

CHILDHOOD ASTHMA: EMERGENCY DEPARTMENT
FOLLOW-UP DETERMINANTS

By

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This dissertation is dedicated to my husband Blaine, for his unwavering support; and to my parents Gil and Claire Desjardins and my brother Mark, for always believing in my ability and for encouraging me to be a permanent student.

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Low-income, minority, and uninsured children use the emergency department (ED) more often for asthma care, and suffer increased mortality and morbidity compared to their less vulnerable peers. This comparative correlational study used the Behavioral Model of Health Services Utilization to examine predisposing, enabling and need-related characteristics of families who use the ED for care of childhood asthma, and determinants of follow-up care.

A convenience sample of 63 children presenting to the ED for asthma care were enrolled. Data were collected from parents, ED providers, and medical records. The dependent variable was follow-up care within 30 days of the ED visit. Specific hypotheses were as follows: 1) Families who obtain follow-up care will differ in predisposing, enabling, and need characteristics from families who do not obtain follow-up care; 2) Families who fail to obtain follow-up care will differ in predisposing, enabling, and need characteristics from families who obtain follow-up care; and 3)

Families who use the ED for childhood asthma will exhibit common predisposing, enabling, and need characteristics.

Two-thirds of the subjects did not follow up as directed. Logistic regression was used to test the study hypotheses. Mother's level of education was significantly associated with no follow-up ($p=0.0282$). At the 10% level of significance, the combined effects of travel time to usual source of care, wait time, smoker in the home, fur-bearing pet in the home, parent-evaluated severity, provider-evaluated severity, and provider-evaluated severity for the previous year predicted no follow-up. Odds Ratio (OR) of no follow-up were higher for children with more severe asthma (OR 12.44) or older mothers (OR 2.14).

Subject enrollment was insufficient to achieve statistical power and may have influenced these findings. Additional study limitations included nonrandom sample selection, use of a correlational design, and self-report measures.

This study has direct implications for nursing practice, education, and research. Follow-up of children with asthma is not occurring at the desired levels; therefore additional steps to remove barriers to follow-up should be taken. A larger study exploring ED follow-up determinants should be conducted, as well as a study of nursing interventions to improve follow-up.

CHAPTER 1 INTRODUCTION

Childhood asthma has been a condition of interest to health care providers for many years. Scores of research articles have been written about the pathophysiology, etiology, risk factors for, and treatment of childhood asthma. Parents of children with asthma describe the most frightening aspect of the disease as its sudden tendency to exacerbate or “attack.” Nocturnal symptoms are particularly troublesome. Research of asthma pathophysiology has made healthcare providers aware that asthma exacerbations occur as a result of inflammation in the lungs, and are generally preceded by warning signs. Understanding of (and rapid response to) asthma warning signs can enable a parent to respond appropriately to initial inflammatory changes, thus avoiding or lessening the severity of a flare.

According to Guidelines for the Diagnosis and Management of Asthma, (National Institutes of Health, 1997) effective management of asthma involves four key elements: controlling exposure to asthma triggers, managing asthma with medicine, monitoring the disease, and educating asthma patients to become partners in their own care. A major goal of the National Institutes of Health (NIH) is to reduce the number of hospitalizations and emergency department (ED) visits for asthma. Follow-up care, by a primary care provider or asthma specialist, is recommended after acute, unscheduled asthma care in order to provide education, achieve improved asthma symptom control, and develop a long-term management plan.

Background of the Problem

Childhood Asthma

Asthma is the most prevalent cause of childhood disability in the United States, affecting 2.7 million children (National Center for Health Statistics, 2000). Children with asthma use 3.1 times as many prescriptions; miss three times as much school; and experience 1.9 times as many ambulatory visits, 2.2 times as many ED visits, and 3.5 times as many hospitalizations as children without asthma (Lozano, Sullivan, Smith, & Weiss, 1999). Despite therapeutic breakthroughs, 149 U.S. children (1 to 15 years of age) died in 1997 of asthma-related causes (National Center for Health Statistics, 2000).

