable. All patients were asked to demonstrate using a peak flow meter, regardless of whether they used one on a regular basis. A spirometry test was also administered by the research assistant to assess pulmonary function, if one had not been completed by clinic staff as part of the medical visit.

Additional information about the patient was obtained from a review of the patient's medical record. After the visit, the research assistant reviewed the patient's chart in order to record information on initial asthma diagnosis, previous visits, asthma-related emergency room visits and hospitalizations, and any comorbidities. The timing of the medical record review varied, from the day of enrollment up to six months afterwards.

Finally, data on physicians came from a self-administered physician questionnaire. Shortly after each physician agreed to participate in the study, he or she completed a brief questionnaire, which included demographic questions, as well as questions about their views on asthma management.

Coding of Audiotape Visits

Transcript Generation

All office visit audiotapes were transcribed under the protocol of the primary study; transcription occurred under the supervision of the principal investigator. Having transcriptions of the medical visits makes the coding of the audiotapes more reliable (Mishler 1984; Waitzkin 1990). The transcribing rules used in this study have been used by the principal investigator before and were adapted from transcribing rules used by previous

researchers in the area of physician-patient communication (Mishler 1984; Waitzkin 1990). All identifying information was removed when the audiotapes were transcribed, such as names and schools. The transcriptionists were blinded to the study hypotheses. All audiotapes will be destroyed at the conclusion of the primary study.

Coding

All communication variables come from the transcripts of the audiotapes; two separate coding instruments were used. The Primary Coding Instrument (PCI) was developed under the protocol of the primary study. The Supplemental Coding Instrument (SCI) was developed specifically for this secondary analysis.

Primary Coding Instrument (PCI)

The Primary Coding Instrument (PCI) was developed during the pilot study of the primary study. The PCI was designed to code characteristics of communication and other aspects of the visit. The principal investigator trained research assistants on how to code the transcripts using the PCI. Coders were trained using 12 transcripts from the pilot study. During training, 0.80 was used as a floor for coder inter-rater reliability. Practice and training continued until this minimum level of reliability was achieved. After coders achieved this minimal level of reliability, they began coding the actual transcripts. All coders coded 20 of the same transcripts. Spot checks of coder performance were conducted by the principal investigator throughout the coding process to assure that reliability levels were being maintained. If a problem in a coder's performance was detected, the coder was immediately pulled from coding the transcripts and went back to practice. The coder resumed

coding when the minimum level of 0.80 was achieved. The coders were blinded to the hypotheses of both the primary study and this secondary study, as well as patient characteristics (e.g., patient race).

Supplemental Coding Instrument (SCI)

The Supplemental Coding Instrument (SCI) was developed specifically for this secondary analysis. The SCI was developed to code for communication variables not captured by the PCI. I developed the SCI, in conjunction with my advisors, which included the principal investigator of the primary study. I trained one other coder on the SCI according to the methods outlined above for the PCI, using an identical 0.80 minimum inter-rater reliability. The coder and I practiced until we achieved an inter-rater reliability of 0.80, and periodically checked to ensure this level was being maintained. Reliability was calculated on approximately 10% of the total sample, and an inter-rater reliability of 0.80 was maintained on all items. I performed all of the coding with the SCI, and was therefore not blinded to the study hypotheses. However, both the reliability coder and I were blinded to the patient's race when coding. The SCI and the coding rules for the SCI are included as Appendices 3 and 4, respectively.

Participation Rates/Refusals

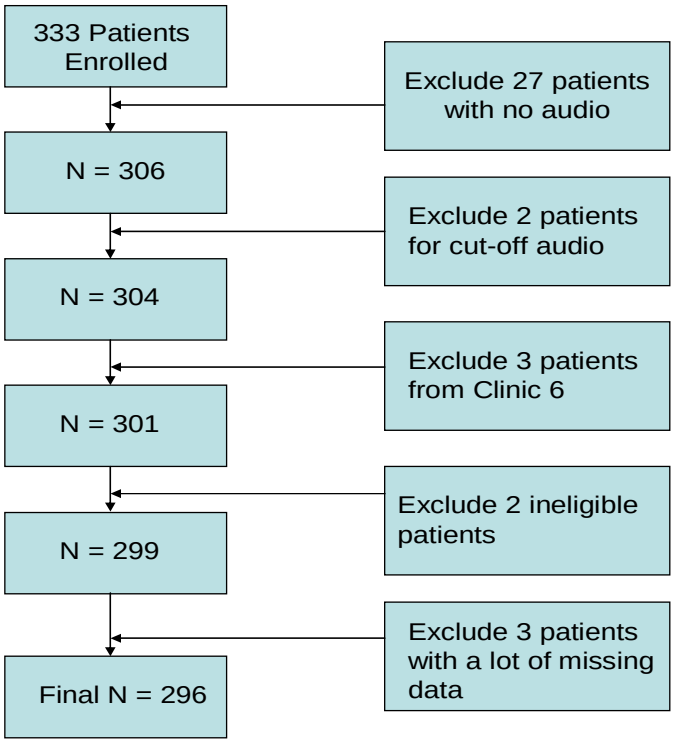
A total of 385 eligible asthma patients were approached about participating in the study by a research assistant. Of these, 52 parents/patients declined to participate in the study. Common reasons given for not wanting to participate included: either the patient or parent was not interested in participating, the parent did not have the time to participate, or

the parent did not want the home visit. Based upon the final enrollment of 333 patients, the participation rate for the study was 86%. This is in line with the 80% participation rate anticipated by the principal investigator of the main grant, based upon prior research (Sleath et al. 2003; Sleath et al. 2002). This participation rate does not include potential participants who were approached by the research assistant and determined to be ineligible.

Final Sample Size

A total of 333 patients were enrolled in the study, as shown in Figure 2. The audiotapes for 27 patients were unusable, either because the tape was blank and contained no audio, or because there was too much static/interference to accurately hear and transcribe what was on the tape. Blank tapes were often the result of technical problems by the research assistants, such as using dead batteries in the recorder or forgetting to turn on the microphone. Of the 306 tapes with usable audio content, there were 46 instances where the tape cut-off prematurely, before the end of the visit, per the primary coder of the PCI. In these 46 cases, the primary investigator and I independently reviewed the transcripts, and determined whether there was enough content to warrant inclusion in the final sample for analysis. We came to the same determination in each case, deciding to retain 44 of these 46 patients in the analysis, leaving a sample of 304 patients. Additionally, patient enrollment was particularly slow at one of the six participating clinics. This clinic was the only one that was a general family practice, and did not see pediatric patients exclusively (Clinic 6). Only four patients were enrolled at this clinic. After a year, the decision was made to cease enrollment at this clinic, and to exclude any of the patients enrolled at this clinic from the

Figure 2. Determination of Final Sample Size



analyses. One of these four patients would have already been excluded due to an unusable audiotape. The other three were excluded, leaving 301 patients.

A review of the symptom and medication use information on the eligibility screener by the research team pharmacist and physician determined that three patients were ineligible for the study, and should not have been enrolled. Two of these patients were already excluded from the analysis due to audio problems; the third patient was excluded from the analysis. The eligibility screener was missing for another patient. For this patient, a review of information regarding medication use and symptom frequency ascertained via other research documents (parent and patient office questionnaires) did not support the case for the patient's eligibility. Therefore, this patient was also excluded from the analysis, leaving 299 patients.

The patient files for an additional three patients either could not be located, or had a large amount of missing data, and nearly all of the independent variables would have had to have been imputed for analysis. Therefore, these three patients were not included in the analyses. Thus, a total of 296 patients were included in the analysis.

Variables and Measures

This section describes all of the variables that were used in the primary and preliminary analyses. Table 6 outlines all key variables that will be included in the analyses, including sources and range. A more detailed description of the variables follows the table.

Table 6. All Variables: Variable Name, Source, Range

VARIABLE	SOURCE	RANGE
Communication – Asthma Symptoms		
Asthma Symptoms Discussed	Supplemental Coding Instrument (SCI)	1 = Yes 0 = No
Initiator of Asthma Symptom Discussion		1 = Doctor 2 = Caregiver (parent) 3 = Patient 9 = n/a
Symptoms Experienced		1 = Yes 0 = No 9 = n/a
Symptoms Reported By		1 = Caregiver (parent) 0 = Patient 9 = n/a
Nighttime Symptoms Discussed		1 = Yes 0 = No
Initiator of Nighttime Symptom Discussion		1 = Doctor 2 = Caregiver (parent) 3 = Patient 9 = n/a
Exercise-Induced Symptoms Discussed		1 = Yes 0 = No
Initiator of Exercise-Induced Symptom Discussion		1 = Doctor 2 = Caregiver (parent) 3 = Patient 9 = n/a
Daytime Symptoms Discussed		1 = Yes 0 = No
Initiator of Daytime Symptoms Discussion		1 = Doctor 2 = Caregiver (parent) 3 = Patient 9 = n/a
Symptom Frequency Discussed		1 = Yes 0 = No
Initiator of Symptom Frequency Discussion		1 = Doctor 2 = Caregiver (parent) 3 = Patient 9 = n/a
Physician Makes Suggestions to Alleviate Asthma Symptoms		1 = Yes 0 = No 9 = n/a

VARIABLE	SOURCE	RANGE
Communication – Spirometry		
Spirometry Discussed	SCI	1 = Yes 0 = No
Initiator of Spirometry Discussion		1 = Doctor 2 = Caregiver (parent) 3 = Patient 9 = n/a
Spirometry Test Performed at Visit	PCI	1 = Yes 0 = No
Results of Day's Spirometry Test Discussed	SCI	1 = Yes 0 = No 9 = n/a
Spirometry Interpretation by Physician		2 = Good 1 = Ambiguous 0 = Poor 9 = n/a
Physician Makes Suggestions to Improve Spirometry Results/Asthma Control		1 = Yes 0 = No 9 = n/a
Communication – Peak Flow		
Peak Flow Meter Discussed	PCI	1 = Yes 0 = No
Initiator of Peak Flow Discussion	SCI	1 = Doctor 2 = Caregiver (parent) 3 = Patient 9 = n/a
Peak Flow Meter Results Discussed		1 = Yes 0 = No
Peak Flow Interpretation by Physician		2 = Good 1 = Ambiguous 0 = Poor 9 = n/a
Physician Makes Suggestions to Improve Peak Flow Readings/Asthma Control		1 = Yes 0 = No 9 = n/a
Communication – Quality of Life		
Activity Limitation (AL) Discussed	SCI	1 = Yes 0 = No
Initiator of AL Discussion		1 = Doctor 2 = Caregiver (parent) 3 = Patient 9 = n/a
AL Reported		1 = Yes 0 = No 9 = n/a

VARIABLE	SOURCE	RANGE
Communication – Quality of Life (continued)		
AL Reported By	SCI	1 = Caregiver (parent) 0 = Patient 9 = n/a
Negative Emotions (NE) Discussed		1 = Yes 0 = No
Initiator of NE Discussion		1 = Doctor 2 = Caregiver (parent) 3 = Patient 9 = n/a
NE Reported		1 = Yes 0 = No 9 = n/a
NE Reported By		1 = Caregiver (parent) 0 = Patient 9 = n/a
Missed School Discussed		1 = Yes 0 = No
Initiator of Missed School Discussion		1 = Doctor 2 = Caregiver (parent) 3 = Patient 9 = n/a
Physician Makes Recommendations to Improve Patient's Quality of Life (QoL)		1 = Yes 0 = No 9 = n/a
Family QoL Discussed		1 = Yes 0 = No
Initiator of Family QoL Discussion		1 = Doctor 2 = Caregiver (parent) 3 = Patient 9 = n/a
Communication – Control Medication Adherence		
Medication Adherence Discussed	PCI	1 = Yes 0 = No
Initiator of Adherence Discussion	SCI	1 = Doctor 2 = Caregiver (parent) 3 = Patient 9 = n/a
Non-Adherence Reported		1 = Yes 0 = No 9 = n/a
Non-Adherence Reported By		1 = Caregiver (parent) 0 = Patient
Education on Adherence Provided	PCI	1 = Yes 0 = No

VARIABLE	SOURCE	RANGE
Primary Independent Variables		
Patient Race	Child Survey (CS)	1 = Minority 0 = White
Reason for Visit	Parent Survey (PS)	1 = Asthma 0 = Non-asthma
Control Variables - Patient Characteristics		
Ethnicity	CS	1 = Hispanic 0 = Non-Hispanic
Gender		1 = Male 0 = Female
Age, in years		8 – 16
Asthma Severity	Eligibility Screener	1 = Moderate/Severe 0 = Mild
Private Insurance Coverage	PS	1 – Private 0 – Other
Number of Asthma Medications		0 – 5
Number of Co-Morbid Conditions	Medical Record Abstraction	0 – 11
Number of Past Visits With Physician		0 – 70
Control Variables - Caregiver Characteristics		
Education, in years	PS	2 – 20
Control Variables - Physician Characteristics		
Gender	Physician Questionnaire	1 = Male 0 = Female
Years Since Medical Degree Received		1 – 43
Other Control Variables		
Length of Visit, in minutes	Primary Coding Instrument (PCI)	2.32 – 45.72
Tape Cuts-Off Prematurely		1 = Yes 0 = No

Outcome Variables

The following sections describe the communication variables, as well as other outcomes variables. Data were collected on four separate areas of asthma management: asthma symptoms, pulmonary function, asthma-related quality of life, and control medication adherence. Most of the communication variables are dichotomous, indicating whether *any* discussion of the topic occurred, rather than the *content* of the discussion.

Communication – Asthma Symptoms

Asthma Symptoms Discussed: This variable indicates whether any discussion of asthma symptoms occurred (including nighttime, exercise-induced, or daytime). It was coded as 'yes' if during the visit either the patient or parent mentioned any coughing, wheezing, chest pains, or shortness of breath that the patient had been experiencing recently. These are collectively referred to as 'asthma symptoms.' In addition, if the patient or parent mentioned any other symptoms that are not usually considered asthma symptoms, but that the patient or parent clearly attributed to *asthma* (i.e. headaches, dizziness, etc), the variable was coded as 'yes.' Finally, this variable was also coded as 'yes' if the physician asked about any asthma problems that the patient may have been experiencing, or a general question about asthma (i.e. How is your asthma doing?), even if the patient did not report that he or she was experiencing any symptoms. Discussion of possible medication side effects was not included in this variable.

Initiator of Symptom Discussion: In cases where **Asthma Symptoms Discussed** was coded as 'yes', this variable indicates the person who initiated the conversation.

If the discussion was prompted by the physician asking about asthma symptoms, the physician was coded as the initiator. If asthma had previously been mentioned in the conversation, and the physician asked about any problems or troubles, the physician was coded as the initiator. Otherwise, the initiator was coded as either the patient or the parent, depending on who first mentioned the topic.

Symptoms Experienced: In cases where **Asthma Symptoms Discussed** was coded as 'yes', this variable indicates whether the patient was experiencing asthma symptoms (or symptoms that the patient or parent attributed to asthma.). It was coded as 'yes' if the patient or parent stated that the patient was experiencing any asthma symptoms. If the patient or parent stated specifically that the patient was not experiencing any asthma symptoms, it was coded as 'no.'

Symptoms Reported By: In cases where **Symptoms Experienced** was coded as 'yes', this variable indicates who first said that the patient was experiencing symptoms, i.e., the patient or the parent/caregiver.

Table 7 below outlines the Coding Rules that were applied to transcripts when coding the above **Symptoms** communication variables; these Coding Rules were developed to accompany the Supplemental Coding Instrument (SCI). The first four columns give all combinations of situations that may surround the discussion. The last three columns outline how each **Symptom** variable was coded in the corresponding situation.

Table 7. Coding Rules for Symptom Communication Variables

SITUATION				CODED VARIABLES		
Asthma has been mentioned	**Physician asks about problems (asthma specific)**	**Physician asks about problems (not asthma specific)**	**Patient or Parent Mentions Asthma Symptoms**	**Asthma Symptoms Discussed**	**Initiator**	**Symptoms Experienced**
No	No	No	No	No	N/A	N/A
No	Yes	No	No	Yes	Physician	No
No	No	No	Yes	Yes	Patient or Parent	Yes/No
No	Yes	No	Yes	Yes	Physician	Yes/No
No	No	Yes	No	No	N/A	N/A
No	Yes	Yes	No	Yes	Physician	No
No	No	Yes	Yes	Yes	Patient or Parent	Yes/No
No	Yes	Yes	Yes	Yes	Physician	Yes/No
Yes	Yes	No	No	Yes	Physician	No
Yes	No	No	No	No	N/A	N/A
Yes	Yes	No	Yes	Yes	Physician	Yes/No
Yes	No	No	Yes	Yes	Patient or Parent	Yes/No
Yes	Yes	Yes	No	Yes	Physician	No
Yes	No	Yes	No	Yes	Physician	No
Yes	Yes	Yes	Yes	Yes	Physician	Yes/No
Yes	No	Yes	Yes	Yes	Physician	Yes/No

Nighttime Symptoms Discussed: This variable indicates whether asthma nighttime symptoms were specifically discussed. This may include trouble falling asleep at night, or waking up anytime in the middle of the night, due to asthma symptoms.

Initiator of Nighttime Symptoms Discussion: In cases where **Nighttime Symptoms Discussed** is coded as 'yes', this variable indicates the person who initiated the discussion. If the discussion was prompted by the physician asking about nighttime asthma symptoms, the physician was coded as the initiator. Otherwise, the initiator was coded as either the patient or the parent, depending on who first mentioned the topic.

Exercise-Induced Symptoms Discussed: This variable indicates whether asthma symptoms specifically experienced during exercise or other comparable physical activity (playing, recess, PE class, sports, etc.) were discussed.

> **Initiator of Exercise Symptom Discussion:** In cases where **Exercise-Induced Asthma Symptoms Discussed** is coded as 'yes', this variable indicates the person who initiated the discussion. If the discussion was prompted by the physician asking about exercise-induced asthma symptoms, the physician was coded as the initiator. Otherwise, the initiator was coded as either the patient or the parent, depending on who first mentioned the topic.

Daytime Symptoms Discussed: This variable indicates whether asthma symptoms experienced specifically during the daytime (but not during exercise) were discussed.

> **Initiator of Daytime Symptoms Discussion:** In cases where **Daytime Symptoms Discussed** is coded as 'yes', this variable indicates the person who initiated the discussion. If the discussion was prompted by the physician asking about daytime symptoms, the physician was coded as the initiator. Otherwise, the initiator was coded as either the patient or the parent, depending on who first mentioned the topic.

Symptom Frequency Discussed: This variable indicates whether the frequency with which the patient may or may not have been experiencing symptoms was discussed. The frequency may have been in relation to any specified period of time, such as a day, a night, a week, or a

month. It may also include a discussion of how often the patient had to use his or her rescue inhaler (e.g., albuterol) during any specified period of time, since rescue inhaler use almost always indicates the patient is experiencing acute symptoms.

Initiator of Symptom Frequency Discussion: In cases where **Symptom Frequency Discussed** is coded as 'yes,' this variable indicates the person who initiated the discussion. If the discussion was prompted by the physician asking about symptom frequency, the physician was coded as the initiator. Otherwise, the initiator was coded as either the patient or the parent, depending on who first mentioned the topic.

Physician Makes Suggestions to Alleviate Asthma Symptoms: In cases where the patient or parent reported that the patient was experiencing any kind of symptoms (i.e., **Symptoms Experienced** coded as 'yes'), this variable indicates whether the physician subsequently made a recommendation to help the patient alleviate the symptoms. A recommendation may have included a change in medication regimen, suggestions about avoiding asthma triggers, or adjustments in physical activity.

Communication - Spirometry

Spirometry Discussed: This variable indicates whether any discussion of spirometry occured. It was coded as 'yes' if any reference to spirometry was made, even if a spirometry test was not performed on that day. For instance, the physician may have stated that a spirometry test was not needed since one was just performed three months ago. In addition,

this variable was coded as 'yes' if there was any reference to a "breathing test" or "lung test." These terms are often used interchangeably with spirometry.

Initiator of Spirometry Discussion: In cases where **Spirometry Discussed** was coded as 'yes,' this variable indicates the person who initiated the discussion. If the discussion was prompted by the physician mentioning spirometry in any context, the physician was coded as the initiator. If the patient or parent/caregiver inquired about a spirometry test, either he or she was coded as the initiator.

Spirometry Test Performed at Visit: This variable indicates whether a spirometry test was performed that day as part of the medical visit by clinic staff. It includes spirometry tests administered by the study research assistant *only* if the physician specifically referred to the test in the course of the visit.

Spirometry Test Results Discussed: This variable indicates whether the physician discussed the results of a spirometry test, performed on that day, with the patient and/or parent/caregiver.

Spirometry Interpretation by Physician: In cases where **Spirometry Test Results Discussed** was coded as 'yes,' this variable indicates how the physician interpreted the results of the spirometry test and its relation to overall asthma control for the patient. This variable was coded as either: 1) good results/good control, 2) ambiguous, or 3) not good results/poor control. If the physician indicated that the test

results were good (normal), with no qualifications, this variable was coded as 'good.' If the physician indicated that the results were not adequate, this variable was coded as 'poor.' However, in cases where the physician described the results as good, but with some qualifications, or where it was difficult to definitively determine how the results were being interpreted, the variable was coded as ambiguous. (Example: "..This looks ok, but not great")

Physician Makes Suggestions to Improve Spirometry Results: In cases where the **Spirometry Interpretation** variable was coded as either 'poor' or 'ambiguous,' this variable indicates whether the physician subsequently made a recommendation to help the patient achieve better control.

Communication – Peak Flow Meter

Peak Flow Meter Discussed: This variable indicates whether any discussion of peak flow meter use occurred, regardless of whether the patient regularly used one at home. This variable came from the Primary Coding Instrument (PCI). On the PCI, peak flow discussion is broken down into five separate categories. If any of these categories were coded 'yes' on the PCI, the **Peak Flow Meter Discussed** variable was coded as 'yes' for the present study. The box below was adopted from the coding rules of the PCI and briefly describes each of the peak flow categories.

Excerpt from the *Coding Rules* from the Primary Coding Instrument:

1) Provider asks about peak flow use:
Includes whether the child is using a peak flow meter currently or whether the provider is suggesting use of a peak flow meter.

2) How often to use:
Includes discussion of when a peak flow meter should be used, or discussion of how often to use it if needed on a regular basis.

3) Explains zones:
Includes discussion of zones based on result of using peak flow meter. These zones are often referred to by color: red, yellow, green. Can include if the doctor reviews the zones that have already been set.

4) What to do if in zone:
Includes what medications the patient should take if in different zones. Also, includes if peak flow should be repeated more often during certain periods or after administration of medication. Includes the doctor informing the patient of who to call and what medications to take based on the zone they are in.

5) Provider suggests keeping a journal:
Includes if the provider suggests keeping a record of peak flow measurements, or whether he inquires about continued record keeping. This can also include if the patient is keeping a journal of asthma symptoms.

Initiator of Peak Flow Discussion: In cases where **Peak Flow Meter Discussed** was coded as 'yes,' this variable indicates the person who initiated the discussion. It will be applied in the same manner as the variables listed above.

Peak Flow Meter Results Discussed: This variable indicates whether there was any discussion of peak flow meter *results*, either from home or from a test administered at the visit by the physician.

Peak Flow Results Interpretation by Physician: In cases where **Peak Flow Meter Results Discussed** was coded as 'yes,' this variable indicates how the physician interpreted the results of the peak flow use and its relation to overall asthma control for the patient. The categories (good, ambiguous, poor) are identical to those for the spirometry variable described above.

Physician Makes Suggestions to Improve Peak Flow: In cases where the interpretation of the peak flow results was poor or ambiguous, this variable indicates whether the physician subsequently made a recommendation to help the patient achieve better control.

Communication – Asthma-Related Quality of Life

Coding rules for the quality-of-life variables were adapted from two sources: 1) the Pediatric Asthma Quality of Life Questionnaire (PAQLQ), a validated instrument used to measure quality of life in pediatric asthma patients (Juniper, Guyatt et al. 1996; Okelo, Wu et al. 2004) and the NAEPP guidelines. The PAQLQ asks 23 questions in three domains: symptoms, activities, and emotions. Discussions of Asthma Symptoms were not included here, because they were coded as a separate category. The PAQLQ asks about the previous week; however, for the purposes of these variables, reference to any time period was acceptable. The four domains comprising the quality of life variables include: activity limitation, negative emotions, missed school, and family's quality of life. Each domain is described in greater detail below.

Activity Limitation (AL) Discussed: This dichotomous variable indicates whether any discussion of activity limitation due to asthma occurred. For example, there may have been discussion of whether the patient was able to keep up with others during recess, had to take more breaks than normal, or wasn't able to participate in any pleasurable activity (e.g., band).

Initiator of AL Discussion: In cases where **AL Discussed** was coded as 'yes,' this variable indicates the person who initiated the discussion. It was applied in the same manner as the variables listed above.

AL Reported: In cases where **AL Discussed** was coded as 'yes,' this variable indicates whether the patient or parent reported that the patient had been experiencing activity limitations.

AL Reported By: In cases where **AL Reported** was coded as 'yes', this variable indicates whether the patient or parent first mentioned that the patient was experiencing activity limitations.

Negative Emotions (NE) Discussed: This dichotomous variable indicates whether any discussion of negative emotions experienced by the patient due to asthma occurred during the office visit. Trigger words, including those adapted from the PAQLQ, include: frustrated, worried, concerned, troubled, angry, irritable, different, left-out, uncomfortable, frightened by an attack, sad, angry, embarrassed, or upset.

Initiator of NE Discussion: In cases where **NE Discussed** was coded as 'yes,' this variable indicates the person who initiated the discussion. It was applied in the same manner as the variables listed above.

NE Reported: In cases where **NE Discussed** was coded as 'yes,' this variable indicates whether the patient or parent reported that the patient had been experiencing negative emotions.

NE Reported By: In cases where **NE Reported** was coded as 'yes', this variable indicates whether the patient or the parent first mentioned that the patient was experiencing negative emotions.

Physician Makes Suggestions to Improve Patient's Quality of Life (QoL): In cases where the patient's quality of life had been affected (**AL Reported** or **NE Reported** coded as 'yes,'), this variable indicates whether the physician subsequently made a suggestion to help the patient improve his or her quality of life.

Missed School Discussed: This dichotomous variable indicates whether any discussion of the patient missing school due to asthma occurred.

Initiator of Missed School Discussion: In cases where **Missed School Discussed** was coded as 'yes,' this variable indicates the person who initiated the discussion. It was applied in the same manner as the variables listed above.

Family's QoL Discussed: This dichotomous variable indicates whether any discussion of the family's quality of life due to the patient's asthma occurred. For example, it may include discussion of a parent missing work, or not being able to devote as much time as desired to another child.

Initiator of Family QoL Discussion: In cases where **Family QoL Discussed** was coded as 'yes,' this variable indicates the person who initiated the discussion. It was applied in the same manner as the variables listed above.

Communication – Control Medication Adherence

Control Medication Adherence Discussed: This variable indicates whether there was any discussion of adherence to a control medication. Discussion of adherence to control medications was coded as 'yes' if during the visit either the patient, parent or physician discussed whether the patient was taking his or her control medication as instructed by the physician. In some instances, the patient was taking more than one control medication. If adherence to any asthma control medication was discussed, this variable was coded as 'yes.' This variable is from the Primary Coding Instrument. The excerpt below from the *Coding Rules* for the Primary Coding Instrument outlines how this variable was coded.

Excerpt from *Coding Rules* from Primary Coding Instrument:

Adherence: For controller meds adherence refers to info or questions about taking meds when you're suppose to and how you're suppose to.

Example: "Are you taking your medicine everyday like I told you to?"
"So he is doing his Advair twice a day, he's not missing that?"
"Every night?

Initiator of Adherence Discussion: In cases where **Control Medication Adherence Discussed** was coded as 'yes', this variable indicates the person who initiated the discussion. It was applied in the same manner as the variables listed above.

Non-Adherent: In cases where **Control Medication Adherence Discussed** was coded as 'yes', this variable indicates whether the patient was non-adherent. It was coded as 'yes' if the patient or parent reported that the patient was not taking the control medication in accordance with the physician's instructions. For example, if the patient or parent reported 'forgetting' or 'skipping doses', this variable was coded as 'yes'. If the patient or parent did not mention any of these things, the variable was coded as 'no'.

Non-Adherence Reported By: In cases where **Non-Adherent** was coded as 'yes', this variable indicates whether the patient or the parent initially said that the patient was non-adherent.

Adherence Education Provided: This variable indicates whether the physician provided education on the importance of patient adherence to control medication. It was coded as 'yes' if during the visit the physician explained to the patient or parent the importance of taking a control medication everyday, the purpose of a control medication (vs. a rescue medication), or explained how taking the control medication may reduce asthma symptoms and over-dependence on a rescue medication (e.g., albuterol). This variable is from the

Primary Coding Instrument. The excerpt below from the *Coding Rules* for the Primary Coding Instrument outlines how this variable was coded.

Excerpt from *Coding Rules* from Primary Coding Instrument:

Purpose: If they discuss what a medication is used for. This would also include the **reasons** that a patient needs the medicine, or why they are using or want to use the medicine.

Example for education on purpose of controller med: "…the main objective is to try to prevent the symptoms, not deal with the symptoms as they come up. Like you said,…once he's having a bad attack….he can't suck the medicine out of the Pulmicort turbuhaler right? Okay. So…He needs to be on a medicine every single day…to prevent his symptoms."

Example for education on purpose for controller med: "Singulair is an allergy medicine and I chose it because it also helps with asthma."

In addition to the adherence education variable described above, a separate variable from the PCI reads: The provider explains that the child needs to take his controller every day. If this variable was coded as 'yes' on the PCI, the **Adherence Education Provided** variable was coded as 'yes' in this study.

Primary Independent Variables

Patient Race: Patients (children) were asked to select the category that best described their race. Patients were given six categories from which to choose. In addition, patients were allowed to indicate more than one category. For analysis, race was dichotomized into two categories: minority and white. Patients who selected any minority category (any other than White), even in conjunction with selecting 'White,' were categorized as minority for the purposes of this analysis

Race question as it appears on the child questionnaire:

Which of the following best describes your race? (*You may select more than one category.)*

- ☐ a American Indian or Alaskan Native
- ☐ b Asian
- ☐ c Black or African American
- ☐ d Native Hawaiian or other Pacific Islander
- ☐ e White
- ☐ f Other:
  g. specify _____

Reason for Visit: This dichotomous variable indicates whether or not the primary reason for the visit was asthma, as reported by the parent.

Control Variables: Patient Characteristics

Ethnicity: Ethnicity is a dichotomous variable indicating whether patients are of Hispanic ancestry.

Ethnicity question as it appears on the child questionnaire:

Are you Hispanic or Latino? [Were you or your parents born in Mexico, Central America, South America, Cuba, or Puerto Rico?]

- ☐ 1 Yes
- ☐ 0 No

Gender: Gender is a dichotomous variable indicating whether the patient is male or female.

Age: This variable indicates the patient's age at enrollment. Patient age ranged from 8-16 years.

Private Insurance Coverage: Private insurance coverage is a dichotomous variable indicating whether the patient was covered by a private insurance company on the day of enrollment. Parents were given a choice of five different options to indicate their child's insurance coverage. The insurance options on the parent questionnaire included: none, private, Medicaid, NC Health Choice, and Other. NC Health Choice is a state program that provides free or reduced price coverage for children whose families make too much money to qualify for Medicaid yet cannot afford private insurance. All responses other than private were collapsed into a separate Other category.

Asthma Severity: Asthma severity is a dichotomous variable indicating whether the research assistant classified the patient as having: 1) mild persistent asthma or 2) moderate-to-severe persistent asthma. The research assistant made this classification based upon the responses given to questions asked during eligibility screening regarding symptom frequency and medication use. A doctor or pharmacist later verified the classification made by the research assistant. The eligibility screener has been validated against physician diagnosis (Joseph 1996; Clark, Brown et al. 2002; Lewis, Robins et al. 2004).

The research assistant classified the patient as having moderate-to-severe asthma if the patient:

- reported experiencing daytime symptoms everyday, or
- reported experiencing nighttime symptoms five or more times a month, or
- reported taking two or more asthma control medications.

The research assistant classified the patient has having mild asthma if the patient:

- did not meet the criteria for moderate-to-severe asthma, and
- reported experiencing daytime symptoms more than two times a week, or
- reported experiencing nighttime symptoms two-four times a month, or
- reported taking one asthma control medication.

The symptom frequency questions were based on the NAEPP guidelines. The medication questions were based on previous research validating medication use as a way to classify asthma severity (Lewis, Robins et al. 2004).

Number of Asthma Medications: This variable indicates the number of different asthma medications the child used in the past week, according to the parent. In addition, if the parent indicated that the child was taking an antihistamine for asthma, it was counted as an asthma medication.

Number of Co-Morbid Conditions: This variable indicates the number of co-morbid chronic conditions the patient had been diagnosed with. This information was obtained by the research assistant from the review of the patient's medical records.

Number of Past Visits with Physician: This variable indicates the number of prior visits the patient has had with the physician over their lifetime. These visits may have been for any purpose (not just asthma-related).

Control Variables: Caregiver Characteristics

Education: This variable indicates the number of years of education completed by the parent/caregiver accompanying the patient to the visit.

Control Variables: Physician Characteristics

Gender: Gender is a dichotomous variable indicating whether the physician is male or female.

Years Since Medical Degree Received: This variable indicates the number of years since the physician received his or her medical degree at the time he or she agreed to participate in the primary study.

Other Control Variables

Length of Visit: This variable indicates the amount of time, in minutes, that the patient spent with the physician during the visit. It was often less than the length of the actual tape. Often, the research assistant began the tape recorder before the physician entered the examination room. Also, the physician may have exited the room after beginning for various reasons (e.g. to retrieve medication samples). And, as noted above, recording may have been stopped and re-started for different reasons. In most cases, notes on the transcript indicated when the physician first entered the room, and whether he or she left and returned. In cases where this information could not be gleaned from the transcript, the actual audiotape was reviewed.

Tape Cut Off Prematurely: This dichotomous variable indicates whether the tape recorder cut off before the verbal communication between the patient, parent, and physician in the exam room was complete.

Creation of Composite Variables

In addition to the variables described above, several variables were created by combining information from multiple sources. The creation of these variables is described below.

Racial Concordance

A new variable, **Racial Concordance**, was created to indicate whether the patient and caregiver each reported their respective race in the same way (1 = Racially Concordant, 0 = Not Racially Concordant). This variable was created because of the importance of the race variable for this analysis, and it would be informative to know whether the race of the patient was the same as the race of the parent. For example, a patient whose parents are of different races may have reported his or her race as both African-American and white, while the child's mother reported her race as white only. This situation would be coded as 'Not Racially Concordant.' Results from preliminary analyses will determine whether this variable will be included in the primary analyses. If a large percentage (>25%) of the sample has racial discordance, this variable will be included in the primary analyses. Otherwise, it will be used for descriptive purposes only.

.

Comprehensiveness of Symptom Discussion

A new variable, **Comprehensiveness of Symptom Discussion**, was created to indicate the comprehensiveness of the discussion concerning asthma symptoms. This variable was created from the following four symptom variables:

- Nighttime Symptoms Discussed
- Exercise-Induced Symptoms Discussed
- Daytime Symptoms Discussed
- Symptom Frequency Discussed

The **Comprehensiveness of Symptom Discussion** variable ranged from 0-4. For visits where asthma symptoms were not discussed at all, the variable had a value of zero. Each 'yes' response increased the value for the **Comprehensiveness** variable by one point. In instances where asthma symptoms were discussed, yet none of the four areas listed above was included in the discussion, one point was given.

Comprehensiveness of the Quality of Life Discussion

A new variable, **Comprehensiveness of the Quality-of-Life Discussion**, was similarly created to indicate the comprehensiveness of the discussion concerning the patient and family's asthma-related quality of life. This variable was created from the following four quality-of-life variables:

- Activity Limitations Discussed
- Negative Emotions Discussed
- Missed School Days Discussed
- Family's Quality of Life Discussed

The **Comprehensiveness of the Quality of Life Discussion** variable ranged from 0-4. For visits where none of these aspects of quality-of-life were discussed, the variable had a value of zero. Each 'yes' response increased the value for the **Comprehensiveness** variable by one point.

Quality of Life Problem Reported

A new dichotomous variable, **Quality of Life Problem Reported,** was created to indicate whether the patient reported a quality of life problem, either by expressing that he/she was experiencing any Activity Limitation or Negative Emotion.

Pulmonary Function Discussed

A discussion of pulmonary function may have included a discussion of spirometry or peak flow meter use. From these two separate variables, a new dichotomous variable, **Pulmonary Function Discussed**, was created, indicating whether either of these two topics was discussed.

Poor Pulmonary Function

A new dichotomous variable, **Poor Pulmonary Function**, was created to indicate whether the physician interpreted either the patient's spirometry test results or current peak flow meter readings as 'poor' or 'ambiguous.'

Sample Size and Statistical Power

Power analyses were performed using SAS 9.1.3 (Cary, NC) after data collection was completed. Actual sample sizes for the two independent groups and frequency of the outcome for the reference group (white patients) were used to calculate the effect size (odds ratio) that the study would be powered to detect. Power analyses were performed on three dichotomous outcome variables. For the variable Pulmonary Function Discussed, the frequency of 'yes' responses in the reference group was 53%. Given a sample of 296 patients, a power of 0.80, and an alpha of 0.05, the study was powered to detect an odds ratio of 0.50. For the variable Adherence Discussed, the frequency of 'yes' responses in the reference group was 49%. Given a sample of 251 patients (patients on a control medication), a power of 0.80 and an alpha of 0.05, the study was powered to detect an odds ratio of 0.46. For Adherence Education Provided, the frequency of 'yes' responses in the reference group was 24%. Given a sample of 251 patients, a power of 0.80, and an alpha of 0.05, the study was powered to detect an odds ratio of 0.35.

Data Analysis

Data Management

Data from the Supplemental Coding Instrument were entered into a SPSS 14.0 dataset. All other study data obtained as part of the primary study had previously been entered into separate SPSS datasets. After all datasets were complete, one master SPSS dataset for this research was created by merging datasets by patient's unique ID number, and retaining only the variables included in this analysis. This master dataset was converted into SAS datasets for all analyses to be completed using SAS 9.1.3 (Cary, N.C.).

Data Cleaning

Several steps were taken to ensure both the accuracy and completeness of the dataset. The entire dataset was analyzed to determine if any values were outside of the appropriate range for each variable. In all instances that values outside the expected range were found, the original patient file was reviewed and the value corrected.

The dataset was also reviewed for missing data. In each instance where a missing value was found, the first step was to review the hard copy source (questionnaire, coding instrument, etc) to determine whether it was simply data entry error or omission. Table 8 reports all the instances where data were missing from the original patient file. The variable that had the most missing values was the number of past visits with the physician. There were 36 instances where this variable was missing. There were three missing values for the number of co-morbidities, four missing values for years of education for the caregiver, and two missing values for the type of insurance for the child.

Table 8. Variables with Missing Values, and Number of Missing Values

Variable	Number of Missing Values
Number of Past Visits with Physician	36
Caregiver Education, in Years	4
Number of Co-morbidities	3
Private Insurance	2

For instances where the data were truly missing due to patient non-response, analyses were performed to detect any pattern of missingness, which in turn determined the method for addressing the problem. The strongest assumption is that the data are missing completely at random (Allison 2009). Two methods were used to detect any patterns of missingness.

First, patients were divided into two groups: those with missing responses and those without. T-tests and chi-square statistics were calculated to detect mean differences on key independent variables, continuous and categorical, respectively, between the two groups. The two groups did not differ significantly on any of the variables, with the exception of years of education for the caregiver, which itself had missing data. Second, a dummy variable was created to indicate whether a patient had any missing values. A logistic regression of this variable was run on independent variables where no observations were missing. None of the coefficients were significant, indicating that the assumption of the variables being missing completely at random (MCAR) was not violated (Allison 2009). However, since the first test did indicate that patients with missing data did differ significantly from patients with no missing data, on caregiver education, a more conservative assumption was made that the data were missing at random (MAR). This assumption can not be tested directly, because it requires knowledge of the missing values (Faris, Ghali et al. 2002; Allison 2009).

Multiple imputation is a preferable method for addressing missing data that are assumed to be missing at random (Allison 2009). Multiple imputation was performed in SAS 9.1.3. The Markov Chain Monte Carlo (MCMC) algorithm method was used for multiple imputation. An advantage of this method over a multivariate normal expectation-maximization (EM) algorithm is that, in MCMC, after generating predicted values, random draws are made from the simulated error distribution for each regression equation and added to the predicted values for each individual to produce the imputed values, thereby compensating for the downward bias in variance estimates that usually results from other methods (Allison 2009). Five imputed datasets were generated, and the appropriate model

was run on each imputed dataset. The results from these five datasets were combined to produce valid parameter estimates and standard errors for each model.

Preliminary Analyses

This section describes several different analyses that were conducted to characterize the sample of patients and inform decisions about primary analyses. Descriptive statistics were calculated for all independent and dependent variables. Frequencies and percents were calculated for the categorical and dichotomous variables. Similarly, means and standard deviations were calculated for all continuous and count variables. Descriptive statistics were calculated for the complete sample, and by patient race. T-tests and chi-squared tests were used to test for significant differences between minority patients on continuous and categorical values, respectively. Descriptive statistics for the primary independent and dependent variables were also calculated by clinic, and ANOVA methods were used to assess differences among clinics. If there were significant differences in any of the key independent variables by clinic, a 'dummy' variable for clinic was included in the primary analyses. For all continuous and count variables, the data were plotted to examine the structure and deviations from normality. Decisions on variable transformation based on skewness were made on an individual basis. The variation of the independent and control variables were examined. Independent variables with very small variation were not included in the primary analyses.

Other information was provided to describe additional characteristics of the sample, including the specific reason for the visit for patients where the reason is coded as 'Other.' Information will also be provided on the identity of the caregiver (e.g. mother, father,

grandparent) and other people present in the room during the patient's medical visit. In order to retain maximal power in the primary analyses, this information will only be provided descriptively, and will not be included in the models for the primary analyses.

Descriptive statistics were calculated for the physicians included in the primary analyses. Bivariate relationships between the primary communication variables and patient characteristics were assessed using t-tests and chi-square statistics. These relationships were examined to understand the distribution of the independent variables to the dependent variables. A correlation matrix was also constructed to examine the relationships between the independent variables. Finally, the patients excluded from the analysis due to problems with the audio were compared to the 296 included in the analysis; this was done for descriptive purposes.

Primary Analysis

Analysis - Aim 1

To examine the relationship between patient race and communication, including discussions about asthma symptoms, pulmonary function, quality-of -life, and control medication adherence.

H1: A comprehensive discussion of asthma symptoms is less likely to occur if the patient is minority than if the patient is white

H2: Pulmonary function (from peak flow meter or spirometry) is less likely to be discussed if the patient is minority than if the patient is white

H3: A discussion of asthma-related quality-of-life is less likely to occur if the patient is minority than if the patient is white

H4: Adherence to control medication is less likely to be discussed if the patient is minority than if the patient is white

H5: The physician will be less likely to provide education about the importance of adherence if the patient is minority than if the patient is white

Hypotheses 1-5 were tested by running models utilizing generalized estimating equations. The patients were clustered by physician, to account for intra-physician correlation. The alpha level for all analyses was 0.05.

For each hypothesis above, the primary independent variable was **Patient Race**. The corresponding communication variable was included in each separate model as the dependent variable. Other explanatory variables included in each of the above models were: Reason for Visit, Age, Patient Gender, Insurance Coverage, Asthma Severity, Number of Asthma Medications, Number of Comorbidities, Past Number of Visits, Years Since M.D. Received, Caregiver Education, Physician Gender, Length of Visit, and Tape Cuts Off.

Models to test Hypotheses 4 and 5 were only run on the subset of the sample that reported control medication use on the Eligibility Screener. The additional explanatory variables of **Symptoms Experienced, Poor Pulmonary Function, and Quality of Life Problem Reported** were also included in the model for Hypothesis 4, because if the physician appreciated that the patient was experiencing any negative effects of asthma, it was hypothesized that this should be associated with an increased likelihood of discussing control medication adherence. The additional explanatory variable of **Non-Adherent** was included in the model for Hypothesis 5, because it was hypothesized that a patient report of non-adherence should be associated with an increased likelihood of the physician providing education on the importance of medication adherence.

For each model, the ratio of the deviance to the degrees of freedom (DF) was reviewed, to assess goodness of fit. Because each model was run five times (five imputed

datasets), the mean ratio for model was reported. Deviance is defined as two times the difference of the log likelihood for the mean ("expected") model and the log likelihood under the fitted model. It has an approximate chi-square distribution with n-p degrees of freedom, where n is the number of observations, and p is the number of predictor variables. If the model fits the data well, the ratio of the deviance to the degrees of freedom should be about one (Boyle, Flowerdew et al. 1997). Large ratio values may indicate model misspecification or an over-dispersed response variable; ratios less than one may also indicate model misspecification or an under-dispersed response variable. As a consequence of these dispersion issues, the standard errors are incorrectly estimated. However, assuming the model is correctly specified, the regression estimates remain unbiased in the presence of ill-dispersion.

Analysis – Aim 2

To determine if the relationship between race and the communication variables specified above varies as a function of the primary purpose of the visit (i.e., whether the primary purpose of the visit is related to asthma).

H6: Racial differences on the communication variables will be greatest when the primary purpose of the visit is not related to asthma.

An interaction term between Race (Minority =1, White = 0) and Reason for Visit (Asthma = 1, Non-Asthma = 0) was created for this Aim. First, the values for Reason for Visit were reverse coded, so that Asthma = 0 and Non-Asthma =1. Therefore, a patient who was *both a minority AND had a non-asthma-related* visit had a value of 1. All other patients had a value of 0.

Similar to Aim 1, separate logistic models using generalized estimating equations were run for each of the communication outcome variables, as appropriate. For each model, the primary independent variable was the **Race/Reason for Visit** interaction variable. The same group of explanatory variables listed above in Aim 1 was also included in these models, and the models with **Adherence Discussed** and **Education on Adherence** as the dependent variables also included the same additional explanatory variables. Goodness of fit for each model will be reported as described above for Aim 1.

Additional Analyses

As described above, all minority patients were combined into one category (**Minority**) to maintain maximum power in the models. However, a separate sensitivity analysis was run to examine whether this significantly altered the results from having an African-American/Black category. Models were also run using complete case analysis to account for missing data as opposed to multiple imputation. The analyses were re-run: (1) stratifying by reason for the visit, and (2) re-coding the reason for the visit so that other asthma-related conditions were included in the asthma category.