Race appears to be an important contributing factor to disability and death from childhood asthma. In the U.S., the overall prevalence of asthma for nonwhite children is only slightly higher than for whites; yet the death, hospitalization, and ED-visit rates for these children are more than twice the rates for white children (Wade et al., 1997).

Access to Health Care for Vulnerable Children

For children, lack of access to adequate health care has been associated with decreased health supervision and decreased management and control of chronic illness (Davidson, Klein, Settipane, & Alario, 1994). Children from vulnerable groups (minority racial backgrounds, poor, and uninsured) are more likely to lack a usual source of care than are a reference group of white, nonpoor, insured children (Newacheck, Hughes, & Stoddard, 1996). Lack of access to primary health care providers has been associated with increased ED use for many populations (Grossman, Rich, & Johnson, 1998).

ED Utilization

Analysis of the 1988 National Health Interview Survey on Child Health determined that African American children, children from single-parent households, children with

mothers who did not complete high school, and children living in urban settings were more likely to cite the ED as a usual source of care (Halfon, Newacheck, Wood, & St. Peter, 1996). Even when a more appropriate usual source of care existed, there was often a lack of after-hours and weekend coverage. Families who used neighborhood health centers for routine care were twice as likely to report use of ED for sick care than were those who used private physician's offices or HMOs (Halfon et al., 1996).

ED Utilization for Childhood Asthma

Nonscheduled acute or emergency care suggests poor asthma management and predicts suboptimal outcomes (Sullivan et al., 1996). In the U.S., asthma was the tenth most common principal diagnosis in ED visits for children and adults in 1996 (National Center for Health Statistics, 2000). In many cases, the ED visit occurred because the family lacked the tools, medication, knowledge or confidence to manage the disease at home (Sherman & Capen, 1997).

Vulnerable children from low-income or minority families, use the ED more frequently for asthma exacerbations, and experience increased mortality and morbidity compared to their less vulnerable counterparts. Analysis of the 1988 National Maternal and Infant Health Survey and 1991 Longitudinal Follow-Up Survey determined that poverty and African American race were the most important determinants of ED use for asthma (Miller, 2000).

Follow-up Care after an ED Visit for Childhood Asthma

In a national study of inner-city children with asthma, 58% of study participants found it difficult to obtain care for an asthma attack as well as for follow-up visits (Kattan et al., 1997). The perceived difficulty obtaining acute or follow-up care for asthma occurred despite the fact that over 92% of the children in the study had insurance

coverage. In a study of inner-city children presenting to the ED for asthma care, the likelihood of follow-up increased when ED staff either made appointments for the parents, or clearly indicated the need for follow-up appointments (Leickly et al., 1998). The most common reason for not making (or keeping) a follow-up appointment was that the child was well. The perception that follow-up is not needed when the acute wheezing episode has resolved may represent a lack of understanding about the chronic nature of the disease and the underlying role of inflammation in the cycle of remission and exacerbation.

Purpose of the Study

The purpose of this research study is threefold:

- To investigate determinants of (and barriers to) the achievement of follow-up care after an ED visit for children with asthma;
- To identify predisposing, enabling, and need-related variables associated with use of the ED by children with asthma; and
- To prospectively test a leading model of health services utilization for predictive ability.

This study used a comparative descriptive/correlational design. Sixty-three children (ages 1 to 18 years) presenting to the ED for treatment of asthma were enrolled. The site chosen was the pediatric emergency department of a tertiary care center in central Florida.

The Behavioral Model of Health Services Utilization guided this study (Andersen, 1995). This model uses a systems perspective to link individual, environmental, patient-related and provider-related variables associated with decisions to seek care. The variables studied were chosen based on the model and based on critical review of the literature of vulnerable children, children with asthma, and other vulnerable populations.

In conceptualizing the likelihood of achieving follow-up care as a measure of overall vulnerability to health care utilization (and identifying the barriers to follow-up care) health care providers can use the information collected in this study to test popular assumptions about ED use and health care delivery for children with asthma.

Specific Aims

1. To identify key determinants that are associated with the greatest likelihood of obtaining recommended follow-up care after an asthma-related ED visit.
2. To identify key determinants that are associated with the greatest likelihood of failing to obtain recommended follow-up care after an asthma-related ED visit.
3. To evaluate predisposing, enabling, and need characteristics of families who have presented to the ED with a child with an acute episode of asthma.