CHAPTER FIVE – RESULTS

Sample Characteristics

Characteristics of the 296 patients included in the analyses are presented in the first column of Table 9. For the total sample, the majority of the visits, 56%, were asthma-related. The average patient age was 11 years (SD=2.4). The majority of the patients, 54%, were male. Most patients were classified as having moderate-to-severe asthma (72%) and were not covered by private insurance (71%). These patients either had no insurance (1%), or were covered by Medicaid (52%) or NC Health Choice (18%). NC Health Choice is a state program that provides free or reduced price coverage for children whose families make too much money to qualify for Medicaid yet cannot afford private insurance. The average number of asthma-related medications that patients used in the previous week was 2.2 (SD=0.9) and ranged between 0 and 5. The average number of chronic co-morbid conditions that patients had in addition to asthma was 2.4 (SD=1.9). The number of co-morbid conditions ranged from 0 to 11. On average, patients had seen their doctor 11 times before (SD=11.5). The responses to this question varied widely, with number of prior visits ranging from 0 to 70. The average number of years of education for the caregiver was 12.8 (SD=2.5), and ranged from 2 to 20. The average visit lasted 15.2 minutes (SD=8.5). Visit length ranged from 2.3 minutes to 45.7 minutes.

Table 9 - Characteristics of Total Sample and Stratified by Patient Race

Sample Characteristics	Total Sample (N=296)	Minority (N=131)	White (N=165)
Reason for Visit, (%)		.	
Asthma Related	55.8	64.9	48.5*
Non-Asthma Related	44.2	35.1	51.5*
Age, mean (sd)	11.1 (2.4)	11.2 (2.4)	11.0 (2.4)
Male, (%)	53.7	62.6	46.7*
Asthma Severity, (%)			
Mild	28.0	27.5	28.5
Moderate-to-Severe	72.0	72.5	71.5
Insurance Coverage, (%) [(a)]			
Private	28.7	15.4	39.6*
Other	70.6	84.6	60.4*
Number of Asthma Medications, mean (sd)	2.2 (0.9)	2.2 (1.1)	2.1 (0.8)
Number of Co-morbid Conditions, mean (sd) [(b)]	2.4 (1.9)	2.0 (1.8)	2.7 (1.9)*
Number of Past Visits with Physician, mean (sd) [(c)]	11.1 (11.5)	11.0 (10.7)	11.2 (12.1)
Caregiver Education (in years), mean (sd) [(d)]	12.8 (2.5)	12.4 (2.5)	13.1 (2.5)*
Length of Visit (in minutes), mean (sd)	15.2 (8.5)	14.7 (7.4)	15.6 (9.2)

*p<0.05

(a) Variable contains 2 missing values

(b) Variable contains 3 missing values

(c) Variable contains 36 missing values

(d) Variable contains 4 missing values

The majority of visits by minority patients, 65%, were asthma-related, compared to 49% for white patients (χ^2 =7.96, p=0.01). Approximately 63% of the minority patients were male, compared to 47% of white patients (χ^2 =7.45, p=0.01). The insurance coverage distribution also differed significantly between the two groups. Approximately 15% of the minority patients were covered by private insurance, compared to almost 40% of the white patients (χ^2 =20.75, p<0.01). Minority patients had an average of 2.0 (SD=1.8) co-morbid conditions, compared to 2.7 (SD=1.8) for white patients (p<0.01). The caregivers of minority patients

reported completing an average of 12.4 (SD=2.5) years of education compared to 13.1 (SD=2.5) years for the caregivers of white patients (p=0.03).

The two groups did not differ significantly from each other on average age, asthma severity, average number of asthma medications, average number of past visits with the physician, or the average length of the visit.

Sample Characteristics, by Clinic

This section further describes characteristics of the sample, stratified by clinic. Sample characteristics stratified by clinic are presented in Table 10. In part due to differences in enrollment duration, patient enrollment was not evenly distributed among the five clinics. Clinic 1 enrolled the most patients, 115, which was almost twice as many as the next highest enrollment clinic, clinic 5, which enrolled 68 patients. Clinic 2 enrolled the fewest patients (n=20).

There were several differences in patient characteristics by the clinic in which they were enrolled. The distribution of minority and white patients varied among the five clinics ($F=11.78$, $p<0.001$). Minority enrollment ranged from 29% at clinic 5 to 80% at clinic 2. The reason for the visit also varied across clinics ($F=13.73$, $p<0.01$). “Asthma” as the reason for the visit ranged from 37% at clinic 5 to 100% at clinic 2. Other variables that varied across clinic were: average number of asthma medications reported ($F=7.99$, $p<0.01$), the average number of co-morbidities recorded ($F=27.45$, $p<0.01$), and the average length of visit ($F=3.38$, $p=0.01$). The average number of asthma medications ranged from 1.9 (SD=0.9) at clinic 5 to 2.9 (SD=1.0) at clinic 3. The average number of co-morbid conditions ranged from

Table 10 - Sample Characteristics and Primary Discussion Variables, Stratified by Clinic

Sample Characteristics	Clinic 1 (N=115)	Clinic 2 (N=20)	Clinic 3 (N=36)	Clinic 4 (N=57)	Clinic 5 (N=68)
Race of Patient, (%) *					
Minority	32.2	80.0	77.8	52.6	29.4
White	67.8	20.0	22.2	47.4	70.6
Reason for Visit, (%)*					
Asthma Related	48.7	100.0	91.7	54.4	36.8
Other Reason	51.3	0.0	8.3	45.6	63.2
Age, mean (sd)	11.3 (2.5)	10.6 (1.9)	11.4 (2.3)	11.1 (2.5)	10.9 (2.4)
Male, (%)	55.7	65.0	52.8	63.2	39.7
Asthma Severity, (%)					
Mild	27.8	50.0	19.4	28.1	26.5
Moderate-to-Severe	72.2	50.0	80.6	71.9	73.5
Insurance Coverage, (%) [(a)]					
Private	27.0	21.0	19.4	40.4	29.9
Other	73.0	79.0	80.6	59.6	70.1
Number of Asthma Medications, mean (sd)*	2.0 (0.9)	2.4 (1.0)	2.9 (1.0)	2.1 (0.8)	1.9 (0.9)
Number of Co-morbid Conditions, mean (sd) [(b)]*	3.1 (1.7)	1.5 (2.4)	1.9 (1.6)	0.7 (0.8)	3.2 (1.6)
Number of Past Visits with Physician, mean (sd) [(c)]	11.4 (11.7)	12.2 (13.5)	10.3 (11.9)	13.2 (12.5)	8.6 (9.0)
Caregiver Education (in years), mean (sd) [(d)]	12.8 (2.4)	12.3 (2.3)	12.4 (2.4)	13.6 (2.8)	12.4 (2.5)
Length of Visit (minutes), mean (sd)*	13.5 (8.3)	14.1 (9.2)	17.1 (7.9)	18.1 (8.2)	15.2 (8.5)
Primary Discussion Variables					
Comprehensiveness of Symptom Discussion Score, mean (sd)*	2.1 (1.2)	3.0 (1.0)	2.2 (1.1)	2.6 (0.7)	2.3 (1.1)
Pulmonary Function Discussed, (%)*	40.0	80.0	69.4	61.4	63.2
Asthma-Related QoL Discussed, (%)	23.5	40.0	44.4	38.6	32.4
Patient on a Control Medication, (N)	**(N=96)**	**(N=17)**	**(N=33)**	**(N=54)**	**(N=51)**
Control Medication Adherence Discussed	47.9	82.4	63.6	57.4	49.0
Education on Adherence Provided	27.1	58.8	36.4	29.6	23.5

* Significant difference between at least 2 clinics at p<0.05

(a) Variable contains 2 missing values

(b) Variable contains 3 missing values

(c) Variable contains 36 missing values

(d) Variable contains 4 missing values

0.7 (SD=0.8) at clinic 4 to 3.2 (SD=1.6) at clinic 5. The average length of visit for clinic 1 was 13.5 min (SD=8.3 min), compared to 18.1 min (SD=8.1 min) for clinic 4.

Differences on the primary communication variables were also examined. Differences were observed in the average comprehensiveness of symptom discussion (CSD) score ($F=5.15$, $p=0.01$), and the frequency of any discussion of pulmonary function ($F=5.66$, $p<0.01$). The average CSD score ranged from 2.1 at clinic 1 to 3.0 at clinic 2. Pulmonary function was discussed in 40% of the visits at clinic 1, compared to 80% of the visits at clinic 2.

Originally, Clinic was not intended to be included as a control variable in the primary analyses. However, due to the observed differences in sample characteristics by clinic, the decision was made to control for clinic in all primary analyses. A sensitivity analysis was performed without including the clinic identifiers.

Physician/Provider Characteristics

Forty-four providers originally agreed to participate in the study. Three were from the clinic that was dropped from the study. Additionally, there were five for whom no patients enrolled in the study, and one whose only patient was excluded from the analysis. Therefore, there were 35 physicians/providers for whom patients were included in this analysis. Of these 35, four were physician assistants, nurse practitioners, or nurses. Seventeen of the study providers were male (48%). The average number of years since the provider had graduated from medical school was 17.7 (SD=10.0). The number of years ranged from 1 to 43. The number of patients enrolled per provider ranged from 1 patient (2 providers) to 29 patients (1

provider). The average number of patients per provider was 8.5 (SD=6.5). The modal enrollment was 7 patients (5 providers).

Characteristics of the Office Visit

This section describes the characteristics of the office visit, specifically the communication variables and associated variables that came from the coding of the audiotape transcripts. Each of the following topics is described separately: symptoms, pulmonary function, asthma-related quality of life, and control medication adherence. Information on the communication variables and associated variables are presented in Table 11, both for the entire sample (first column) and stratified by patient race (second and third columns).

Discussion of Asthma Symptoms

Overall, asthma symptoms were discussed in 277 of the 296 visits, approximately 94% of the visits. The average score for the comprehensiveness of the symptom discussion was 2.3 (SD=1.1). The two dimensions of symptom experience that were discussed most often were nighttime symptoms and exercised-induced symptoms, which were discussed in 71% and 74% of the visits, respectively. The least frequently discussed dimension was daytime symptoms, which was discussed in 13% of the visits. In the 277 visits where symptoms were discussed, 204 patients (74%) reported that they were experiencing symptoms. In the 204 visits where the patient was experiencing symptoms, the physician provided a suggestion to the patient and/or parent in 181 (89%) visits to help improve the symptoms. There were no statistical differences on any of the symptom discussion variables between minority patients and white patients.

Table 11 Communication and Associated Variables, Total Sample and Stratified by Patient Race

Communication and Associated Variables	Total Sample (N=296)	Minority (N=131)	White (N=165)
Symptoms			
Asthma Symptoms Discussed, % (n)	93.6 (277)	93.9 (123)	93.3 (154)
Comprehensiveness of Symptom Discussion, mean (sd)	2.3 (1.1)	2.3 (1.1)	2.3 (1.1)
Nighttime Symptoms Discussed, % (n)	70.6 (209)	69.5 (91)	71.5 (118)
Exercise-Induced Symptoms Discussed	74.3 (220)	73.3 (96)	75.2 (124)
Daytime Symptoms Discussed	13.2 (39)	15.3 (20)	11.5 (19)
Symptom Frequency Discussed	63.2 (187)	61.8 (81)	64.2 (106)
Symptoms Experienced (where symptoms discussed)[(a)]	73.6 (204)	72.4 (89)	74.7 (115)
Suggestions Given to Help Manage Symptoms (where symptoms experienced) [(b)]	88.7 (181)	93.3 (83)	85.2 (98)
Pulmonary Function, % (n)			
Pulmonary Function Discussed	55.7 (165)	59.5 (78)	52.7 (87)
Poor or Ambiguous Pulmonary Function Scores (where pulmonary function discussed) [(c)]	40.6 (67)	42.3 (33)	39.1 (34)
Spirometry			
Spirometry Discussed	46 (136)	42.8 (56)	48.5 (80)
Spirometry Performed at Visit	38.2 (113)	36.6 (48)	39.4 (65)
Spirometry Results Discussed (where spirometry performed) [(d)]	77.9 (88)	81.2 (39)	75.4 (49)
Poor or Ambiguous Spirometry Results (where results discussed) [(e)]	58.0 (51)	66.7 (26)	51 (25)
Suggestions Given to Improve Pulmonary Function (where results were ambiguous or poor) [(f)]	86.3 (44)	84.6 (22)	88.0 (22)
Peak Flow Meter			
Peak Flow Meter Discussed	21.3 (63)	23.7 (31)	19.4 (32)
Current Peak Flow Meter Results Discussed (where peak flow meter discussed) [(g)]	44.4 (28)	45.2 (14)	43.8 (14)
Poor or Ambiguous Peak Flow Results (where current results discussed) [(h)]	57.1 (16)	50.0 (7)	64.3 (9)
Suggestions Given to Improve Peak Flow Results (where results are ambiguous or poor) [(i)]	75.0 (12)	85.7 (6)	66.7 (6)

Communication and Associated Variables	Total Sample	Minority	White
Asthma-Related Quality of Life, % (n)			
Any QoL Discussed	32.1 (95)	32.1 (42)	32.1 (53)
Activity Limitation (AL) Discussed	27.4 (81)	26.7 (35)	27.9 (46)
Negative Emotions (NE) Discussed	3 (9)	3.1 (4)	3 (5)
Missed School Discussed	6.4 (19)	6.9 (9)	6.1 (10)
Family QoL Discussed	2.4 (7)	4.6 (6)	0.6 (1) *
Patient Experiencing QoL Problems (where QoL Discussed) [j]	45.3 (43)	42.9 (18)	47.2 (25)
Suggestion Give to Help ImproveQoL (where patient reported experiencing QoL problems) [k]	60.5 (26)	72.2 (13)	52.0 (13)
Control Medication Adherence, % (n)	**(n=251)**	**(n=107)**	**(n=144)**
Medication Adherence Discussed	54.6 (137)	62.6 (67)	48.6 (70)*
Education on Adherence Provided	30.3 (76)	38.3 (41)	24.3 (35)*
Non-Adherence Reported (where adherence discussed) [l]	31.4 (43)	31.3 (21)	31.4 (22)

*p<0.05

(a) N-Total (N_T)=277; N-Minority (N_M)=123; N-White (N_W)=154

(b) N_T=204; N_M=89; N_W=115

(c) N_T=165; N_M=78; N_W=87

(d) N_T=113; N_M=48; N_W=65

(e) N_T=88; N_M=39; N_W=49

(f) N_T=51; N_M=26; N_W=25

(g) N_T=63; N_M=31; N_W=32

(h) N_T=28; N_M=14; N_W=14

(i) N_T=16; N_M=7; N_W=9

(j) N_T=95; N_M=42; N_W=53

(k) N_T=43; N_M=18; N_W=25

(l) N_T=137; N_M=67; N_W=70

Discussion of Pulmonary Function

Pulmonary function (*either* spirometry or peak flow meters, or both) was discussed in 165 of the 296 visits, or 56% of the visits. The sections below describe communication about the two methods for measuring pulmonary function, spirometry and peak flow meters, separately.

Discussion of Spirometry

Spirometry was discussed during 46% (n=136) of the visits. A spirometry test was actually administered during 38% (n=113) of the visits. In the 113 visits where a spirometry test was administered, the test results were discussed during 78% (n=88) of the visits. In the 88 visits where the results of the spirometry test were discussed, the interpretation of the results (pulmonary function at the time) was determined to be poor or ambiguous during 58% (n=51) of the visits. The following excerpts from two transcripts provide examples of physicians' interpretations that were coded as poor and ambiguous, respectively.

- Physician: "alright buddy look, let me tell you, these numbers don't look too good really and we need to put him on, get him back on his medicines here for some of this breathing problem"

- Physician: "Um, I mean this is… let me show you ah, she's not bad. She's not perfect but she's pretty close to doing good…"

In the 51 visits where the results were determined to be ambiguous or poor, the physician made a suggestion to the patient and/or parent to help improve pulmonary function during 86% (n=44) of the visits. The following excerpt provides an example of a suggestion made by a physician to help improve pulmonary function based on spirometry results.

- Physician: "…his numbers on the spirometry, that's what I am looking at, um, they look ok, they could be better…let me put him on 5 days of prednisone and you continue to use this albuterol for five days."

  Caregiver: "Okay"

  Physician: "Take one pill once a day and he is going to do this albuterol before school, after school, dinner time and bedtime, 4 puffs with the spacer."

Caregiver: “Okay.”

Physician: “…then I want him to stay on his Singulair, he should be on a 10 mg tablet, one pill once a day everyday and that’s to prevent and control his asthma and then I what I want to do is see ya’ll back in two weeks”

Caregiver: “Okay”

Physician: “And I want to repeat his spirometry in two weeks after this course of steroids and after the five days of albuterol and I want to see if his numbers look better”

Caregiver: “Okay”

Physician: “Now if his numbers look better then fine, we’ll leave him on Singulair, if his numbers don’t look better then we are going to step up to something a little bit stronger than Singulair”

There was no statistical difference for any of the spirometry variables between minority patients and white patients.

Discussion of Peak Flow

Overall, peak flow meter use was discussed during 21% (n=63) of the visits. Of these 63 visits, *current* peak flow readings were discussed during 44% (n=28) of the visits. In the 28 visits where current peak flow readings were discussed, the interpretation of the results was poor or ambiguous in 57% (n=16) of these visits. The following excerpt provides an example of a physician’s interpretation that was coded as poor.

- (peak flow meter results being discussed)

  Physician: “Now I’m looking at a big difference between what you should be doing and what you blew.”

In the 16 visits where the results were interpreted as poor or ambiguous, the physician made a suggestion to help improve pulmonary function in 75% (n=12) of these visits. The following excerpt provides an example of a suggestion made by a physician to help improve pulmonary function based on peak flow meter results.

- (peak flow meter use is being discussed.)
  Patient: “I’m in my yellow zone right now.”

  Physician: “Then, then as you progress you can get wheezing, tightness of chest, shortness of breath, inability to sleep because you cough so much, ok.”

  Patient: “I’ve had that.”

  Physician: “All that is yellow zone stuff and then it tells you here what to do, you know. Here you will do your first step, is use your quick, ah, quick relief medication, that’s the Albuterol.”

  Caregiver: “Okay.”

  Physician: “And within the first hour you do three treatments.”

  Caregiver: “Okay.”

  Physician: “So that’s to open the airway. So you do treatment twenty minutes later, treatment, twenty minutes later, treatment, twenty minutes later, treatment.”

There was no statistical difference for any of the peak flow meter discussion variables between minority patients and white patients.

Discussion of Asthma-Related Quality of Life

Asthma-related quality of life (at least one of the four dimensions) was discussed during 32% (n=95) of the visits. The most common component of asthma-related quality of life (QoL) that was discussed was activity limitation, which was discussed during 27% (n=81) of the visits. Negative emotions about asthma were discussed during 3% (n=9) of the visits. Missed school due to asthma was discussed during 6% (n=19) of the visits. The family's quality of life due to the patient's asthma was discussed during 2% (n=7) of the visits.

In the 95 visits where asthma-related QoL was discussed, the patient reported experiencing QoL problems (either activity limitations or negative emotions) during 15% (n=43) of the visits. In these 43 visits where the patient reported have any QoL problems, the physician made a suggestion to the patient and/or parent to help improve the QoL during 61% (n=26) of the visits. The following excerpts provide examples of suggestions made by a physician to help improve quality of life for a patient who reported experiencing activity limitations.

- Physician: "What about PE….Do you have problems every time you have PE?"

  Patient: "…Yeah, I walk around the thing five times and then I stop and get some water…"

  Physician: "Why do you have to stop?"

Patient: “Because after I walk a certain amount of time my asthma will start kicking in.”

Physician: “What exactly will happen?”

Patient: “I start wheezing (unclear) and sometimes I feel like I get slow walking and I feel like I need to rest.”

Physician: “Yes, ok, all of what you described is very consistent with asthma that is not well controlled, these are all good things for us to take care of with an asthma action plan and have you use some control medicine that you use everyday.”

- (…earlier discussion established a problem when playing sports…)

Physician: “….the sports, you want the coach to pull him out because he is getting more winded, that is telling me things are not as good as they could be because there are Olympic athletes and pro football players and pro baseball players who can do all the sports they want to do with their asthma so there is not any reason he should not be able to play as hard as the next kid, be as good as an Olympic athlete. Ok, so I would increase his Advair dose from 100 to 250, follow me?”

Caregiver: “Um hum”

Physician: “You do it once a day?”

Caregiver “Um hum”

Physician: “I would do it twice a day.”

Family-related quality of life was more likely to be discussed with minority patients compared to white patients. This discussion occurred during six visits with a minority patient compared to one visit with a white patient, for frequencies of 4.6% and 0.6%, respectively (χ^2 = 5.00, p=0.03). The following excerpts provide examples of discussion of family-related quality of life.

- (discussing child's night time cough)

  Caregiver: "..It's just like, it sounds like an eighty year old woman or man

  Physician: "Right, right"

  Caregiver: "I mean, it just tears me up"

- Physician: " You watch his football games and basketball games?"

  Caregiver: "Um hum"

  Physician: Do you worry about him when he is playing?"

  Caregiver: "Yeah" (unclear)

There were no statistical differences with any of the other quality of life discussion variables between minority and white patients.

Discussion of Control Medication Adherence and Education

Approximately 85% of the patients (n=251) reported using a control medication for asthma prior to enrollment in the study. All analyses regarding control medication adherence (preliminary and primary) refer only to this subset of 251 patients. Approximately 82% of the minority patients (n=107) were on a control medication. In comparison, approximately 87% of the white patients (n=144) were on a control medication.

Overall, adherence to control medication was discussed during 55% (n=137) of these 251 visits. The physician educated the patient and/or parent on the importance of adherence to asthma control medications during 30% (n=76) of these visits. In the 137 visits where adherence was discussed, either the patient or parent reported non-adherence during 32% (n=44) of the visits.

Adherence to control medications was discussed during 63% (n=67) of the visits with minority patients compared to 49% (n=70) of the visits with white patients (χ^2=4.86, p=0.03). Education on the importance of adherence was discussed during 38% (n=41) of the visits for minority patients compared to 24% (n=35) of the visits with white patients (χ^2=5.71, p=0.02). There was no difference in non-adherence between minority and white patients.

Additional Descriptive Characteristics of Visit

Information on whether the physician, caregiver, or patient initiated discussion of specific aspects of asthma symptoms, pulmonary function, quality of life, and control medication adherence is presented in Table 12. In the 277 visits where symptoms were discussed, the physician initiated the discussion during 84% (n=233) of the visits. In the 204 visits where it was reported that the patient was experiencing symptoms, the parent initially reported symptoms in 63% (n=129) of the visits compared to the patient initially reporting the symptoms in 37% (n=75) of the visits. A discussion of pulmonary function was almost always initiated by the physician. Of the 136 visits where spirometry was discussed, the discussion was initiated by the physician in 97% (n=132) of the visits. Of the 63 visits where peak flow meters were discussed, the discussion was initiated by the physician in 89% (n=56) of the visits. Asthma-related quality of life was the topic where patients were more

Table 12- Discussion Initiators About Asthma Management Topics

Communication Variables	Physician Initiates, % (n)	Caregiver Initiates, % (n)	Patient Initiates, % (n)
Symptoms			
Symptoms Discussion	84.1 (233)	13.7 (38)	2.2 (6)
Patient Is Experiencing Symptoms	-	63.2 (129)	36.8 (75)
Nighttime Symptoms Discussion	83.3 (174)	12.9 (27)	3.8 (8)
Exercise-Induced Symptoms Discussion	67.7 (149)	21.8 (48)	10.5 (23)
Daytime Symptoms Discussion	69.2 (27)	25.6 (10)	5.1 (2)
Symptom Frequency Discussion	82.9 (155)	12.3 (23)	4.8 (9)
Pulmonary Function			
Spirometry Discussion	97.1 (132)	2.9 (4)	0.0 (0)
Peak Flow Meter Discussion	88.9 (56)	11.1 (7)	0.0 (0)
Asthma-Related Quality of Life			
Activity Limitation Discussion	59.3 (48)	25.9 (21)	14.8 (12)
Patient Is Experiencing Activity Limitation	-	51.2 (21)	48.8 (20)
Negative Emotions Discussion	11.1 (1)	44.4 (4)	44.4 (4)
Patient Is Experiencing Negative Emotions	-	57.1 (4)	42.9 (3)
Missed School Discussion	68.4 (13)	26.3 (5)	5.3 (1)
Family Quality of Life Discussion	42.9 (3)	57.1 (4)	0.0 (0)
Control Medication Adherence			
Medication Adherence Discussion	84.7 (116)	12.4 (17)	2.9 (4)
Patient Is Non-adherent	-	65.1 (28)	34.9 (15)

likely to initiate discussion. For example, in the 41 visits where the patient was experiencing quality of life limitations, the patient reported this information during 49% (n=20) of the visits, almost as often as the caregiver, who reported the information during 51% (n=21) of the visits. In the 128 visits where control medication adherence is discussed, the discussion was initiated by the physician during 78% (n=107) of the visits. Patient non-adherence to control medication was more often reported by the caregiver (66%, n=29) than the patient (34%, n=15).

Of the 131 visits where the reason for the visit was coded as 'other,' the parent wrote-in 'asthma' as a part of the reason for the visit on 6% (n=8) of the questionnaires. An example is 'asthma and flu'. A review of the actual questionnaires confirmed that the parent chose 'other' as the reason for the visit; thus, the variable was analyzed accordingly. Of the same 131 visits, the reason given was closely related to asthma or other respiratory/pulmonary conditions on 6% (n=8) of the questionnaires. Examples include: allergies, bronchitis, or pneumonia. After the primary analyses were completed, a sensitivity analyses was run in which these 16 patients were transferred from the 'other' group to the 'asthma' group.

The following information is provided for descriptive purposes only, and was not considered in the primary analyses. Of the 296 visits, the patient's mother was the only primary caregiver present in the exam room during 83% (n=245) of the visits. The patient's father was the only primary caregiver present in the exam room during 6% (n=18) of the visits. During 7% (n=22) of the visits, at least two caregivers (usually a mother and father) were present in the exam room. For these visits, the person who signed the consent form and completed the office questionnaire was identified as the primary caregiver. In the final 3% of visits, someone else, either a grandparent or an aunt, was the primary caregiver present in the room. For two patients, it appears that the caregiver did not accompany the patient into the exam room and/or did not speak at all in the exam room. For 65% of the visits, there was no one else in the room to participate in the conversation except the patient, the caregiver(s), and the physician. This does not include a nurse who may have briefly entered to converse with the doctor or take the patient to another room. In the other 35% of the visits, there were other people in the room who may have participated in the communication, or have otherwise

drawn the attention of the patient, caregiver, or physician. In most of these visits, the other people in the room were siblings of the patient.

Preliminary Analyses

This section describes the results of the preliminary analyses that were conducted on all variables to characterize the sample, and also to inform decisions about whether to include these variables in the primary analyses. This section also includes: (1) the results of the bivariate analyses, and (2) the results of the comparison between the patients included in the analyses and those excluded for audio problems.

Initial Variable Review

For two patients, the parent did not give a reason for their child's visit to the doctor on their office visit questionnaire. Patients were asked an identical question about the reason for their visit on their questionnaire. An analysis of the other questionnaires showed that parent and patient answers to this question were in agreement more than 80% of the time. Based upon the high percentage of agreement between the patient and the parent, the decision was made to substitute the patient's response for this variable, instead of excluding the patient from the analysis or imputation.

Initial examination of the variable indicating the comprehensiveness of the quality of life discussion (score 0-4) revealed very little variation. Of the 296 patients, 201 (68%) had no quality of life discussion at all. Of the remaining 95 patients, 82% discussed only one dimension of quality of life. There were only 17 visits where two or three dimensions were discussed, and none where all four were discussed. Therefore, a dichotomous variable,

Quality of Life Discussed, was created. This variable indexed whether any of the four dimensions of QoL were discussed (0= No QoL Discussion; 1= QoL Discussion). This variable was used as the primary outcome variable for the QoL discussion.

Examination of the variable indicating the number of prior visits by the patient revealed a very large range of 0-70. Because this was not a primary independent or outcome variable, and a relatively high percentage (12%) of observations were missing, requiring imputation, the decision was made not to transform this variable for the primary analyses.

The ethnicity variable did not have enough variation to have predictive power in any of the models. Approximately 4% of the final sample (12 patients) identified themselves as Hispanic or Latino. Therefore, ethnicity was not included in any of the primary analyses.

An examination of the variable indicating whether there was racial concordance between the parent and the patient revealed that there was 90% racial concordance. Therefore, this variable was not included in the primary analyses.

In 4% (n=11) of the 296 visits, a nurse or physician assistant was present either in addition to or instead of a physician, and participated substantially in the communication (as opposed to coming into the room only to escort the patient to a separate room for spirometry, for example). The type of provider was noted in the study documents; however, due to very small numbers, the type of provider was not distinguished in the primary analyses.

Bivariate Analysis

Tables 13-17 present patient and length of visit by each of the primary discussion dependent variables: Comprehensiveness of Symptom Discussion (Table 13); Pulmonary Function Discussed (Table 14); Quality of Life Discussed (Table 15); Control Medication Adherence Discussed (Table 16); and Adherence Education Provided (Table 17).

Table 13 shows the patient and discussion characteristics, stratified by the comprehensiveness of symptom discussion (CSD) variables. Of the 296 visits, 275 (93%) included a discussion of asthma symptoms. Most of the visits that included a discussion of asthma symptoms received a score of 3, indicating that three different components of asthma symptoms were discussed. For both white and minority patients, most of the patients received an index score of 3. The average CSD score also was significantly associated with the reason for the visit. Patients with a CSD score of 0 were less likely to be visiting the doctor for asthma compared to patients with a score of 2, 3, or 4 ($F=4.32$, $p<0.01$). Also, the CSD score increased with the length of visit. Visits with a score of 1 averaged 12.5 (SD=7.3) minutes, and visits with a score of 4 averaged 20.6 (9.6) minutes. ($F=6.94$, $p<0.001$).

Table 14 shows that pulmonary function was discussed in 165 of the visits. Pulmonary function was significantly more likely to be discussed if the reason for the visit was asthma-related, as opposed to a non-asthma related visit ($\chi^2 = 26.92$, $p<0.001$). A discussion of pulmonary function was more likely to occur with a male patient than with a

Table 13 - Sample Characteristics by Comprehensiveness of Symptom Discussion Variable (n=296)

	Comprehensiveness of Symptom Discussion Score				
Sample Characteristics	0 (n=19)	1 (n=57)	2 (n=64)	3 (n=128)	4 (n=28)
Race, (%)					
Minority	6.1	23.7	16.8	41.2	12.2
White	7.9	14.6	25.5	44.9	7.3
Reason for Visit, (%)*					
Asthma Related	2.4	17.6	21.2	46.1	12.7
Other Reason	13.0	19.8	22.1	39.7	5.3
Age, mean (sd)	11.1 (2.4)	11.1 (2.6)	11.0 (2.5)	11.1 (2.3)	11.4 (2.5)
Gender, (%)					
Male	3.8	18.2	20.8	49.1	8.2
Female	10.9	19.0	22.6	36.5	10.9
Asthma Severity, (%)					
Mild	10.8	14.5	28.9	37.3	8.4
Moderate-to-Severe	5.6	20.2	18.8	45.5	9.9
Insurance Coverage, (%)					
Private	7.1	14.1	29.4	40.0	9.4
Other	7.2	20.6	18.2	44.5	9.6
Number of Asthma Medications, mean (sd)	2.2 (1.0)	2.2 (1.0)	2.0 (0.9)	2.2 (0.9)	2.3 (1.0)
Number of Co-morbid Conditions, mean (sd)	3.2 (1.7)	2.6 (1.5)	2.2 (1.8)	2.2 (2.0)	3.1 (1.9)
Number of Past Visits with Physician, mean (sd)	10.6 (13.9)	11.1 (10.0)	13.1 (12.6)	11.1 (11.9)	6.6 (6.6)
Caregiver Education (in years) mean (sd)	12.8 (4.1)	12.9 (2.6)	12.7 (2.0)	12.7 (2.6)	12.8 (1.8)
Length of Visit, (in minutes), mean (sd)*	11.7 (7.1)	12.5 (7.3)	13.8 (8.6)	16.5 (8.1)	20.6 (9.6)

*p<0.05

female patient (χ^2=4.83, p=0.028). A discussion of pulmonary function was also associated with a longer visit. On average, a visit that included a discussion of pulmonary function

Table 14 - Sample Characteristics by Pulmonary Function Discussion Variable (n=296)

Sample Characteristics	Pulmonary Function Discussed: Yes (n=165)	Pulmonary Function Discussed: No (n=131)
Race, (%)		
Minority	59.5	40.5
White	52.7	47.3
Reason for Visit, (%)*		
Asthma Related	69.1	30.9
Other Reason	38.9	61.1
Age, mean (sd)	10.9 (2.3)	11.4 (2.5)
Gender, (%)*		
Male	61.6	38.4
Female	48.9	51.1
Asthma Severity, (%)		
Mild	55.4	44.6
Moderate-to-Severe	55.9	44.1
Insurance Coverage, (%)		
Private	60.0	40.0
Other	54.1	45.9
Number of Asthma Medications, mean (sd)	2.2 (0.9)	2.1 (1.0)
Number of Co-morbid Conditions, mean (sd)	2.4 (1.9)	2.5 (1.8)
Number of Past Visits with Physician, mean (sd)	11.5 (11.5)	10.6 (11.5)
Caregiver Education (in years) mean (sd)	12.8 (2.5)	12.7 (2.6)
Length of Visit, (in minutes), mean (sd)*	17.4 (8.7)	12.6 (7.3)

*p<0.05

lasted 17.4 (SD=8.7) minutes, compared to 12.6 (SD=7.3) minutes for a visit that did not include a discussion of pulmonary function ($p<0.001$).

Table 15 shows that asthma-related quality of life was discussed in 95 of the visits. QoL was significantly more likely to be discussed if the reason for the visit was asthma-related, as opposed to a non-asthma related visit (χ^2 =5.14, p=0.023). On average, a visit that included a discussion of QoL lasted 16.8 (SD=8.1) minutes, compared to 14.5 (SD=8.6) minutes for a visit that did not include a discussion of QoL (p<0.001).

Table 16 shows that, of the 251 patients who were on an asthma control medication prior to enrollment in the study, adherence was discussed in 165 of the visits. Adherence was significantly more likely to be discussed if the patient was minority, as opposed to if the patient was white (χ^2 = 4.86, p=0.028). Adherence was also significantly more likely to be discussed if the reason for the visit was asthma-related, as opposed to a non-asthma related visit (χ^2 = 15.44, p<0.001). Adherence was discussed in 59% of the visits of patients with moderate-to-severe asthma, compared to 43% of the visits of patients with mild asthma (χ^2 =4.68, p=0.031). Adherence was more likely to be discussed if the patient had poor or ambiguous pulmonary function results (72%) than if the patient did not have poor or ambiguous results (49.5%) (χ^2 =8.95, p=0.003).

Table 17 shows that education on the importance of adherence to control medication was provided in 76 of the 251 visits where the patient was on a control medication. Education on the importance of adherence was more likely to be provided if the patient was minority than if the patient was white (χ^2 = 5.71, p=0.017). This type of discussion occurred in 39% of the visits when the primary reason for the visit was asthma-related, compared to 18% of the visits when the reason for the visit was something other than asthma (χ^2 =12.69, p<0.001). Education was provided in 71% of the visits when the patient reported non-

Table 15 - Sample Characteristics by Quality of Life Discussion Variable (n=296)

Sample Characteristics	Quality of Life Discussed Yes (n=95)	No (n=201)
Race, (%)		
Minority	32.1	67.9
White	32.1	67.9
Reason for Visit, (%)*		
Asthma Related	37.6	62.4
Other Reason	25.2	74.8
Age, mean (sd)	11.4 (2.4)	11.0 (2.4)
Gender, (%)		
Male	32.7	67.3
Female	31.4	68.6
Asthma Severity, (%)		
Mild	28.9	71.1
Moderate-to-Severe	33.3	66.7
Insurance Coverage, (%)		
Private	34.1	65.9
Other	31.6	68.4
Number of Asthma Medications, mean (sd)	2.3 (1.0)	2.1 (0.9)
Number of Co-morbid Conditions, mean (sd)	2.3 (1.9)	2.5 (1.8)
Number of Past Visits with Physician, mean (sd)	10.2 (10.2)	11.5 (12.1)
Caregiver Education (in years) mean (sd)	12.7 (2.5)	12.8 (2.6)
Length of Visit, (in minutes), mean (sd)*	16.8 (8.1)	14.5 (8.6)

*p<0.05

adherence, compared to 22% of the visits where the patient did not report non-adherence (χ^2 = 40.79, p<0.001).

Table 16 - Sample Characteristics by Control Medication Adherence Discussion Variable (n=251)

	Adherence Discussed	
	Yes	No
Sample Characteristics	**(n=137)**	**(n=114)**
Race, (%)*		
Minority	62.6	37.4
White	48.6	51.4
Reason for Visit, (%)*		
Asthma Related	65.1	34.9
Other Reason	40.0	60.0
Age, mean (SD)	11.1 (2.5)	10.9 (2.3)
Male, (%)	60.1	39.9
Female, %	47.8	52.2
Asthma Severity, (%)*		
Mild	43.1	56.9
Moderate-to-Severe	58.6	41.4
Insurance Coverage, (%)		
Private	52.1	47.9
Other	55.1	44.9
Number of Asthma Medications, mean (sd)	2.4 (0.9)	2.3 (0.8)
Number of Co-morbid Conditions, mean (sd)	2.2 (1.9)	2.6 (1.8)
Number of Past Visits with Physician, mean (sd)	11.8 (12.2)	10.8 (10.7)
Caregiver Education (in years), mean (sd)	13.0 (2.3)	12.8 (2.6)
Length of Visit, (in minutes), mean (sd)*	15.9 (8.4)	14.3 (8.0)
Patient Experiencing Symptoms, (%)		
Yes	58.7	41.3
No	45.6	54.4
Patient Has Poor Pulmonary Function, (%)*		
Yes	71.9	28.1
No	49.5	50.5
Patient Reports Quality of Life Problems, (%)		
Yes	63.2	38.8
No	53.1	46.9

*$p<0.05$

Table 17 - Sample Characteristics by Education Provided on Adherence Variable (n=251)

	Education on Adherence Provided	
	Yes	No
Sample Characteristics	**(n=76)**	**(n=175)**
Race, (%)*		
Minority	38.3	61.7
White	24.3	75.7
Reason for Visit, (%)*		
Asthma Related	39.0	61.0
Othe Reason	18.1	81.9
Age, mean (sd)	10.8 (2.5)	11.1 (2.4)
Male, (%)	34.8	65.2
Female, %	24.8	75.2
Asthma Severity, (%)		
Mild	26.2	73.8
Moderate-to-Severe	31.7	68.3
Insurance Coverage, (%)		
Private	31.5	68.5
Other	29.5	70.5
Number of Asthma Medications, mean (sd)	2.5 (1.0)	2.3 (0.8)
Number of Co-morbid Conditions, mean (sd)	2.2 (2.1)	2.5 (1.8)
Number of Past Visits with Physician, mean (sd)	12.0 (12.4)	11.1 (11.2)
Caregiver Education (in years) mean (sd)	12.9 (2.3)	12.9 (2.5)
Length of Visit, (in minutes), mean (sd)*	16.3 (9.2)	14.6 (7.8)
Patient Reports Non-Adherence, (%)*		
Yes	70.5	29.5
No	21.7	78.3

*p<0.05

Correlations

Pearson correlation coefficients for continuous variables and phi correlation coefficients for categorical variables were generated to test for multicollinearity among the independent and control variables. A correlation matrix showing the Pearson correlation coefficients for the independent variables is presented in Table 18. None of the correlations approached the predetermined level (r=0.70) to indicate that multicollinearity would be a problem in the primary analyses (Slinker and Glantz 1985). However, some variables were found to be significantly correlated with other variables at a level of $p<0.05$. The relationships between patient race and other independent variables have been presented in previous sections. The correlations confirm results presented earlier. Compared to white patients, minority patients were more likely to be visiting for an asthma-related reason (r=0.16, p=0.005) and be male (r=0.15, p=0.006), and were less likely to have private insurance (r=-0.27, $p<0.001$) than white patients. Minority patients also had fewer co-morbid chronic conditions (r=-0.18, p=0.002) than white patients, and their caregivers did not have as many years of education (r=-0.13, p=0.029) as the caregivers of white patients.

A positive correlation was observed between the number of years of caregiver's education and type of insurance, with caregivers with more years of education being more likely to report that their child was covered by private insurance (r=0.29, $p<0.001$). In addition, patients with moderate-to-severe asthma were on more asthma medications compared to children with mild asthma (r=0.26, $p<0.001$). None of the other bivariate correlations exceeded 0.20. Visiting the doctor for an asthma-related reason was positively correlated with being male (r=0.11, $p<0.05$) and using more asthma medications (r=0.16, p=0.007), and negatively associated with having more co-morbid chronic conditions

Table 18 - Correlations Among Independent Variables

	Minority	Asthma Visit	Age	Male	Moderate-to Severe Asthma	Private Insurance	# Asthma Meds	# Comorbid-ities	# Past Visits	Yrs. Caregiver Education	Length of Visit
Minority	1.00										
Asthma Visit	0.16*	1.00									
Age	0.04	-0.08	1.00								
Male	0.16*	0.11*	-0.06	1.00							
Moderate-to-Severe Asthma	0.01	0.08	0.09	-0.02	1.00						
Private Insurance	-0.27*	-0.01	-0.04	0.05	-0.07	1.00					
# Asthma Meds	0.09	0.16*	-0.12*	0.04	0.26*	-0.11	1.00				
# Comorbidities	-0.18*	-0.15*	0.04	-0.10	0.05	-0.05	-0.03	1.00			
# Past Visits	-0.01	-0.05	-0.14*	0.05	0.02	0.01	<0.01	-0.01	1.00		
Yrs. Caregiver Education	-0.13*	-0.08	0.06	-0.04	-0.03	0.29*	0.04	-0.15*	-0.04	1.00	
Length of Visit	-0.05	<0.01	0.02	0.01	0.07	0.09	0.02	-0.05	-0.04	0.16*	1.00

*p<0.05

(r=-0.15, p=0.013). Patient age was negatively correlated with using more asthma medications (r=-0.12, p=0.042) and the number of prior visits (r=-0.13, p=0.030). There was a significant negative correlation between having more co-morbidities and years of education for the caregiver (r=-0.15, p=0.012). Years of caregiver education was positively correlated with the length of the visit (r=0.16, p=0.006).

Comparison of Patients Included in Analyses with Patients Excluded Due to Audio Problems

The 296 patients retained for analysis were compared with the 26 patients who were excluded for not having a usable audiotape. The group of 26 does not include patients who would not have been included in the analysis because of ineligibility, enrollment in the excluded clinic, or large amounts of missing data. Comparisons were made on eleven sample characteristics: patient race, reason for visit, age, gender, asthma severity, insurance coverage, number of asthma medications, number of chronic co-morbid conditions, number of prior visits with the physician, years of caregiver education, and use of a control medication. The two groups did not differ statistically from each other on any of these variables, with the following exceptions: reason for visit, gender and number of prior visits with physician. Of the 26 excluded patients, 77% were visiting the doctor for an asthma-related reason compared to 56% for included patients (χ^2 =4.39, p=0.036). Of the 26 excluded patients, 77% were male compared to 54% of the included patients (χ^2 = 5.21, p=0.022). The excluded patients averaged 7.1 (SD=4.8) prior visits with the physician compared to 11.1 (SD=10.6) prior visits for the included patients (p=0.01).

Primary Analyses – Specific Aim 1

To examine the relationship between patient race and patient-provider communication, including discussions about asthma symptoms, pulmonary function, quality-of -life, and control medication adherence

This section describes the results of analyses to examine the relationship between patient race and patient-provider communication. Generalized estimating equations (GEE), clustering patients by physician, were used to test the five primary hypotheses for Aim 1.

H1: A comprehensive discussion of asthma symptoms is less likely to occur if the patient is minority than if the patient is white
H2: Pulmonary function (from peak flow meter or spirometry) is less likely to be discussed if the patient is minority than if the patient is white
H3: A comprehensive discussion of asthma-related quality-of-life is less likely to occur if the patient is minority than if the patient is white
H4: Adherence to control medication is less likely to be discussed if the patient is minority than if the patient is white

Five separate models were evaluated for this Aim, corresponding to the five topics of asthma discussion. The results for the models from Aim 1 are presented in Tables 19-23.

Comprehensiveness of Symptom Discussion

Table 19 shows the results from the regression with the Comprehensiveness of Symptom Discussion (CSD) as the dependent variable. Patient race was not associated with a decrease in the CSD Score ($p=0.66$). Patients visiting the physician for asthma scored 1.22 more points on the CSD variable than patients visiting the doctor for some other reason ($p<0.01$). Each one minute increase in the length of visit was associated with a 1.01 increase in the CSD score ($p<0.01$).

Table 19 - Regression of the Comprehensiveness of the Symptom Discussion on Patient, Caregiver, and Physician Characteristics, and Clinic Identifiers (n=296)

	Estimate	Robust SE	95% CI	p value
Minority	0.97	1.07	0.85-1.11	0.66
Asthma-Related Visit	1.22*	1.06	1.08-1.38	<0.01
Male	1.10	1.07	0.97-1.25	0.15
Age (years)	1.01	1.01	0.99-1.04	0.32
Moderate-to-Severe Asthma	1.05	1.04	0.97-1.14	0.23
Number of Asthma Medications	1.01	1.02	0.96-1.06	0.72
Number of Co-morbid Conditions	1.01	1.14	0.99-1.48	0.33
Length of Visit (minutes)	1.01*	1.00	1.01-1.02	<0.001
Caregiver Education (years)	0.99	1.01	0.97-1.009	0.25
Tape Cut-Off	1.08	1.09	0.92-1.26	0.38
Private Insurance Coverage	1.02	1.07	0.89-1.16	0.80
Number of Past Visits with Physician	0.998	1.00	0.99-1.003	0.37
Number of Yrs Since Physician Completed Medical School	0.99	1.01	0.98-1.004	0.21
Male Physician	0.91	1.09	0.77-1.08	0.28
Clinic 2	1.33*	1.13	1.05-1.68	0.02
Clinic 3	0.90	1.12	0.72-1.14	0.38
Clinic 4	1.20	1.10	0.99-1.45	0.06
Clinic 5	0.94	1.15	0.72-1.22	0.63

p<0.05

Clinic 1 was the reference clinic in all models. Patients at clinic 2 scored 1.33 more points on the CSD variable than patients at clinic 1 (p=0.02). The mean ratio of the deviance to degrees of freedom (DF) of this model was 0.62. This indicates that this model may be mis-specified, with slightly incorrect standard errors. However, the estimates remain unbiased, and it is unlikely that the significance of the patient race or reason for the visit is affected, since neither p-value is close to the threshold of 0.05.

Discussion of Pulmonary Function

Table 20 shows the results from the model with Pulmonary Function Discussed as the dependent variable. Minority patients were no less likely than white patients to have a discussion of pulmonary function with their physician (OR 1.25, 95% CI 0.67-2.34). Patients visiting the physician for asthma were more likely to have a discussion of pulmonary function than those who were visiting the physician for another reason (OR 3.89, 95% CI 2.51-6.02). A one minute increase in the length of visit was associated with an increased likelihood of discussing pulmonary function (OR 1.07, 95% CI 1.04-1.11). Patients at clinics 2 (OR 3.14, 95% CI 1.08-9.14) and 4 (OR 2.70, 95% CI 1.05-6.94) were more likely to discuss pulmonary function than patients at clinic 1. The mean ratio of deviance to DF for this model was 1.18, indicating an adequate model fit.

Discussion of Asthma-Related Quality of Life

Table 21 shows the results from the model with Quality of Life Discussed as the dependent variable. Minority patients were no less likely than white patients to have a discussion of asthma-related quality of life with their physician (OR 0.72, 95% CI 0.41-1.26). A one year increase in age was associated with an increased likelihood of discussing QoL (OR 1.09, 95% CI 1.01-1.09). The mean ratio of deviance to DF for this model was 1.26, indicating an adequate model fit.

Table 20 - Regression of Pulmonary Function Discussion on Patient, Caregiver, and Physician Characteristics, and Clinic Identifiers (n=296)

	Odds Ratio	Robust SE	95% CI	p value
Minority	1.25	1.37	0.67-2.34	0.48
Asthma-Related Visit	3.89*	1.25	2.51-6.02	<0.0001
Male	1.62	1.40	0.84-3.12	0.15
Age (years)	0.96	1.06	0.85-1.08	0.49
Moderate-to-Severe Asthma	0.86	1.35	0.48-1.56	0.63
Number of Asthma Medications	0.96	1.16	0.72-1.30	0.81
Number of Co-morbid Conditions	1.03	1.09	0.86-1.23	0.73
Length of Visit (minutes)	1.07*	1.02	1.04-1.11	<0.0001
Caregiver Education (years)	1.03	1.06	0.91-1.16	0.62
Tape Cut-Off	1.66	1.40	0.86-3.21	0.13
Private Insurance Coverage	1.15	1.48	0.53-2.50	0.72
Number of Past Visits with Physician	1.01	1.01	0.99-1.03	0.50
Number of Yrs Since Physician Completed Medical School	0.99	1.02	0.95-1.03	0.58
Male Physician	0.75	1.43	0.37-1.51	0.42
Clinic 2	3.14*	1.73	1.08-9.14	0.04
Clinic 3	1.87	1.75	0.63-5.61	0.26
Clinic 4	2.70*	1.62	1.05-6.94	0.04
Clinic 5	2.30	1.92	0.64-8.21	0.20

p<0.05

Discussion of Control Medication Adherence

Table 22 shows the results from the model with Control Medication Adherence Discussed as the dependent variable. Minority patients were no less likely than white patients to discuss control medication adherence (OR 1.42, 95% CI 0.79-2.58). Patients who were visiting the doctor for asthma were more likely to discuss medication adherence than patients who were visiting the doctor for a reason other than asthma (OR 2.04, 95% CI 1.14-3.63).

Table 21 - Regression of Quality of Life Discussion on Patient, Caregiver, and Physician Characteristics, and Clinic Identifiers (n=296)

	Odds Ratio	Robust SE	95% CI	p value
Minority	0.72	1.33	0.41-1.26	0.25
Asthma-Related Visit	1.56	1.32	0.90-2.70	0.11
Male	1.002	1.29	0.61-1.66	0.99
Age (years)	1.09*	1.04	1.01-1.19	0.03
Moderate-to-Severe Asthma	0.92	1.34	0.51-1.64	0.77
Number of Asthma Medications	1.21	1.18	0.88-1.66	0.24
Number of Co-morbid Conditions	1.03	1.08	0.89-1.19	0.68
Length of Visit (minutes)	1.03	1.01	0.99-1.06	0.08
Caregiver Education (years)	0.95	1.05	0.87-1.04	0.30
Tape Cut-Off	1.05	1.47	0.49-2.23	0.91
Private Insurance Coverage	1.22	1.36	0.67-2.22	0.51
Number of Past Visits with Physician	0.998	1.01	0.97-1.03	0.86
Number of Yrs Since Physician Completed Medical School	1.01	1.02	0.98-1.04	0.72
Male Physician	0.72	1.53	0.31-1.65	0.44
Clinic 2	2.21	2.26	0.45-10.92	0.33
Clinic 3	1.98	1.70	0.70-5.62	0.20
Clinic 4	1.70	1.64	0.65-4.47	0.28
Clinic 5	1.31	1.70	0.46-3.73	0.61

$p<0.05$

Asthma severity was also a significant predictor of discussing adherence, with patients classified as having moderate-to-severe asthma being more likely to discuss adherence than patients classified as having mild asthma (OR 2.31, 95% CI 1.14-4.66). The mean ratio of deviance to DF for this model was 1.34, indicating adequate model fit.

Table 22 - Regression of Control Medication Adherence Discussion on Patient, Caregiver, and Physician Characteristics, and Clinic Identifiers (n=251)

	Odds Ratio	Robust SE	95% CI	p value
Minority	1.42	1.35	0.79-2.58	0.24
Asthma-Related Visit	2.04*	1.34	1.14-3.63	0.02
Male	1.40	1.40	0.72-2.71	0.32
Age (years)	1.02	1.05	0.93-1.13	0.65
Moderate-to-Severe Asthma	2.31*	1.43	1.14-4.66	0.02
Number of Asthma Medications	0.80	1.14	0.62-1.03	0.08
Number of Co-morbid Conditions	0.90	1.10	0.75-1.08	0.25
Length of Visit (minutes)	1.01	1.02	0.97-1.05	0.64
Caregiver Education (years)	1.11	1.07	0.96-1.27	0.16
Tape Cut-Off	0.79	1.67	0.29-2.16	0.64
Private Insurance Coverage	0.81	1.36	0.44-1.47	0.49
Number of Past Visits with Physician	1.003	1.01	0.98-1.03	0.77
Number of Yrs Since Physician Completed Medical School	0.99	1.02	0.96-1.03	0.61
Male Physician	1.47	1.58	0.59-3.59	0.40
Patient Experiencing Symptoms	1.47	1.32	0.86-2.53	0.16
Patient Has Poor Pulmonary Function	1.73	1.54	0.74-4.04	0.20
Patient Reports QoL Problems	1.34	1.47	0.63-2.86	0.45
Clinic 2	2.70	2.12	0.62-11.75	0.19
Clinic 3	1.15	1.99	0.30-4.41	0.84
Clinic 4	0.84	1.75	0.28-2.51	0.75
Clinic 5	1.24	1.82	0.38-4.00	0.72

$p<0.05$

Education on Importance of Control Medication Adherence

Table 23 shows the results from the model with Education on Adherence Provided as the dependent variable. In the original model, the variable Tape Cut-Off was significantly associated with whether education on adherence was provided. Since this make obvious

Table 23 - Regression of the Education on Adherence Discussion on Patient, Caregiver, and Physician Characteristics, and Clinic Identifiers (n=212)

	Odds Ratio	Robust SE	95% CI	p value
Minority	1.20	1.49	0.55-2.64	0.64
Asthma-Related Visit	2.12	1.62	0.83-5.46	0.12
Male	1.23	1.48	0.57-2.64	0.59
Age (years)	0.96	1.07	0.84-1.10	0.55
Moderate-to-Severe Asthma	0.92	1.38	0.49-1.73	0.80
Number of Asthma Medications	1.05	1.25	0.68-1.63	0.83
Number of Co-morbid Conditions	0.98	1.11	0.80-1.21	0.86
Length of Visit (minutes)	1.02	1.03	0.96-1.08	0.53
Caregiver Education (years)	1.06	1.07	0.93-1.20	0.39
Private Insurance Coverage	0.89	1.50	0.40-1.97	0.77
Number of Past Visits with Physician	1.01	1.02	0.98-1.04	0.60
Number of Yrs Since Physician Completed Medical School	1.02	1.02	0.97-1.06	0.43
Male Physician	1.37	1.99	0.36-5.26	0.65
Patient Reports Non-Adherence	8.45*	1.60	3.35-21.30	<0.0001
Clinic 2	4.08	3.04	0.46-36.09	0.21
Clinic 3	1.56	2.16	0.34-7.11	0.56
Clinic 4	0.86	1.56	0.36-2.06	0.74
Clinic 5	1.51	1.95	0.41-5.61	0.53

p<0.05

sense, especially sense physicians may be more likely to offer advice toward the end of the visit, the model was re-run, excluding the cases where the tape was cut-off (n=39). The results of this model are presented. Physicians were no less likely to provide education on the importance of adherence to asthma medication to minority patients than white patients (OR 1.46, 95% CI 0.72-2.96). Education on the importance of adherence was more likely to be

provided to patients reporting non-adherence than those who did not report non-adherence (OR 8.45, 95% CI 3.35-21.30). The mean ratio of deviance to DF for this model was 1.07, indicating adequate model fit.

Primary Analyses – Specific Aim 2

To determine if the relationship between patient race and the asthma communication variables specified above (asthma symptoms, pulmonary function, quality-of-life, and control medication adherence) varies depending on the primary purpose of the visit (whether the primary purpose of the visit is asthma)

This section describes the results of analyses to examine whether the relationship between patient race and patient-provider communication varies depending on the primary purpose of the visit. GEE, clustering patients by physician, was again used to test the primary hypothesis for Aim 2.

> H6: Racial differences on the communication variables will be greatest when the primary purpose of the visit is not related to asthma.

Five separate models were evaluated for this Aim, corresponding to the five topics of asthma discussion. The results for the models from Aim 2 are presented in Tables 24-29.

Comprehensiveness of Symptom Discussion

Table 24 shows the results from the regression with the Comprehensiveness of Symptom Discussion (CSD) as the dependent variable. The interaction of patient race and reason for the visit was not associated with an increase in the CSD Score (p=0.68). The mean ratio of deviance to DF for this model was 0.62, again indicating that the model may be mis-

Table 24 - Regression of the Comprehensiveness of the Symptom Discussion on Patient, Caregiver, and Physician Characteristics, and Clinic Identifiers, with a Patient Race/Reason for Visit Interaction (n=296)

	Estimate	Robust SE	95% CI	p value
Minority	0.95	1.08	0.81-1.11	0.53
Asthma-Related Visit	1.24*	1.08	1.07-1.44	<0.01
Race/Reason for Visit Interaction	1.05	1.12	0.84-1.31	0.68
Male	1.10	1.07	0.97-1.26	0.15
Age (years)	1.01	1.01	0.99-1.04	0.31
Moderate-to-Severe Asthma	1.05	1.04	0.97-1.14	0.23
Number of Asthma Medications	1.01	1.02	0.96-1.06	0.67
Number of Co-morbid Conditions	1.01	1.01	0.99-1.04	0.32
Length of Visit (minutes)	1.01*	1.004	1.01-1.22	<0.01
Caregiver Education (years)	0.99	1.01	0.97-1.01	0.26
Tape Cut-Off	1.07	1.09	0.91-1.26	0.39
Private Insurance Coverage	1.01	1.07	0.90-1.15	0.82
Number of Past Visits with Physician	0.998	1.002	0.99-1.003	0.38
Number of Yrs Since Physician Completed Medical School	0.99	1.01	0.98-1.004	0.21
Male Physician	0.91	1.09	0.77-1.08	0.28
Clinic 2	1.34*	1.14	1.04-1.73	0.02
Clinic 3	0.91	1.13	0.71-1.16	0.45
Clinic 4	1.20	1.11	0.99-1.47	0.07
Clinic 5	0.94	1.15	0.72-1.23	0.64

p<0.05

specified. However, the p-value of the interaction term did not approach of the threshold of 0.05, and it is unlikely that any misspecification affected the significance of this estimate.

Discussion of Pulmonary Function

Table 25 shows the results from the model with Pulmonary Function Discussed as the dependent variable. The interaction of patient race and reason for the visit was not associated with a decreased likelihood of discussing pulmonary function (OR 1.12, 95% CI 0.38-3.33). The mean ratio of deviance to DF for this model was 1.17, indicating adequate model fit.

Table 25 - Regression of Pulmonary Function Discussion on Patient, Caregiver, and Physician Characteristics, and Clinic Identifiers with a Patient Race/Reason for Visit Interaction (n=296)

	Odds Ratio	Robust SE	95% CI	p value
Minority	1.19	1.53	0.52-2.73	0.69
Asthma-Related Visit	4.07*	1.39	2.14-7.72	<0.001
Race/Reason for Visit Interaction Term	1.12	1.75	0.38-3.33	0.84
Male	1.62	1.40	0.84-3.12	0.15
Age (years)	0.96	1.06	0.85-1.08	0.48
Moderate-to-Severe Asthma	0.87	1.35	0.48-1.56	0.64
Number of Asthma Medications	0.97	1.17	0.72-1.30	0.83
Number of Co-morbid Conditions	1.03	1.09	0.86-1.23	0.73
Length of Visit (minutes)	1.07*	1.02	1.03-1.11	<0.01
Caregiver Education (years)	1.03	1.06	0.91-1.17	0.63
Tape Cut-Off	1.66	1.40	0.86-3.21	0.13
Private Insurance Coverage	1.15	1.50	0.52-2.55	0.74
Number of Past Visits with Physician	1.01	1.01	0.99-1.03	0.49
Number of Yrs Since Physician Completed Medical School	0.99	1.02	0.96-1.03	0.58
Male Physician	0.75	1.42	0.38-1.51	0.43
Clinic 2	3.19*	1.75	1.07-9.57	0.04
Clinic 3	1.91	1.74	0.64-5.66	0.25
Clinic 4	2.73*	1.63	1.05-7.10	0.04
Clinic 5	2.31	1.92	0.65-8.26	0.20

p<0.05

Discussion of Asthma-Related Quality of Life

Table 26 shows the results from the model with QoL discussed as the dependent variable. The interaction of patient race and reason for the visit was not associated with a decreased likelihood of discussing QoL (OR 1.06, 95% CI 0.39-2.91). The mean ratio of deviance to DF for this model was 1.27, indicating adequate model fit.

Table 26 - Regression of Quality of Life Discussion on Patient, Caregiver, and Physician Characteristics, and Clinic Identifiers with a Patient Race/Reason for Visit Interaction (n=296)

	Odds Ratio	Robust SE	95% CI	p value
Minority	0.70	1.34	0.39-1.26	0.23
Asthma-Related Visit	1.59	1.42	0.80-3.16	0.19
Race/Reason for Visit Interaction	1.06	1.67	0.39-2.91	0.90
Male	1.002	1.29	0.60-1.66	0.99
Age (years)	1.09	1.04	1.01-1.18	0.03
Moderate-to-Severe Asthma	0.92	1.34	0.52-1.63	0.77
Number of Asthma Medications	1.21	1.17	0.89-1.66	0.23
Number of Co-morbid Conditions	1.03	1.08	0.89-1.19	0.68
Length of Visit (minutes)	1.03	1.01	0.997-1.06	0.08
Caregiver Education (years)	0.95	1.05	0.87-1.04	0.31
Tape Cut-Off	1.04	1.47	0.49-2.22	0.91
Private Insurance Coverage	1.22	1.35	0.68-2.20	0.51
Number of Past Visits with Physician	0.998	1.01	0.97-1.03	0.87
Number of Yrs Since Physician Completed Medical School	1.01	1.02	0.98-1.04	0.72
Male Physician	0.72	1.53	0.31-1.66	0.44
Clinic 2	2.24	2.26	0.45-11.06	0.32
Clinic 3	2.00	1.71	0.70-5.73	0.20
Clinic 4	1.71	1.67	0.63-4.67	0.29
Clinic 5	1.31	1.71	0.46-3.75	0.61

$p<0.05$

Discussion of Control Medication Adherence

Table 27 shows the results from the model with Control Medication Adherence Discussed as the dependent variable. The interaction of patient race and reason for visit was

Table 27 -Regression of Education on Control Medication Adherence Discussion on Patient, Caregiver, and Physician Characteristics, and Clinic Identifiers, Including a Patient Race/Reason for Visit Interaction (n=251)

	Odds Ratio	Robust SE	95% CI	p value
Minority	1.82	1.44	0.89-3.74	0.10
Asthma-Related Visit	1.71	1.50	0.78-3.79	0.18
Race/Reason for Visit Interaction	0.59	1.88	0.17-2.03	0.40
Male	1.38	1.40	0.71-2.67	0.35
Age (years)	1.02	1.05	0.92-1.13	0.65
Moderate-to-Severe Asthma	2.27*	1.42	1.14-4.51	0.02
Number of Asthma Medications	0.80	1.14	0.62-1.03	0.08
Number of Co-morbid Conditions	0.90	1.10	0.75-1.08	0.25
Length of Visit (minutes)	1.01	1.02	0.97-1.05	0.66
Caregiver Education (years)	1.11	1.08	0.96-1.27	0.17
Tape Cut-Off	0.79	1.67	0.29-2.15	0.65
Private Insurance Coverage	0.84	1.37	0.46-1.56	0.59
Number of Past Visits with Physician	1.003	1.01	0.98-1.03	0.78
Number of Yrs Since Physician Completed Medical School	0.99	1.02	0.96-1.02	0.55
Male Physician	1.43	1.57	0.59-3.47	0.43
Patient Experiencing Symptoms	1.45	1.33	0.83-2.53	0.19
Patient Has Poor Pulmonary Function Scores	1.73	1.55	0.74-4.06	0.21
Patient Reports QoL Problems	1.32	1.46	0.63-2.77	0.46
Clinic 2	2.41	2.10	0.57-10.30	0.23
Clinic 3	1.04	1.95	0.28-3.84	0.96
Clinic 4	0.79	1.73	0.27-2.31	0.67
Clinic 5	1.22	1.79	0.39-3.82	0.74

p<0.05

not associated with a decreased likelihood of discussing control medication adherence (OR 0.59. 95% CI 0.17-2.03). The mean ratio of deviance to DF for this model was 1.34, indicating adequate model fit.

Education on Importance of Control Medication Adherence

Table 28 shows the results from the model with Education on Adherence Provided as the dependent variable. As with Aim 1, the cases where the tape cut off were excluded from analysis. The interaction of patient race and reason for the visit was not associated with a decreased likelihood of education on adherence being provided (OR 1.19, 95% CI 0.29-4.94). The mean ratio of deviance to DF for this model was 1.08, indicating adequate model fit.

Additional Analyses

After the primary analyses were completed, several sensitivity analyses were run to compare different models. The results of these analyses are presented below.

Complete Case Analyses

Models for Aims 1 and 2 were re-run using complete case analysis (dropping observations) to address missing values in the dataset. The number of patients included in the models was reduced from 296 to 254 in the three models for discussion of symptoms, pulmonary function, and QoL, and from 251 to 218 in the models for control medication adherence. In the regression on discussion of QoL, patient race changed from a non-significant predictor to a significant predictor. In Aim 1, minority patients were less likely to

Table 28 - Regression of the Education on Adherence Discussion on Patient, Caregiver, and Physician Characteristics, and Clinic Identifiers with a Patient Race/Reason for Visit Interaction (n=212)

	Odds Ratio	Robust SE	95% CI	p value
Minority	1.07	1.76	0.35-3.24	0.91
Asthma-Related Visit	2.42	1.86	0.72-8.16	0.15
Race/Reason for Visit Interaction	1.42	2.16	0.31-6.43	0.65
Male	1.24	1.47	0.59-2.63	0.57
Age (years)	0.96	1.07	0.84-1.10	0.56
Moderate-to-Severe Asthma	0.92	1.39	0.49-1.75	0.80
Number of Asthma Medications	1.05	1.25	0.68-1.62	0.82
Number of Co-morbid Conditions	0.98	1.11	0.80-1.21	0.87
Length of Visit (minutes)	1.02	1.32	0.96-1.08	0.52
Caregiver Education (years)	1.06	1.07	0.93-1.21	0.37
Private Insurance Coverage	0.86	1.52	0.38-1.96	0.72
Number of Past Visits with Physician	1.01	1.02	0.98-1.04	0.58
Number of Yrs Since Physician Completed Medical School	1.02	1.02	0.98-1.06	0.40
Male Physician	1.38	1.96	0.37-5.18	0.63
Patient Reports Non-Adherence	8.35*	1.59	3.37-20.70	<0.0001
Clinic 2	4.32	3.12	0.46-40.21	0.20
Clinic 3	1.66	2.14	0.37-7.38	0.51
Clinic 4	0.89	1.55	0.38-2.10	0.79
Clinic 5	1.54	1.91	0.43-5.49	0.50

p<0.05

discuss quality of life than white patients (OR 0.39, 95% CI 0.19-0.79). In Aim 2, the significance of the interaction term did not change.

Patient Race

Models were re-run in which the variable Patient Race was modified so that only patients who selected African-American/Black as their race (either alone or in conjunction with another race) were included as a minority patient. The number of patients included as a minority was reduced from 131 to 89. The other 42 patients were not included in these models. This modification did not change the significance of any of the primary independent variables.

Reason for Visit

Models for Aim 1 were re-run, stratified by the reason for the visit. This modification did not change the significance of the patient race variable.

All models for Aim 1 and 2 were re-run, in which 16 patients who were visiting the doctor for an asthma-related reason, but were classified as 'Other', were transferred to the 'Asthma' group. This increased the number of patients with an asthma-related reason from 165 to 181. In Aim 1, in the regression on the quality of life discussion, the reason for the visit became a significant predictor. A patient visiting the doctor for asthma was more likely to discuss quality of life issues than a patient visiting the doctor for another reason (OR 1.9, 95% CI 1.11-3.54). This modification did not change the significance of the interaction term in any of the models for Aim 2.

Clinic Identifiers

All models for Aim 1 and 2 were re-run, without including the clinic identifiers. In Aim 1, reason for visit became a significant predictor for providing education on adherence.

A physician was more likely to provide education on the importance of adherence if the reason for the visit was asthma compared to something else (OR 2.11, 95%CI). This modification did not change the significance of the interaction term in any of the models for Aim 2.

CHAPTER SIX - DISCUSSION

Pediatric asthma is one of the most common chronic pediatric conditions in the U.S., and minority children with asthma have been shown to suffer worse asthma-related health outcomes than white children with asthma (Targonski, Persky et al. 1994; Akinbami 2006; Erickson, Iribarren et al. 2007). This research examined the relationship between a patient's race and patient-provider communication with pediatric asthma patients. It focused on communication concerning the following topics of asthma management: symptoms, pulmonary function, asthma-related quality of life, and adherence to control medications. These topics are among those highlighted in the NEAPP guidelines for asthma management. Previous research suggests that effective communication about these aspects of asthma management may lead to better asthma control and health outcomes for asthma patients (NHLBI 1997; Wissow 1998). Patient race was hypothesized to be associated with differences in patient-provider communication for these topics of asthma management. This association would support patient-provider communication as a contributor to disparities in a pediatric asthma population, and suggest one mechanism through which communication may be contributing to disparities. This section summarizes and discusses the major findings of this study, as well as the limitations, strengths, and directions for future research.

Summary of Findings

The bivariate analyses did not support an association between patient race and communication about asthma symptoms, pulmonary function or asthma-related quality of life. These topics were no less likely to be discussed with minority patients than with white patients. However, the bivariate analyses did support an association between the reason for the visit and communication about asthma symptoms, pulmonary function, and control medication adherence. The reason for the visit remained significant in the multivariate analyses for these outcomes. This finding can be interpreted two different ways. On one hand, it is encouraging that patients visiting the physician for asthma are discussing these important topics of asthma management, in accordance with recommended guidelines. However, on the other hand, it also suggests that these topics are less likely to be discussed if the patient is visiting the physician for a non-asthma related reason. Due to the fact that asthma is a chronic disease, asthma management needs to be regularly monitored by the physician.

This study only considered two levels (asthma or non-asthma) for the reason for the visit, as well as sensitivity analyses for which some reasons associated with asthma (e.g., flu, pneumonia) were switched from non-asthma to asthma. The switching did not significantly alter the results in the multivariate analyses. Future studies may consider other levels for the reason for the visit. For example, many patients were visiting the doctor for an annual well-child check up or physical. In this present study, these patients were included in the same category as patients visiting for other acute reasons, such as stomach cramps (both were in non-asthma group). A future study may consider whether asthma management is as likely to be discussed during a yearly physical as for an asthma visit, as compared to visit for other

reasons. A study of this nature, examining several levels for the reason for the visit, may provide additional information as to how the reason is associated with whether asthma management is discussed.

Although previous studies have shown that minority children are more likely to experience symptoms, the results from this present study did not show that minority children were any more likely to report experiencing symptoms than white patients. Minority and white children were also very similar in the likelihood of any asthma symptoms being discussed, as well as the inclusion of specific aspects of asthma symptoms: nighttime symptoms, exercise-induced symptoms, daytime symptoms and symptom frequency. For all patients, asthma symptoms were discussed in more than 90% of the visits, and there was no difference between minority and white patients in the comprehensiveness of the symptom discussion scores, suggesting that physicians tend to be compliant with that particular recommendation from the NAEPP guidelines, without regard to patient race.

Patient race was also not shown to be associated with whether pulmonary function (either spirometry or peak flow) was discussed. There was communication about pulmonary function in slightly more than half of the visits. Even though it is less than the frequency of communication about symptoms, this is not necessarily out of line with the recommendation of the NAEPP guidelines because: 1) a spirometry test is not recommended to be administered at every visit, and 2) peak flow meter checks are not recommended to be discussed at every visit, and have been de-emphasized in the most recent guidelines (2007) which were issued while data collection was in progress.

Quality of life was discussed the least of any of the four topics. For the entire sample, and for minority and white patients, quality of life was discussed in slightly less than one-

third of the visits. One possible explanation for this finding is that physicians may feel these more subjective areas are not as important indicators of asthma control as more clinical measures, such as symptom report and pulmonary function. QoL, while not normally assessed via standardized, validated instruments during routine medical visits, is still an important component of an asthma management discussion. In particular, QoL, especially the domain of activity limitations, may be the easiest way to convey to the child the importance of obtaining optimal control through control medication adherence. For example, a young child who doesn't comprehend the need to regularly take medicine for clinical reasons, such as improving FVC scores, may be able to more easily understand the relationship between not taking medicine and not being able to play outside after school.

Finally, bivariate analyses revealed that patient race was associated with the discussion of control medication adherence and the provision of education about the importance of the adherence to control medications. However, the direction of these associations was contrary to the hypothesized direction, with discussions *more* likely to occur for minority patients than white patients. This was a surprising finding, and contradictory to what previous research would suggest. Previous research has found that minority patients are more likely to under-utilize control medications, and be less adherent to these medications than white patients.

One possible explanation for the finding in this study is that physicians are aware of the research literature suggesting that minority patients are less adherent than white patients, and therefore, physicians are more cognizant of the need to discuss this issue and to reinforce to minority patients the importance of adherence. The difference was not likely due to observed non-adherence, because minority and white patients were almost identical in self-

reported non-adherence. This finding was also somewhat surprising, given that previous research suggests that adherence tends to be worse in minority patients, compared with white patients.

In multivariate analyses, the association between patient race and communication about control medication adherence disappeared. It is likely that this association was confounded by the reason for the visit variable, which remained significant (OR 2.04, p=0.02). Minority patients were more likely than white patients to be visiting the physician for asthma than a non-asthma reason, thus confounding the relationship between patient race and discussion of control medication adherence.

The multivariate model predicting whether control medication adherence was discussed also had the additional explanatory variables of whether or not the patient reported experiencing symptoms, whether the patient had poor pulmonary function scores (either from spirometry or peak flow) or whether the patient reported experiencing quality of life problems. It was surprising that none of these factors predicted whether adherence to control medication was discussed. One explanation for this finding is the possibility that some physicians are more apt to discuss medication adherence than others, regardless of any asthma-related problems that may arise during the course of the visit. Other physicians may be less apt to discuss adherence under the same circumstances. Finally, it is possible that the magnitude of the difference in communication about adherence education was too small to be observed with multivariate analysis in this study.

In the final model predicting whether the physician provided education about the importance of medication adherence, the report of patient non-adherence remained a highly significant predictor (OR 8.30, $p<0.001$) of the physician providing education about the

importance of adherence. There were no significant differences in the report of non-adherence between minority and white patients, again somewhat surprising since previous research suggests that non-adherence is more prevalent for minority patients than white patients. However, it is interesting to note that non-adherence was reported most often by the parent, and not the patient. One possible explanation for this finding is that patients, especially the younger patients, are not likely to admit, or even comprehend, that they have not been taking their medication according to physician instructions. Also, especially for the younger patients, their parents may be assuming most of the responsibility for the child's medication-taking behavior patterns, and in a better position to know if the child is adherent or not. One implication of parents assuming most of the responsibility for their child's medication-taking behaviors is that interventions and programs designed to improve adherence may need to involve the parent as well as the patient.

Another point to consider is whether parents' beliefs about medication-taking and the importance of adherence may be driving their child's non-adherence. Parents of children with asthma may believe that control medications only need to be used when symptoms appear, that the medication will cause too many side effects, or that their child may become too dependent on the medication (Farber, Capra et al. 2003; Bender and Bender 2005). Parents also report that they may simply forget to give their child their medication (Burgess, Sly et al. 2008). An implication of this is that many adverse outcomes experienced by pediatric asthma patients may be due to their parent's beliefs or medication-taking patterns. A future study may even consider whether parents and children with chronic diseases, each requiring daily medications, exhibit the same degree of adherence (or non-adherence), and how closely the adherence of the child aligns with the parent's beliefs about medication-taking.

For almost all areas, the physician initiated discussions of asthma management. This may indicate that the physician is dominating and driving the conversation. This can be interpreted in two ways. It is probably safe to assume that patients and their caregivers are not familiar with the guidelines for asthma management, and therefore unaware of several methods of assessing asthma control. For example, patients and caregivers may not be aware that nighttime symptoms are particularly indicative of asthma control, and therefore need to be discussed separately, in addition to regular daytime symptoms. In this study, a discussion of nighttime symptoms was initiated by the physician during 83% of the visits (where it was discussed). Pulmonary function, in particular assessment by spirometry, is another area where discussion was initiated almost exclusively by the physician (97%). There were no instances where the patient initiated discussion about pulmonary function (spirometry or peak flow), and only a few instances where the caregiver initiated the discussion. I think it is an indication of effective disease management that physicians are initiating discussions about important topics that are unlikely to be discussed otherwise. It is interesting to note that quality of life is an area where the patient or caregiver was most likely to initiate a discussion, particularly negative emotions. This again may suggest that this area is not considered as important by the physician.

The clinic findings are also worthy of comment. There were several regressions where there were significant differences in the clinic identifiers (Clinic 1 was the reference clinic in all models). While data collection was in-progress, additional descriptive information was collected from each clinic, including information about patient make-up, clinic staff, and specialized asthma practices. All clinics were exclusively pediatric clinics, with the exception of Clinic 6, which was excluded from analyses. All clinics reported that

they routinely screen patients for asthma, and administer a spirometry test as part of a routine asthma visit. However, the clinics differed slightly in their approach towards asthma management and education. For example, Clinics 2, 3 and 4 reported that they offered asthma education to children and their caregivers, while Clinics 1 and 5 reported that they did not. Also, only Clinic 3 reported that it offered a specialized asthma clinic, which it held every other month. Clinic 2 was the only to report that it had an asthma educator or specialist on staff.

Differences in the resources offered by clinics to patients with asthma may provide insight into reasons by some of the significant clinic findings in the multivariate analysis. The comprehensiveness of the symptom discussion score was predicted to be 1.3 points higher for patients at Clinic 2 than for patients at Clinic 1, indicating a more comprehensive discussion of asthma symptoms during visits. As reported above, Clinic 2 was the only clinic that reported having an asthma educator or specialist on staff. Although all clinics reported routinely administering a spirometry test as part of a routine asthma visit, a discussion of pulmonary function was more likely to be discussed at Clinic 2 (OR: 3.14, p=0.04) and Clinic 4 (OR: 2.70, p=0.04) than at Clinic 1, indicating that this is not necessarily true. Therefore, clinic resources and practices may be influencing the level of care a patient receives more than other factors, such as patient race.

Previous research in the area of patient-provider communication and race has produced conflicting results. Some studies report a clear association of patient race and communication. In a cross-sectional study of adults with asthma within 15 managed care organizations, African-Americans were more likely than white patients to rate the quality of their asthma care and communication with their physician less favorably (Okelo, Wu et al.

2007). Other previous studies, comparing white and African-American adult patients with conditions including HIV and depression, have shown that, compared to visits with white patients, visits with African-American patients are more likely to be characterized as less participatory, with lower levels of affect, lower levels of rapport-building, less involvement in medical decision making, and higher levels of distrust (Cooper-Patrick, Gallo et al. 1999; Doescher, Saver et al. 2000; Johnson, Roter et al. 2004; Ghods, Roter et al. 2008; Cené, Roter et al. 2009).

A study by Beach and colleagues, which examined communication between providers and adults with HIV, also yielded somewhat mixed results (Beach, Saha et al. 2010). The authors used the Roter Interaction Analysis System (RIAS) to analyze communication in 354 patient encounters. The RIAS assigns each complete thought to 1 of 37 mutually exclusive and exhaustive categories of communication. The categories can reflect groups of exchange representing data gathering, patient education and counseling, relationship-building, and partnership building (Cooper, Roter et al. 2003). In the Beach study, the authors found no association between patient race and several communication characteristics, including patient-centeredness and socio-emotional talk. However, they report that physicians were significantly more verbally dominant with black patients, and that black patients provided less information, compared to white patients.

Another study examining the association between patient race and patient-provider communication with patients with HIV reported that, in unadjusted analysis, African-American patients were significantly more likely than white patients to report positive communication experiences with their physician, such as the physician always listens carefully, always explains things in way that can be understood, always respects what the

patient has to say, and always spends adequate time with the patient (Korthuis, Saha et al. 2008). However, once socio-demographic characteristics and site-of-care level indicators were included in the analysis, the only outcome that remained significant was 'the physician always explains things in a way that can be understood.' This study is similar to the present study, in that an initial observed relationship between patient race and communication disappeared in multivariable analyses, suggesting that initial findings of more favorable associations with communication for minority patients may be confounded by other factors.

In light of these previous studies, results from the present study, showing no association between patient race and patient-provider communication, seem contradictory to what would be expected. Most previous studies have found an association between patient race and patient-provider communication, although not all aspects of communication have always been statistically significant. The present study is somewhat different from these previous studies in that it focused on very disease-specific aspects of communication, rather than these more general and broad characteristics of communication. Therefore, the results from this present study, suggesting that patient race is not associated with communication about asthma management when other variables are considered, may be more reflective of the narrow focus of the study.

In summary, the findings from this research do not support that patient race is associated with patient-provider communication regarding the aforementioned topics of asthma management. The interaction between patient race and reason for the visit was not associated with discussion of any topics of asthma management. An implication of these findings, for minority patients in particular, would seem to be that physician behavior, particularly communicating about asthma-specific topics in accordance with recommended

guidelines, is not a significant contributor to disparities in this population. However, as discussed above, these findings contradict several other studies, and no conclusions should be drawn on this study alone. Also, as discussed in the following sections, there were several limitations in this study, including a narrow focus on disease-specific communication, and additional research is needed to better understand additional aspects of communication in this population.

Limitations

There are several limitations that will need to be considered when interpreting the results from these analyses. First, the sample was pediatric patients attending pediatric clinics within one state. Therefore, the results may not be generalizable to other disease states or adult patients with asthma. Also, this analysis was cross-sectional in nature. It did not include any communication from previous physician's visits, which may affect communication during the visit observed. In addition, there was no variable to indicate how closely the analyzed visit followed a previous visit. In some instances, it was clear that the patient had a very recent visit with the doctor. In others, it was clear that a longer time period had passed since the patient had seen the doctor. It is possible that this affected communication during the observed visit.

In addition, this research did not consider verbal communication throughout the entire visit. Although the length of the overall visit was considered, only certain pre-determined, asthma-specific topics were included in the analysis, instead of looking at all aspects of the communication. Many previous studies of patient-provider communication utilize a more comprehensive method of analysis and coding, such as the RIAS described above. Also, non-

verbal communication occurred during these visits; this information was not captured in the audio-tapes. Non-verbal communication was beyond the scope of this study, yet may provide an important direction for future research.

Another limitation to consider is that this study may have been underpowered to detect smaller differences in communication between the two groups. Therefore, some of the differences observed in the bivariate analyses disappeared when the multivariate analyses were performed. This was most apparent in the models regarding communication about medication adherence. In bivariate analyses, physicians were more likely to discuss these topics with minority patients than white patients. This suggests another possible direction for future research. The inclusion of more patients may allow for these differences to remain in multivariate analyses, provided that the relationship is not confounded by other variables.

Another aspect not considered in this analysis was a measure of comprehension on the part of the patient or caregiver. Even though a topic was discussed, this does not translate to the patient and caregiver having a thorough understanding of the implications of the discussion, nor does it translate to behavior that the patient and/or caregiver will employ once they return home from the physician's office.

The presence of the audio tape recorder in the exam room may also have had an impact on communication between the physician, parent and patient. The physician may have been more inclined to be more comprehensive than normal, knowing that the conversation was being recorded. Therefore, the frequency of discussions regarding the topics of asthma management may have been higher than would normally be expected. In addition, both the parent and the patient may have also have been impacted by the presence of the recorder. Either may have been more reluctant to speak openly about concerns that they had, regarding

asthma, or on other topics as well. In particular, this may have led to lower frequencies of initiating topics of asthma management.

Finally, it is also important to consider that the patients who were excluded from the analysis due to problems with the audio were significantly different from the patients who were included in the analysis. One of the differences was in the reason for the visit, in that the patients who were excluded were significantly more likely to be visiting the doctor for asthma compared to the patients who were not. However, they did not differ by patient race. Since reason for the visit was found to be significant and patient race was not, it is unlikely that the inclusion of these patients in the analyses would have significantly altered the primary conclusions.

Strengths

There are several strengths of this research. This is the one of the first studies to examine the direct effect of patient race on patient-provider communication about specific topics of asthma management in a pediatric population. One strength is that it used actual audio recordings of the communication, instead of depending on patient, caregiver, or physician recall, eliminating any form of recall bias for communication. This gives a more accurate and complete description of the communication rather than relying on questionnaires alone.

Another strength of this study is that it utilized a coding instrument that was developed specifically to answer the questions that were integral to the study. The coding instrument allowed for easy quantification of the communication variables that were pre-selected for inclusion in the analysis.

A final advantage of the study is the fact that the participants were blinded to the hypotheses in this secondary research. Given the sensitive nature of race, it was beneficial that neither physicians nor patients/parents knew of the hypotheses of this particular study. Therefore, even if physicians altered their behavior and communication due to the presence of the audiotape recorder in the exam room, it is unlikely that they did so on the basis of the patient's race.

Practice Implications

The study results showing that communication about some topics of asthma management differed significantly by clinic could imply that the quality of asthma care received is dependent on the site of care. The five pediatric clinics reported offering additional resources and routine practices for asthmatic patients, to varying degrees, including specialized asthma clinics, an asthma educator or specialist on staff, routine spirometry testing, and offering asthma education to patients and their caregivers. In clinics where specific topics of asthma communication were not discussed as frequently as in others, clinic administrators may consider implementing more asthma-specific programs to improve the quality of asthma care at their site. This would be especially prudent if additional research were to show significant differences in other quality of care indicators or asthma-related health outcomes by different clinics.

In addition, the finding that the reason for the visit was highly significant in many of the models suggests that patients with asthma are not necessarily having their asthma control monitored when visiting the physician for non-asthma related reasons. While it is encouraging that patients visiting the physician for asthma are discussing asthma

management, the results of this study suggest that there is room for improvement for more frequent monitoring. More interventions could be directed towards physicians to routinely engage in dialogue regarding asthma control, regardless of the purpose of the visit.

Future Research

There are several questions that have been raised by the results of this research, which could direct future research. Communication is very complex, and this research took a fairly narrow view of the issue. Instead of using the coding instrument that was developed specifically for this project, the entire discussion could be reviewed using a more sophisticated coding system, such as the RIAS. Using this system would allow for a more in-depth analysis of the communication, including additional characteristics considered in several previous studies of a similar nature, such as verbal dominance, patient-centeredness, information-seeking, and socio-emotional talk. Looking at these different dimensions of the entire discussion, rather than just whether certain topics are covered, may provide more information about any differences in communication.

Future studies may also include greater variation in physician/provider type, or patient base. The majority of the providers included in this study were pediatricians who did not necessarily specialize in asthma. Future studies could include more pulmonologists who specialize in asthma, or more general practitioners, in addition to pediatricians. Studies of this nature would allow for the type of the physician to be included as a variable in the analysis, in order to observe any differences in communication patterns or styles. In addition, patients from different geographic areas could be compared to each other to observe whether

there are differences in communication by location (for example, north vs. south). The inclusion of more patients would also increase the power of future studies.

As mentioned above, non-verbal communication is also an important aspect to consider. There are non-verbal cues that could have affected communication, especially for the patient. A future research study could video-record the communication between the patients and their doctors, and examine differences as a function of patient race. Non-verbal clues may include observation of body language (e.g., leaning, touching), facial expressions, and maintaining eye contact.

Conclusion

In conclusion, patient race was not found to be significantly associated with patient-provider communication about asthma symptoms, pulmonary function, asthma-related quality of life, or control medication adherence, all important asthma management topics.

Despite these findings, asthma disparities still persist in this population. More research is needed to determine whether other aspects of communication are associated with the race of the patient or his/her caregiver in a pediatric asthma population. In the event that patient-provider communication is not found to be associated with patient race, other factors that have been proposed to contribute to racial disparities warrant further research as well.

APPENDIX 1. Guidelines for Classifying Asthma Severity in Children 5-11 Years of Age (Modified from the 2007 NAEPP Guidelines)

Classified as Intermittent:

Symptoms no more than 2 days a week
Nighttime awakenings no more than 2 days a week
Rescue medication use no more than 2 days a week
No interference with normal activity

Pulmonary Function: Normal FEV_1 between exacerbations, FEV_1 > 80% predicted, FEV_1/FVC>85%

Classified as Mild Persistent:

Symptoms more than 2 days a week but not daily
Nighttime awakening 3-4 times a month
Rescue medication use more than 2 days a week but not daily
Minor activity limitation

Pulmonary Function: FEV_1 at least 80% predicted, FEV_1/FVC >80%

Classified as Moderate Persistent:

Symptoms daily
Nighttime awakenings more than once a week but not nightly
Rescue medication use daily
Some activity limitation

Pulmonary Function: FEV_1 between 60-80% predicted, FEV_1/FVC = 75-80%

Classified as Severe Persistent:

Symptoms throughout the day
Nighttime awakenings often/nightly
Rescue medication use several times a day
Extremely limited in activities

Pulmonary Function: FEV_1 < 60% predicted, FEV_1/FVC <75%

APPENDIX 2. Eligibility Screener

ELIGIBILITY SCREENER

Child/Patient Inclusion Criteria

1. Is your child between 8 and 15 years of age?

☐$_1$ Yes - CONTINUE WITH Q #2
☐$_0$ No – STOP, EXPLAIN, THANK

2. Does your child read and speak English?

☐$_1$ Yes - CONTINUE WITH Q #3
☐$_0$ No – STOP, EXPLAIN, THANK

3. Has your child visited/been seen by a doctor at this clinic at least once before?

☐$_1$ Yes - CONTINUE WITH Q #4
☐$_0$ No – STOP, EXPLAIN, THANK

Caregiver Inclusion Criteria

4. What is your relationship with the child?

☐$_1$ Parent or Legal guardian - CONTINUE WITH Q #5
☐$_0$ No – STOP, EXPLAIN, THANK

5. Are you at least 18 years of age?

☐$_1$ Yes - CONTINUE WITH Q #6
☐$_0$ No – STOP, EXPLAIN, THANK

6. Do you read and speak English?

☐$_1$ Yes - CONTINUE WITH Q #7
☐$_0$ No – STOP, EXPLAIN, THANK

Child Asthma Severity Level

7. What type of medication does your child take for his/her asthma?
Interviewer: show list and pictures, check all appropriate boxes below and CONTINUE WITH Q #8.
(Circle the dose if known where indicated; it does not affect classification but is important for Stephanie and Dennis)

Rescuer/Reliever medication Bronchodilators (via inhaler or nebulizer)	**Controller medication** Anti-inflammatory
Short-acting beta-agonists ☐ a Albuterol (Proventil®, Ventolin®) ☐ b Bitolerol (Tomalate®) ☐ c Pirbuterol (Maxair®) ☐ d Terbutaline (Brethine®) ☐ e Levalbuterol (Xopenex®) ☐ z **Other**_____	Inhaled Corticosteroids ☐ f Beclomethasone (Qvar®) (Circle) 40 mcg, 80 mcg) ☐ g Triamcinolone (Azmacort®) ☐ h Flunisolide (Aerobid®) ☐ i Fluticasone (Flovent®) (Circle) 44 mcg, 110mcg, 220 mcg ☐ j Budesonide (Pulmicort®) ☐ k Mometasone (Asmanex) Systemic Corticosteroids ☐ l Prednisone (Deltasone®) list strength _____ ☐ m Prednisolone (Prelone®) list strength _____ ☐ n Methylprednisolone (Solu-Medrol®)list strength_____ Anti-inflammatory: Mast-cell stabilizer ☐ o Cromolyn (Intal®) ☐ p Nedocromil (Tilade®) Long-acting beta agonist ☐ q Salmeterol (Serevent®) ☐ r Formoterol (Foradil®) Inhaled corticosteroid and long-acting beta agonist ☐ s Salmeterol and fluticasone (Advair® diskus) (Circle) 100 mcg, 250 mcg , 500 mcg Methylxanthines ☐ t Theophylline (Slo-bid®, Theo-Dur®, Uniphyl®) List Strength _____ Leukotriene Modifiers ☐ u Zileuton (Zyflo®)

	☐v Zarfirlukast (Accolate®) ☐w Montelukast (Singulair®) (Circle) 4 mg, 5 mg, 10 mcg ☐x **Other**_____ ☐y Does not know name

8. In the past 12 months (the past year), how often has your child…

	Never	1-2 times per year	3-12 times per year	More than 2 times per month	More than 2 times per week	Everyday
a. Had wheezing (whistling sounds from the chest) with a cold?	0	1	2	3	4	5
b. Had wheezing (whistling sounds from the chest) without a cold?	0	1	2	3	4	5
c. Had an attack of wheezing that made it hard to breathe or catch his or her breath that persisted (or lasted) for a day or more?	0	1	2	3	4	5
d. Had a cough that would not go away?	0	1	2	3	4	5
e. Complained that his or her chest felt tight or heavy?	0	1	2	3	4	5
f. Used his/her rescue inhaler for symptoms?	0	1	2	3	4	5
g. Wheezed with exercise or running or playing hard?	0	1	2	3	4	5
h. Coughed with exercise or running or playing hard?	0	1	2	3	4	5

9. **In the past 12 months, (the past year) how often has your child's** sleep been disturbed because of wheezing, coughing, chest tightness, or shortness of breath?

Never	1-2 times per year	3-12 times per year	1 time per month	2-4 times per month	5 or more times per month
0	1	2	3	4	5

CHILD MEETS ASTHMA SEVERITY CRITERIA FOR THE STUDY IF:

Moderate to Severe Persistent Asthma

- Circled "5" on any question 8a through 8h or 9, **OR**
- On 2 controller medications (checked at least 2 of f through w on Question #7or Advair since it has 2 medications in it)

Mild Persistent Asthma

- Circled "4" on at least one of questions 8a through 8h or 9 **OR**

- On a controller medication (checked at least 1 of f through w on Question #7) (if they are on Advair they are classified as moderate/severe)

10. Child classified by research assistant as:

☐ 0 Ineligible due to one of reasons above, including severity level
☐ 1 Mild Persistent
☐ 2 Moderate to Severe Persistent

IF ELIGIBLE, CONTINUE with consent and assent process.

IF NOT ELIGIBLE, STOP, explain, and thank them for their time.

11. Child classified by Dennis or Stephanie as:

☐ 1 Mild Persistent
☐ 2 Moderate to Severe Persistent

APPENNDIX 3. Supplemental Coding Instrument

Patient ID: _____ Coder ID: _____
Date of Visit: _____ Date of Coding: _____

Communication Variables

Symptoms

i) Is asthma mentioned before any symptom discussion?			Y^1	N^0
ii) Does doctor ask about asthma-specific symptoms/problems?			Y^1	N^0
iii) Does doctor ask about general symptoms/problems?			Y^1	N^0
iv) Are asthma symptoms mentioned?			Y^1	N^0
1a) Are asthma symptoms (any kind) discussed?			Y^1	N^0
1b) Who initiates discussion about asthma symptoms?	D^1	C^2	P^3	n/a^9
1c) Does patient or caregiver state that patient is experiencing symptoms (any kind)?	Y^1		N^0	n/a^9
1d) If yes, is it caregiver or patient?	C^1		P^0	n/a^9
1e) Are nighttime symptoms discussed?	Y^1		N^0	
1f) Who initiates discussion about nighttime symptoms?	D^1	C^2	P^3	n/a^9
1g) Are exercise-induced symptoms discussed?	Y^1		N^0	
1h) Who initiates discussion about exercise-induced symptoms?	D^1	C^2	P^3	n/a^9
1i) Are daytime symptoms discussed?	Y^1		N^0	
1j) Who initiates discussion of daytime symptoms?	D^1	C^2	P^3	n/a^9
1k) Is symptom frequency discussed?	Y^1		N^0	
1l) Who initiates discussion about symptom frequency?	D^1	C^2	P^3	n/a^9
1m) Does the doctor make any recommendation to alleviate asthma symptoms?	Y^1		N^0	n/a^9

Pulmonary Function (Spirometry)

2a) Is spirometry discussed?	Y^1		N^0	
2b) Who initiates discussion of spirometry?	D^1	C^2	P^3	n/a^9
2c) Are the results of day's spirometry test discussed?	Y^1		N^0	n/a^9
2d) How does the doctor interpret the day's spirometry test results?	G^2	A^1	P^0	n/a^9
2e) Does the doctor make any recommendation to improve spirometry test results?	Y^1		N^0	n/a^9

Pulmonary Function (Peak Flow)

3a) Who initiates discussion of peak flow?	D[1]	C[2]	P[3]	n/a[9]
3b) Are current peak flow meter readings discussed?	Y[1]	N[0]		
3c) How does doctor interpret current peak flow meter readings?	G[2]	A[1]	P[0]	n/a[9]
3d) Does the doctor make any recommendation to improve peak peak flow meter readings?	Y[1]	N[0]	n/a[9]	

Quality of Life

4a) Is activity limitation due to asthma discussed?	Y[1]	N[0]		
4b) Who initiates activity limitation discussion?	D[1]	C[2]	P[3]	n/a[9]
4c) Does patient or caregiver report activity limitation?	Y[1]	N[0]	n/a[9]	
4d) If yes, is it caregiver or patient?	C[1]	P[0]	n/a[9]	
4e) Are negative emotions due to asthma discussed?	Y[1]	N[0]		
4f) Who initiates negative emotion discussion?	D[1]	C[2]	P[3]	n/a[9]
4g) Does patient or caregiver report negative emotions?	Y[1]	N[0]	n/a[9]	
4h) If yes, is it patient or caregiver?	C[1]	P[0]	n/a[9]	
4i) Are missed school days due to asthma discussed?	Y[1]	N[0]		
4j) Who initiates missed school days discussion?	D[1]	C[2]	P[3]	n/a[9]
4k) Does the doctor make any recommendation to improve patient's quality of life?	Y[1]	N[0]	n/a[9]	
4l) Is the family's asthma-related QoL discussed?	Y[1]	N[0]		
4m) Who initiates discussion of family QoL?	D[1]	C[2]	P[3]	n/a[9]

Control Medication Adherence

5a) Who initiates discussion about control medication adherence?	D[1]	C[2]	P[3]	n/a[9]
5b) Does patient or caregiver report non-adherence?	Y[1]	N[0]	n/a[9]	
5c) If yes, is it caregiver or patient?	C[1]	P[0]	n/a[9]	
5d) Is reason for non-adherence given?	Y[1]	N[0]	n/a[9]	

If yes, what is it? _____

(Notes from Primary Coding Instrument)

Is spirometry performed?	Y[1]	N[0]
Is control medication adherence discussed?	Y[1]	N[0]
Is education on control med adherence discussed?	Y[1]	N[0]
Is peak flow discussed?	Y[1]	N[0]

APPENDIX 4. Coding Rules for Supplemental Coding Instrument

Coder Information

First, record the patient ID/transcript number, coder initials, the date of the visit and the date of the coding on the top of the coding sheet.

Information from Primary Coding Instrument

Information on whether spirometry was performed as part of the medical visit is included in the Primary Instrument (Question 5x).

Information on whether peak flow use was discussed during the medical visit is included in the Primary Instrument. Questions 28a-e will be merged into the final dataset. (It is likely that one variable, titled **'Peak Flow Discussed'** will be created, and that any affirmative answer to Questions 28a-e will be considered an affirmative answer to this variable.)

Information on whether control medication adherence was discussed is included on the Primary Instrument (Question 22a). Information on whether education on the importance of control medication adherence was provided is also included (Question 5b and 23a).

Record all above information obtained from the Primary Coding Instrument at the bottom of the page.

Symptoms

Questions i,ii, iii and iv are used to determine the first three symptom variables. Based on research, the most common asthma symptoms that will be discussed are coughing, wheezing, chest tightness, or shortness of breath.

Answer question i as 'yes' if there has been any mention of asthma prior to any discussion of symptoms.

Answer question ii as 'yes' if the doctor asks about asthma specifically. This may include an asthma-specific symptom question, such as "Have you been wheezing at all?" It may also be a question that includes asthma but does not mention any specific symptom, such as "How has his asthma been?"

Answer question iii as 'yes' if the doctor asks about any problems or symptoms. This could be a general question, or question related to some other condition.

Answer question iv as 'yes' if the parent or patient mentions any symptoms, currently being experienced, that they attribute to asthma. This may include ongoing symptoms that the patient/parent is concerned about. It may include symptoms experienced only during certain activities (i.e running). It will not include symptoms that have been experienced in the past, but are no longer a problem.

The answers to these four questions will guide the coding of questions 1a-1d, according to the table below. As a follow-up question to 1c, note whether it is the patient or caregiver who initially makes the initial statement, if applicable, for question 1d.

Coding Rules for Symptom Communication Variables

SITUATION				CODED VARIABLES		
Asthma has been mentioned	**Physician asks about asthma specific-ally**	**Physician asks about problems (not asthma specific)**	**Patient or Parent Mentions Asthma Symptoms**	**Discuss Asthma Symptoms * (1a)**	**Initiator * (1b)**	**Symptoms Experienced * (1c and 1d)**
No	No	No	No	No	N/A	N/A
No	Yes	No	No	Yes	Physician	No
No	No	No	Yes	Yes	Patient or Parent	Yes/No
No	Yes	No	Yes	Yes	Physician	Yes/No
No	No	Yes	No	No	N/A	N/A
No	Yes	Yes	No	Yes	Physician	No
No	No	Yes	Yes	Yes	Patient or Parent	Yes/No
No	Yes	Yes	Yes	Yes	Physician	Yes/No
Yes	Yes	No	No	Yes	Physician	No
Yes	No	No	No	No	N/A	N/A
Yes	Yes	No	Yes	Yes	Physician	Yes/No
Yes	No	No	Yes	Yes	Patient or Parent	Yes/No
Yes	Yes	Yes	No	Yes	Physician	No
Yes	No	Yes	No	Yes	Physician	No
Yes	Yes	Yes	Yes	Yes	Physician	Yes/No
Yes	No	Yes	Yes	Yes	Physician	Yes/No

* Coded Variable

Symptoms (continued)

Question 1e. – Code this question as 'yes' if there is any discussion about asthma symptoms experienced at night. This may include trouble falling asleep, or waking up anytime in the night, due to asthma symptoms.

Example: Are you coughing at night?
Is she wheezing during the night?

Question 1f - If applicable, note whether the physician, parent, or patient first mentions nighttime symptoms.

Question 1g – Code this question as 'yes' if there is any discussion about asthma symptoms experienced during exercise, or other similar activities, such as playing at recess, PE class, or team sports.

Example: Do you have trouble breathing when you run?

Question 1h - If applicable, note whether the physician, parent, or patient first mentions exercise-induced symptoms.

Question 1i. – Code this question as 'yes' if the doctor specifically asks about asthma symptoms experienced during the day. This will include discussion of symptoms experienced during the day, that are separate from those experienced during physical activity (which would be exercised-induced).

Example: Do you have any symptoms during the day?
I hear her coughing when she's brushing her teeth in the morning?

Question 1j - If applicable, note whether the physician, parent, or patient first mentions daytime symptoms.

Question 1k – Code this question as 'yes' if there is any discussion about symptom frequency, as related to any of the above events (nighttime, exercise, daytime, other). This discussion may be in relation to any period of time (a night, a week, month, etc.). Also, include discussions about the frequency of inhaler use **IF** it is clear that the doctor is asking about it in relation to the patient experiencing acute symptoms.

Example: How many times do you wake up during the night?
How often is your cough bothering you?
How many times did you have to use your inhaler last week (b/c you were wheezing)?

Do not code as 'yes' if the discussion is primarily on *duration* of symptoms, instead of frequency.

Example: How long have you had the cough? (Do not consider this <u>frequency</u>)

Question 1l - If applicable, note whether the physician, parent, or patient first mentions symptom frequency.

Question 1m – Code this question as yes if the doctor makes any recommendations (to either parent or patient) about helping the patient to alleviate or better control their symptoms. This may include changes in medication regimen, suggestions about how to avoid triggers, suggestion to limit play time, etc. This discussion must *follow* a discussion about asthma symptoms to be coded as 'yes.'

Example: What I am hoping is that as we increase the steroid dose…he will have less of this wheezing…
Make sure you're taking Advair. It's going to help.

Pulmonary Function (Spirometry)

Question 2a – Code this question as 'yes' if the physician, patient, or parent clearly mentions a spirometry test or spirometry results. This will include if a parent or patient asks about a test, even if one is not performed. Spirometry is also often referred to as a 'breathing test' or 'lung test.'

Example: Are we doing spirometry today?

Question 2b – If applicable, note whether the physician, parent, or patient first mentions a spirometry test.

Question 2c –If applicable, note whether the results of a spirometry test, performed on that day, are discussed.

Question 2d – If applicable, note whether the physician says whether the results of the spirometry test are good or bad. If it is difficult to tell, or the physician is not emphatic about the results either way, code as ambiguous.

Example: Your lungs sound great.…That's real good, you're over 100% across the board…(GOOD)

…Um, they look ok, they could be better. (AMBIGUOUS)

These are pretty low, we need to get these up.. (BAD)

Question 2e – Code this question as yes if the doctor makes any recommendations (to either parent or patient) about helping the patient to improve the results of a spirometry test. This may include changes in medication regimen, suggestions about how to avoid triggers, suggestion to limit play time, etc. This discussion must *follow* a discussion about spirometry to be coded as 'yes.'

Pulmonary Function (Peak Flow)

If the information from the Primary Instrument indicates that peak flow was not discussed, questions 3a, 3b and 3c will not be applicable

Question 3a – If applicable, note whether the physician, parent, or patient first mentions a peak flow.

Question 3b – Note whether current peak flow readings are discussed. This may include readings that the patient has been taking at home, or a peak flow test administered that day in the doctor's office.

Question 3c – Note whether the physician, parent or patient clearly states that the peak flow readings are not very good or are cause for any concern. For example, the patient or parent may report that the numbers have been 'not good' or 'low' lately. Or, the patient/parent may say the number to the physician, and the physician's response indicates that the number is cause for concern.

Example: Let's see if we can get those numbers up a bit for next time (says physician)
Ok, that's not too bad but I think we can do better (says physician)

Question 3c - Code this question as yes if the doctor makes any recommendations (to either parent or patient) about helping the patient to improve peak flow meter readings. This may include changes in medication regimen, suggestions about how to avoid triggers, suggestion to limit play time, etc. This discussion must *follow* a discussion about peak flow to be coded as 'yes.'

Asthma-Related Quality of Life

Rules for this variable were adopted from the Pediatric Asthma Quality of Life Questionnaire. These variables will be coded as 'yes' if the patient or parent mentions any of the activity limitations or emotions specified in the Pediatric Asthma Quality of Life Questionnaire, or if the physician poses any quality of life-related question (from any of the two domains below). The Symptom domain is not included here, due to probable overlap with questions above.

Questions in the Activities Domain

Question 4a - Code this question as 'yes' if there is any discussion of whether the patient was bothered or affected by asthma in completing physical activities or felt unable to keep up with others. This may include a question posed by the physician that is answered in the negative. This is different from exercise-induced symptoms (question 1g), in that the discussion must include some type of inability to participate in these activities as normal (if the patient was not experiencing asthma symptoms).

Example: It's not keeping him back from playing?
Your asthma is definitely worse….going to make is harder for you to do stuff….
Can you run….as much as the other boys?

Question 4b – If applicable, note whether the physician, parent or patient first mentions activity limitations.

Question 4c – If applicable, record whether the patient or caregiver reports any type of limitations or alteration of physical activities due to asthma, or feelings of not being able to keep up with others.

Example: Sometimes he gets out of breath he will have to sit down

Question 4d – If applicable, note if it is the caregiver or patient who mentions that the patient is experiencing activity limitations.

Questions in the Emotions Domain

Question 4e -Code this question as 'yes' if there is any discussion of specific (negative) feelings related to asthma. The trigger words (from the PAQoLQ) include: Frustrated, Worried, Concerned, Troubled, Angry, Irritable, Different, Left Out, Frustrated (because couldn't keep up with others), Uncomfortable, and Frightened by an attack. Others will include Sad, Angry Embarrassed or Upset. This may include a question posed by the physician that is answered in the negative.

Question 4f – If applicable, note whether the physician, parent or patient first mentions negative emotions associated with asthma.

Example: I feel sad sometimes because I have asthma.

Question 4g – If applicable, record whether the patient or caregiver reports any negative feelings (listed above) due to asthma.

Question 4h – If applicable, note if it is the caregiver or patient who mentions that the patient is experiencing negative emotions.

Question 4i - Code this variable as 'yes' if there is any discussion of asthma-related missed school days for the patient.

Example: Does he have to miss school because of his asthma?

Question 4j – If applicable, note whether the physician, patient or caregiver first mentions asthma-related missed school days.

Question 4k - Code this question as yes if the doctor makes any recommendations (to either parent or patient) about helping the patient to improve patient's quality of life. This discussion must *follow* a discussion about quality of life to be coded as 'yes.'

Question 4l – Code this question as yes if there is any discussion of how the patient's asthma is affecting other members of the immediate family/household. This may include discussion

of a parent missing work, or not being able to devote as much time as desired to another child. It may also include negative emotions that the parent is experiencing specifically due to the child's asthma.

Example: We weren't able to go to the beach because of her asthma.
I get worried watching her play sometimes.

Question 4m – If applicable, note whether the physician, the parent, or patient first mentions any affect of the patient's asthma on the family's quality of life.

Control Medication Adherence

If the information from the Primary Instrument indicates that control medication adherence was not discussed, questions 5a-5c will not be applicable. Also, these questions assume the child was already on a control medication. This information will be obtained from the Eligibility Screener and Parent After Visit Survey.

Question 5a - If adherence was discussed, indicate whether the physician, parent or patient initiated the conversation. If the doctor asks about whether the patient is taking the medication every day or as directed, the physician will be coded as the initiator. If the parent or patient volunteers the information without being asked, code the parent or patient as the initiator. If the doctor gives information/instructions on taking the medicine everyday, this will count as an adherence discussion.

Example: This is the Advair, you have to take it everyday…
Is she pretty good about taking it most of the time..?

Question 5b – Code this question as 'yes' if the patient or caregiver reports that the patient has not been completely adherent. This may include reports of skipping doses, forgetting doses, or not getting refills in a timely manner.

Example: I forget to take it at night sometimes
When he stays with his father he doesn't always take his medicine.

Question 5c – If applicable, note whether the patient or the caregiver reports non-adherence.

Question 5d – If applicable, note whether the reason that the patient is non-adherent is given. If so, note what the reason is. (This information will be categorized once coding is complete.)

References Cited

Adams, R. J., A. Fuhlbrigge, et al. (2001). "Impact of inhaled antiinflammatory therapy on hospitalization and emergency department visits for children with asthma." Pediatrics **107**: 706-711.

Adler, N. F. and D. H. Rehkopf (2008). "U.S. Disparities in Health: Descriptions, Causes, and Mechanisms." Annual Review of Public Health **29**(1): 235-252.

Akinbami, L. J. (2006). The State of Childhood Asthma, United States, 1980-2005. Advance data from vital and health statistics, no. 381. Hyattsville, MD, Centers for Disease Control and Prevention.

Akinbami, L. J., B. J. LaFleur, et al. (2002). "Racial and Income Disparities in Childhood Asthma in the United States." Ambulatory Pediatrics **2**(5): 382-387.

Akinbami, L. J., J. E. Moorman, et al. (2009). "Status of Childhood Asthma in the United States, 1980-2007." Pediatrics **123**(Supplement_3): S131-145.

Allison, P. D. (2009). Missing Data. The SAGE Handbook of Quantitative Methods in Psychology. A. M.-O. Roger E. Millsap. Thousand Oaks, CA, Sage Publications**:** 72-89.

Apter, A. J., R. C. Boston, et al. (2003). "Modifiable barriers to adherence to inhaled steroids among adults with asthma: It's not just black and white." Journal of Allergy and Clinical Immunology **111**(6): 1219-1226.

Apter, A. J. R., S.T.; Affleck, G.; et al (1998). "Adherence with twice-daily dosing of inhaled steroids: socioeconomic and health-belief differences." Am J Respir Crit Care Med **157**: 1810-1817.

Asmussen, L., K. B. Weiss, et al. (2004). "Parent and child reports of asthma symptoms, activity limitations and emotional distress: Early results from the child health information reporting project (CHIRP)." Journal of Allergy and Clinical Immunology **113**(2, Supplement 1): S182-S182.

Bailey, W., M. Castro, et al. (2008). "Asthma exacerbations in African Americans treated for 1 year with combination fluticasone propionate and salmeterol or fluticasone propionate alone." Current Medical Research & Opinion **24**(6): 1669-1682.

Baki, A. (2002). "The effect of loratadine in exercise-induced asthma." Archives of Disease in Childhood **86**(1): 38-39.

Barnsley, J. J. (1999). "Physician characteristics and the physician-patient relationship. Impact of sex, year of graduation, and specialty." Canadian family physician **45**: 935-942.

Beach, M. C., S. Saha, et al. (2010). "Patient-Provider Communication Differs for Black Compared to White HIV-Infected Patients." AIDS and Behavior.

Bender, B. G. and S. E. Bender (2005). "Patient-identified barriers to asthma treatment adherence; responses to interviews, focus groups, and questionnaires." Immunology and Allergy Clinics of North America **25**(1): 107-130.

Bigby, J. A. and S. W. Ashley (2008). "Disparities in Surgical Care: Strategies for Enhancing Provider-Patient Communication." World Journal of Surgery **32**(4): 529-532.

Blias, L., P. Ernest, et al. (1998). "Inhaled corticosteroids and the prevention of readmission to hospital for asthma." American Journal of Respiratory Critical Care Medicine **158**: 126.

Bloom, B. and R. Cohen (2009). Summary Health Statistics for U.S. Children: National Health Interview Survey, 2007. National Center for Health Statistics. Vital Health Statistics **10** (239): 1-80.

Bonilla, S., S. Kehl, et al. (2005). "School Absenteeism in Children with Asthma in a Los Angeles Inner City School." Journal of Pediatrics **147**: 802-806.

Boyle, P., R. Flowerdew, et al. (1997). "Evaluating the goodness of fit in models of sparse medical data: a simulation approach." Int. J. Epidemiol. **26**(3): 651-656.

Braman, S. (2006). "The Global Burden of Asthma." Chest **130**(Supplement): 4s-12s.

Brim, S. N., R. A. Rudd, et al. (2008). "Asthma Prevalence Among US Children in Underrepresented Minority Populations: American Indian/Alaska Native, Chinese, Filipino, and Asian Indian." Pediatrics **122**(1): e217-e222.

Broers, S., E. Smets, et al. (2005). "Training general practitioners in behavior change counseling to improve asthma medication adherence." Patient Education & Counseling **58**(3): 279-287.

Bull, M. J. and J. F. Miller (2008). "Preparing Teacher-Scholars to Reduce Health Disparities." Nursing Education Perspectives **29**(3): 156-160.

Burgess, S. W., P. D. Sly, et al. (2008). "Assessing adherence and factors associated with adherence in young children with asthma." Respirology **13**: 559-563.

Burkhart, P. V., M. K. Rayens, et al. (2007). "Improved Health Outcomes with Peak Flow Monitoring for Children with Asthma." Journal of Asthma **44**(2): 137-142.

Butz, A. M., M. Tsoukleris, et al. (2006). "Patterns of Inhaled Antiinflammatory Medication Use in Young Underserved Children With Asthma." Pediatrics **118**(6): 2504-2513.

Butz, A. M., J. Walker, et al. (2007). "Improving Asthma Communication in High-Risk Children." Journal of Asthma **44**(9): 739-745.

Cabana, M., D. C. Chaffin, et al. (2008). "Selective Provision of Asthma Self-Management Tools to Families." Pediatrics **121**(4): e900-e905.

Cabana, M., K. K. Slish, et al. (2006). "Outcomes Associated With Spirometry for Pediatric Asthma in a Managed Care Organization." Pediatrics **118**(1): e151-156.

Cabana, M. D., M. Lara, et al. (2007). "Racial and Ethnic Disparities in the Quality of Asthma Care." CHEST **132**: 810S-817S.

Cabana, M. D., K. Slish, et al. (2005). "Asking the Correct Questions to Assess Asthma Symptoms." Clinical Pediatrics **44**: 319-325.

Cabana, M. D., K. K. Slish, et al. (2006). "Impact of Physician Asthma Care Education on Patient Outcomes." Pediatrics **117**(6): 2149-2157.

Camargo Jr, C. A., S. Ramachandran, et al. (2007). "Association between common asthma therapies and recurrent asthma exacerbations in children enrolled in a state Medicaid plan." American Journal of Health-System Pharmacy **64**(10): 1054-1061.

Canino, G., D. Koinis-Mitchell, et al. (2006). "Asthma disparities in the prevalence, morbidity, and treatment of Latino children." Social science & medicine **63**(11): 2926-2937.

Cené, C. W., D. Roter, et al. (2009). "The Effect of Patient Race and Blood Pressure Control on Patient-Physician Communication." Journal of General Internal Medicine **24**(9): 1057-1064.

Christie, M. J., D. French, et al. (1993). "Development of child-centered disease-specific questionnaires for living with asthma." Psychomatic Medicine **55**: 541-548.

Clark, N. M., R. Brown, et al. (2002). "Issues in identifying asthma and estimating prevalence in an urban school population." Journal of Clinical Epidemiology **55**(9): 870-881.

Clark, N. M., M. Cabana, et al. (2008). "Long-Term Outcomes of Physician Peer Teaching." Clinical Pediatrics **47**(9): 883-890.

Coffman, J. M., M. D. Cabana, et al. (2008). "Effects of Asthma Education on Children's Use of Acute Care Services: A Meta-analysis." Pediatrics **121**(3): 575-586.

Cooper-Patrick, L., J. J. Gallo, et al. (1999). "Race, Gender, and Partnership in the Patient-Physician Relationship." JAMA: Journal of the American Medical Association **282**(6): 583-589.

Cooper, L. A., M. C. Beach, et al. (2006). "Delving Below the Surface: Understanding How Race and Ethnicity Influence Relationships in Health Care." JGIM: Journal of General Internal Medicine **21**: S21-S27.

Cooper, L. A., M. N. Hill, et al. (2002). "Designing and Evaluating Interventions to Eliminate Racial and Ethnic Disparities in Health Care." JGIM: Journal of General Internal Medicine **17**(6): 477-486.

Cooper, L. A., D. L. Roter, et al. (2003). "Patient-Centered Communication, Ratings of Care, and Concordance of Patient and Physician Race." Annals of Internal Medicine **139**(11): 907-915.

Cox, E. D., M. A. Smith, et al. (2007). "Effect of gender and visit length on participation in pediatric visits." Patient Education and Counseling **65**(3): 320-328.

DeMore, M., C. Adams, et al. (2005). "Parenting Stress, Difficult Child Behavior, and Use of Routines in Relation to Adherence in Pediatric Asthma." Children's Health Care **34**(4): 245-259.

DeVoe, J. E., L. S. Wallace, et al. (2009). "Measuring patients' perceptions of communication with healthcare providers: Do differences in demographic and socioeconomic characteristics matter?" Health Expectations **12**(1): 70-80.

Diette, G. B., L. Markson, et al. (2000). "Nocturnal Asthma in Children Affects School Attendance, School Performance, and Parents' Work Attendance." Archives of Pediatrics & Adolescent Medicine **154**: 923-928.

Diette, G. B. and C. Rand (2007). "The Contributing Role of Health-Care Communication to Health Disparities for Minority Patients With Asthma." CHEST **132**: 802S-809S.

Doescher, M. P., B. G. Saver, et al. (2000). "Racial and Ethnic Disparities in Perceptions of Physician Style and Trust." Archives of Family Medicine **9**: 1156-1163.

Dubay, L., G. Kenney, et al. (2002). Children's Participation in Medicaid and SCHIP: Early in the SCHIP Era. New Federalism: National Survey of America's Families. Washington, DC, The Urban Institute.

Erickson, S. E., C. Iribarren, et al. (2007). "Effect of Race on Asthma Management and Outcomes in a Large, Integrated Managed Care Organization." Archives of Internal Medicine **167**(17): 1846-1852.

Evans, A. T., L. S. Sadowski, et al. (2009). "Ethnic Disparities in Asthma Morbidity in Chicago." Journal of Asthma **46**(5): 448-454.

Everhart, R. S. and B. H. Fiese (2009). "Asthma severity and child quality of life in pediatric asthma: A systematic review." Patient Education and Counseling **75**(2): 162-168.

Farber, H. J., A. M. Capra, et al. (2003). "Misunderstanding of Asthma Controller Medications: Association with Nonadherence." Journal of Asthma **40**(1): 17-25.

Faris, P. D., W. A. Ghali, et al. (2002). "Multiple imputation versus data enhancement for dealing with missing data in observational health care outcome analyses." Journal of Clinical Epidemiology **55**(2): 184.

Fiese, B. H., M. A. Winter, et al. (2007). "Nighttime Waking in Children With Asthma: An Exploratory Study of Daily Fluctuations in Family Climate." Journal of Family Psychology **21**(1): 95-103.

Flores, G., C. Snowden-Bridon, et al. (2009). "Urban Minority Children with Asthma: Substantial Morbidity, Compromised Quality and Access to Specialists, and the Importance of Poverty and Specialty Care." Journal of Asthma **46**(4): 392-398.

Forester, J. P., B. A. Ong, et al. (2008). "Can Equal Access to Care Eliminate Racial Disparities in Pediatric Asthma Outcomes?" Journal of Asthma **45**(3): 211-214.

Galant, S. P., L. J. R. Crawford, et al. (2004). "Predictive Value of a Cross-Cultural Asthma Case-Detection Tool in and Elementary School Population." Pediatrics **114**(3): e307-e316.

Ghods, B. K., D. L. Roter, et al. (2008). "Patient-Physician Communication in the Primary Care Visits of African Americans and Whites with Depression." JGIM: Journal of General Internal Medicine **23**(5): 600-606.

Ginde, A. A. E., Janice A.; Camargo, Jr., Carlos A. (2008). "Improved overall trends but persistent racial disparities in emergency department visits for acute asthma." Journal of Allergy and Clinical Immunology **122**: 313-318.

Gupta, R. S., V. Carrión-Carire, et al. (2006). "The widening black/white gap in asthma hospitalizations and mortality." Journal of Allergy and Clinical Immunology **117**(2): 351-358.

Halterman, J. S., H. L. Yoos, et al. (2006). "Symptom reporting in childhood asthma: a comparison of assessment methods." Archives of Disease in Childhood **91**(9): 766-770.

Hankinson, J., S. Kawat, et al. (2010). "Performace of American Thoracic Society-Recommended Spirometry Reference Values in a Multiethnic Sample of Adults." Chest **131**(1): 138-145.

Haselkorn, T., J. H. Lee, et al. (2008). "Racial disparities in asthma-related health outcomes in severe or difficult-to-treat asthma." Annals of Allergy Asthma and Immunology **101**(3): 256-263.

Henry, M. and J. D. Robert (2008). "Management of Exercise-Induced Bronchospasm in Children:Role of Long-Acting Î²2-Adrenergic Receptor Agonists." Pediatric Asthma, Allergy & Immunology **21**(2): 59-72.

Hertz, R. P., A. N. Unger, et al. (2005). "Racial Disparities in Hypertension Prevalence, Awareness, and Management." Arch Intern Med **165**(18): 2098-2104.

Hing, E., D. K. Cherry, et al. (2006). National Ambulatory Medical Care Survey: 2004. Hyattsville, Md, National Center for Health Statisitics.

Howell, G. (2008). "Nonadherence to Medical Therapy in Asthma: Risk Factors, Barriers, and Strategies for Improving." Journal of Asthma **45**(9): 723-729.

Janson, S. L., J. V. Fahy, et al. (2003). "Effects of individual self-management education on clinical, biological, and adherence outcomes in asthma." American Journal of Medicine **115**(8): 620.

Johnson, R. L., D. Roter, et al. (2004). "Patient Race/Ethnicity and Quality of Patient-Physician Communication During Medical Visits." American Journal of Public Health **94**(12): 2084-2090.

Joseph, C., D. Ownby, et al. (2000). "Racial Differences in Physiologic Parameters Related to Asthma Among Middle-class Children." Chest **117**: 1336-1344.

Joseph, C. L. M. F., Betsy' Leickly, Frederick E.; Peterson, Edward; Ownby, Dennis (1996). "Prevalence of possible undiagnosed asthma and associated morbidity among urbam schoolchildren." Journal of Pediatrics **129**(5): 735-742.

Juniper, E. F. (1997). "How important is quality of life in pediatric asthma?" Pediatric Pulmonology **24**(S15): 17-21.

Juniper, E. F., G. H. Guyatt, et al. (1996). "Measuring quality of life in children with asthma." Quality of Life Research **5**: 35-46.

Kagawa-Singer, M. K.-L., Shaheen (2003). "A Strategy to Reduce Cross-cultural Miscommunication and Increase the Likelihood of Improving Health Outcomes." Academic Medicine **78**(6): 577-587.

Kelly, H. W. M., Shirley (2001). "Helping Children Adhere to Asthma Treatment Regimens." Pediatric Asthma, Allergy & Immunology **15**(1): 25-30.

Korthuis, P. T., S. Saha, et al. (2008). "Impact of Patient Race on Patient Experiences of Access and Communication in HIV Care." JGIM: Journal of General Internal Medicine **23**(12): 2046-2052.

Krishnan, J. A., G. B. Diette, et al. (2001). "Race and Sex Differences in Consistency of Care With National Asthma Guidelines in Managed." Archives of Internal Medicine **161**(13): 1660.

Kruse, L. K. D., Sandy; Vezina, Melissa (2007). "Disparities in Asthma Hospitalizations among Children Seen in the Emergency Department." Journal of Asthma **44**: 833-837.

Lang, D. M. and M. Polansky (1994). "Patterns of Asthma Mortality in Philadelphia from 1969 to 1991." N Engl J Med **331**(23): 1542-1546.

Le, T. T., A. Bilderback, et al. (2008). "Do Asthma Medication Beliefs Mediate the Relationship Between Minority Status and Adherence to Therapy?" Journal of Asthma **45**(1): 33-37.

Lemanek, K. (1990). "Adherence Issues in the Medical Management of Asthma." Journal of Pediatric Psychology **15**(4): 20.

Levy, B. S. and V. W. Sidel, Eds. (2006). Social Injustice and Public Health. Oxford, Oxford University Press.

Levy, D. R. (1985). "White Doctors and Black Patients: Influence of Race on the Doctor-Patient Relationship." Pediatrics **75**(4): 639-643.

Lewis, T., T. Robins, et al. (2004). "Identification of gaps in the diagnosis and treatment of childhood asthma using a community-based participatory research approach." Journal of Urban Health **81**(3): 472-488.

Lieu, T. A., P. Lozano, et al. (2002). "Racial/Ethnic Variation in Asthma Status and Management Practices Among Children in Managed Medicaid." Pediatrics **109**(5): 857-865.

Lieu, T. A. and C. P. Quesenberry Jr (1997). "Outpatient management practices associated with reduced risk of pediatric asthma hospitalization." Pediatrics **100**(3): 334-341.

Lozano, P., F. A. Connell, et al. (1995). "Use of health services by African-American children with asthma on Medicaid." JAMA **274**(6): 469-473.

Magzamen, S., B. Patel, et al. (2008). "Kickin' Asthma: School-Based Asthma Education in an Urban Community." Journal of School Health **78**(12): 655-665.

Mangan, J. M., A. R. Wittich, et al. (2007). "The Potential for Reducing Asthma Disparities Through Improved Family and Social Function and Modified Health Behaviors." CHEST **132**: 789S-801S.

Margolis, M. L., F. J. Montoya, et al. (1997). "Pulmonary function tests: comparison of 95th percentile-based and conventional criteria of normality." South Med J **90**: 1187-1191.

Marsac, M. L., J. B. Funk, et al. (2007). "Coping styles, psychological functioning and quality of life in children with asthma." Child: Care, Health & Development **33**(4): 360-367.

Meng, Y.-Y., S. H. Babey, et al. (2007). California's Racial and Ethnic Minorities More Adversely Affected by Asthma. Los Angeles, UCLA Center for Health Policy Research. Retrieved March 2010, from http://www.healthpolicy.ucla.edu/pubs/files/Minorities_Asthma_PB_022707.pdf

Milgrom, H., B. Bender, et al. (1996). "Noncompliance and treatment failure in children with asthma." Journal of Allergy and Clinical Immunology **98**(6, Part 1): 1051-1057.

Milgrom, H. B., Bruce (1997). "Nonadherence to asthma treatment and failure of therapy." Current Opinions in Pediatrics **9**: 590-595.

Miller, M. R., J. Hankinson, et al. (2005). "Standardisation of spirometry." Eur Respir J **26**(2): 319-338.

Mishler, E. (1984). The discourse of medicine: dialectics of medical interviews. Norwood, NJ, Ablex Publishing Company.

Moonie, S. A., D. A. Sterling, et al. (2006). "Asthma Status and Severity Affects Missed School Days." Journal of School Health **76**(1): 18-24.

Moorman, J. E., R. A. Rudd, et al. (2007). "National surveillance for asthma - United States, 1980-2004." MMWR Surveil Summ **56**: 1-54.

Mudd, K., M. E. Bollinger, et al. (2006). "Pharmacy Fill Patterns in Young Urban Children with Persistent Asthma." Journal of Asthma **43**(8): 597-600.

Mull, J. D. (1993). "Cross-cultural communication in the physician's office." The Western journal of medicine **159**: 609(5).

National Asthma Council-Australia. (2009). "National Asthma Council - Australia: Measurement of Ventilatory Function." Retrieved March, 2010, from http://www.nationalasthma.org.au/content/view/301/403/.

National Asthma Council-Australia. (2009). "National Asthma Council - Australia: The Technique - How To Do It and Common Pitfalls and Problems." Retrieved March, 2010, from http://www.nationalasthma.org.au/content/view/303/405/.

Newacheck, P. W. and N. Halfon (2000). "Prevalence, Impact and Trends in Childhood Disability Due to Asthma." Archives of Pediatrics & Adolescent Medicine **154**(3): 287-293.

Newcomb, P. (2006). "Results of an Asthma Disease Management Program in an Urban Pediatric Community Clinic." Journal for Specialists in Pediatric Nursing **11**(3): 178-188.

NHLBI (1997). Expert Panel Report 2: Guidelines for the Diagnosis and Management of Asthma. Hyattsville, National Institutes of Health. Hyattsville.

NHLBI (2007). Expert Panel Report 3: Guidelines for the Diagnosis and Management of Asthma. Hyattsville, National Institutes of Health.

NHLBI. (2008). "Diseases and Conditions Index - Asthma. What is Asthma?" Retrieved January, 2010, from http://www.nhlbi.nih.gov/health/dci/Diseases/Asthma/Asthma_WhatIs.html.

Nicolai, J. and R. Demmel (2007). "The impact of gender stereotypes on the evaluation of general practitioners' communication skills: An experimental study using transcripts of physician-patient encounters." Patient Education and Counseling **69**(1-3): 200-205.

Nocon, A. (1991). "Social and emotional impact of childhood asthma." Archives of Disease in Childhood **66**: 458-460.

O'Connell, E. J. (2004). "The burden of atopy and asthma in children." Allergy **59**(Suppl. 78): 7-11.

O'Connor, S., B. Bender, et al. (2004). "Measuring Adherence with the Doser CT in Children with Asthma." Journal of Asthma **41**(6): 663-670.

Okelo, S. O., A. W. Wu, et al. (2004). "Emotional Quality-of-Life and Outcomes in Adolescents with Asthma." Journal of Pediatics **145**: 523-529.

Okelo, S. O., A. W. Wu, et al. (2007). "Are Physician Estimates of Asthma Severity Less Accurate in Black than in White Patients?" JGIM: Journal of General Internal Medicine **22**(7): 976-981.

Ong, L. M. L., J. C. J. M. de Haes, et al. (1995). "Doctor-patient communication: A review of the literature." Social Science & Medicine **40**(7): 903-918.

Peek, M. E., A. Cargill, et al. (2007). "Diabetes Health Disparities." Medical Care Research & Review **64**(5): 101s-156s.

Peek, M. F. and J. H. Han (2004). "REVIEW Disparities in Screening Mammography Current Status, Interventions, and Implications." JGIM: Journal of General Internal Medicine **19**(2): 184-194.

Peterson-Sweeney, K., A. McMullen, et al. (2003). "Parental Perceptions of Their Child's Asthma: Management and Medication Use." Journal of Pediatric Health Care **17**: 118-125.

Petty, T. L. (2001). "Simple office spirometry." Clin Chest Med **22**: 845-859.

Pool, J. B. and A. Greenough (1989). "Ethnic variation in respiratory function in young children." Respiratory Medicine **83**(2): 123-125.

Quinn, K., M. U. Shalowitz, et al. (2006). "Racial and Ethnic Disparities in Diagnosed and Possible Undiagnosed Asthma Among Public-School Children in Chicago." American Journal of Public Health **96**(9): 1599.

Rachelefsky, G. S. (2007). "Improving Patient Adherence The Asthma Template." Pediatric Asthma, Allergy & Immunology **20**(3): 146-156.

Rand, C. S. and A. J. Apter (2008). "Mind the widening gap: Have improvements in asthma care increased asthma disparities?" Journal of Allergy and Clinical Immunology **122**(2): 319-321.

Reicin, A., R. White, et al. (2000). "Montelukast, a Leukotriene Receptor Antagonist, in Combination With Loratadine, a Histamine." Archives of Internal Medicine **160**(16): 2481.

Riekert, K. A., A. M. Butz, et al. (2003). "Caregiver-physician medication concordance and undertreatment of asthma among inner-city children." Pediatrics **111**(3): e214-e220.

Rosenbaum, E. (2008). "Racial/Ethnic Differences in Asthma Prevalence: The Role of Housing and Neighborhood Environments." Journal of Health & Social Behavior **49**(2): 131.

Roter, D. L. (2003). "Observations on methodological and measurement challenges in the assessment of communication during medical exchanges." Patient Education & Counseling **50**(1): 17.

Roter, D. L. and J. A. Hall (2004). "PHYSICIAN GENDER AND PATIENT-CENTERED COMMUNICATION: A Critical Review of Empirical Research." Annual Review of Public Health **25**(1): 497-519.

Sherman, J., P. Patel, et al. (2001). "Adherence to Oral Montelukast and Inhales Fluticasone in Children with Persistent Asthma." Pharmacotherapy **21**(12): 1464-1467.

Skobeloff, E. M., W. H. Spivey, et al. (1992). "The Influence of Age and Sex on Asthma Admissions." JAMA **268**(24): 3437-3440.

Sleath, B., G. Ayala, et al. (2006). Project ChACO - Children and Asthma: Communication and Outcomes - Office Protocol -Version 12 - August 15, 2006.

Slinker, B. K. and S. A. Glantz (1985). "Multiple regression for physiological data analysis: the problem of multicollinearity." Am J Physiol Regul Integr Comp Physiol **249**(1): R1-12.

Smith, J. R., S. Mildenhall, et al. (2005). "Clinician-assessed poor compliance identifies adults with severe asthma who are at risk of adverse outcomes." Journal of Asthma **42**: 437-445.

Smith, M. J., K. L. Rascati, et al. (2004). "Inhaled anti-inflammatory pharmacotherapy and subsequent hospitalizations and emergency department visits among patients with asthma in the Texas Medicaid program." Annals of Allergy, Asthma & Immunology **92**: 40-46.

Smith, W. R., J. R. Betancourt, et al. (2007). "Recommendations for Teaching about Racial and Ethnic Disparities in Health and Health Care." Annals of Internal Medicine **147**(9): 654-W217.

Srinivasan, S., L. R. O'Fallon, et al. (2003). "Creating Healthy Communities, Healthy Homes, Healthy People: Initiating a Research Agenda on the Built Environment and Public Health." American Journal of Public Health **93**(9): 1446-1450.

Stern, L., J. Berman, et al. (2006). "Medication compliance and disease exacerbation in patients with asthma: a retrospective study of managed care data." Annals of Allergy Asthma and Immunology **97**: 402-408.

Sylevester, K., P. Milligan, et al. (2005). "Lung Volumes in Healthly Afro-Carribbean Children Aged 4-17 Years." Pediatric Pulmonology **40**: 109-112.

Targonski, P. V., V. W. Persky, et al. (1994). "Trends in Asthma Mortality among African Americans and Whites in Chicago, 1968 through 1991." American Journal of Public Health **84**(11): 1830-1830.

Tates, K., E. Elbers, et al. (2002). "Doctor-parent-child relationships: a "pas de trois"." Patient Education and Counseling **48**(1): 5-14.

Tates, K. and L. Meeuwesen (2000). ""Let Mum have her say": turntaking in doctor-parent-child communication." Patient Education and Counseling **40**(2): 151-162.

Tates, K., L. Meeuwesen, et al. (2002). "'I've come for his throat': roles and identities in doctor-parent-child communication." Child: Care, Health and Development **28**(1): 109-116.

Thorsteinsdottir, B., G. W. Volcheck, et al. (2008). "The ABCs of Asthma Control." Mayo Clinic Proceedings **83**(7): 814-820.

Townsend, M., D. H. Feeny, et al. (1991). "Evaluation of the burden of illness for pediatric asthmatic patients and their patients." Annals of Allergy **67**: 403-408.

Trochtenberg, D. S., R. BeLue, et al. (2008). "Differing Reports of Asthma Symptoms in African Americans and Caucasians." Journal of Asthma **45**(2): 165-170.

Usherwood, T. P., A. Scrimgeour, et al. (1990). "Questionnaire to measure perceived symptoms and disability in asthma." Archives of Disease in Childhood **65**: 779-781.

Van Gent, R., L. E. M. Van Essen, et al. (2007). "Quality of life in children with undiagnosed and diagnosed asthma." European Journal of Pediatrics **166**(8): 843-848.

van Ryn, M. and J. Burke (2000). "The effect of patient race and socio-economic status on physicians' perceptions of patients." Social Science & Medicine **50**(6): 813-828.

Viswanath, K. and K. M. Emmons (2006). "Message Effects and Social Determinants of Health: Its Application to Cancer Disparities." Journal of Communication **56**: S238-S264.

Waitzkin, H. (1990). "On studying the discourse of medical encounters: a critique of quantitative and qualitative methods and a proposal for a reasonable compromise." Medical Care **28**: 16.

Wang, L. Y., Y. Zhong, et al. (2005). "Direct and Indirect Costs of Asthma in School-age Children." Preventing Chronic Disease (Serial Online) Retrieved Nov, 2008, from http://www.cdc.gov/pcd/issues/2005/jan/04_0053.htm.

Warnecke, R. B., A. Oh, et al. (2008). "Approaching Health Disparities From a Population Perspective: The National Institutes of Health Centers for Population Health and Health Disparities." American Journal of Public Health **98**(9): 1608-1615.

Weiss, K. B. (2007). "An Action Agenda To Eliminate Asthma Disparities: Results From the Workgroups of the National Workshop to Eliminate Asthma Disparities." Chest **132**: 853S-855S.

Wennergren, G., S. Kristjansson, et al. (1996). "Decrease in hospitalization for treatment of childhood asthma with increased use of anti-inflammatory treatment, despite an increase in prevalence of asthma." Journal of Allergy and Clinical Immunology **97**: 742-748.

Willems, S., S. De Maesschalck, et al. (2005). "Socio-economic status of the patient and doctor-patient communication: does it make a difference?" Patient Education and Counseling **56**(2): 139-146.

Williams, D. M. (2006). "Considerations in long-term management of asthma in ambulatory patients." Am J Health Sys Pharm **63**(10 Supple 3): S14 - S21.

Williams, D. R. and P. B. Jackson (2005). "Social Sources Of Racial Disparities In Health." Health Aff **24**(2): 325-334.

Wissow, L. S. and M. B.-D. Kimel (2002). "Assessing Provider-Patient-Parent Communication in the Pediatric Emergency Department." Ambulatory Pediatrics **2**(4): 323-329.

Wissow, L. S. R., Debra; Baumna, Laurie J.; Crain, Ellen; Kercsmar, Carolyn; Weiss, Kevin; Mitchell, Herman; Mohr, Beth (1998). "Patient-Provider Communication During the Emergency Department Care of Children with Asthma." Medical Care **36**(10): 1439-1450.

Yoos, H. L., H. Kitzman, et al. (2003). "Symptom Perception in Childhood Asthma: How Accurate Are Children and Their Parents?" Journal of Asthma **40**(1): 27-39.