Hypotheses

Three study hypotheses were proposed. Although they appear similar at first glance, there is a subtle difference between the first two hypotheses. The study was designed so that logistic regression analysis would result in two separate equations; the first outlining determinants of follow-up, and the second outlining determinants of no follow-up. Study hypotheses are as follows.

1. Families who obtain follow-up care will differ in predisposing, enabling, and need characteristics from families who do not obtain follow-up care.
2. Families who fail to obtain follow-up care will differ in predisposing, enabling, and need characteristics from families who obtain follow up care.
3. Families who utilize the ED as a source of care for childhood asthma will exhibit common predisposing, enabling, and need characteristics.

Significance/Rationale

The NIH Guidelines call for close follow-up, evaluation, education, and support of all children with asthma; and for follow-up after any acute episode that necessitated an ED visit (National Institutes of Health, 1997). To manage their child's asthma effectively,

parents need an asthma action plan that spells out when and how to take medicines correctly, as well as what to do when symptoms worsen. Episodic, crisis-oriented treatment of childhood asthma exacerbations, without adequate daily control of symptoms, can lead to permanent airway remodeling, significant linear growth delay, and life-threatening immune-system suppression from repeated use of oral steroids.

Because of time constraints, the chaotic learning environment, and lack of continuity, the ED is not the optimal environment for providing disease-specific education. This education is best provided by primary care providers or asthma specialists (National Institutes of Health, 1997). Education of families with children who regularly use the ED for asthma care may well be problematic. Interventions targeting this population have met with mixed results, and the cost is prohibitive (Shields, Griffin, & McNabb, 1990). Moreover, a percentage of families obtain follow-up care as directed without any intervention (Leickly et al., 1998). In an era of cost containment and outcomes-based evaluation, it is important to focus intervention efforts on families who are at greatest risk of not obtaining follow-up care and/or who have difficulty adhering to a prescribed management plan.

Limitations

The sample was a convenience sample of participants presenting to the ED on a shift when either the primary investigator or a full-time pediatric ED nurse was available. Not all shifts were equally represented. It is possible that patients presenting to the ED on the underrepresented shifts differed from those enrolled. A nonrandom sample can also limit external validity of the research findings. All of the subjects in the study were from one hospital ED. Although this hospital is located in an urban setting, and treats patients

of varied racial and ethnic backgrounds, use of only one setting limits generalizability of the results.

The subjects were volunteers who consented to participate in this study. There is a possibility that the act of volunteering for a study may influence the parent to act differently than if they had not participated. In order to give informed consent, subjects were made aware that the purpose of the study was to learn about asthma follow-up. This may have influenced the percentage of subjects who achieved follow-up.

The parent questionnaire was a self-report. Items on the questionnaire were adapted from previous research and national surveys. However, neither this tool nor individual items in the tool was evaluated for reliability and validity. It is not known if parents understood all of these questions. There are indications that a few of them did not. Because of time and financial constraints, the survey was only available in English. English reading and writing skills of the participants were not assessed. Parents may not have been truthful or may have misunderstood items on the questionnaire.

Summary

This chapter provided the background, purpose, and rationale of this research study. The theoretical model guiding the research was introduced and clearly linked to the study variables. Specific aims and hypotheses were detailed. Study limitations were described.

CHAPTER 2 REVIEW OF THE LITERATURE

The purpose of this chapter is to describe in detail the theoretical framework chosen to guide this study and to critically review the related research literature. Conceptual and operational definitions of key study variables are provided. Research studies that used the Andersen model are outlined to demonstrate the overall study design.

Theoretical Framework

Andersen's Behavioral Model of Health Services Utilization is a leading model for the analysis of health services use. The purpose of the model is to assist in understanding why families use health services, to define and measure equitable access to health care, and to assist in developing policies to promote equitable access (Andersen, 1995). The model links individual, environmental, patient and provider-related variables associated with decisions to seek care.

The Andersen model has undergone a number of revisions since its inception and has been used to evaluate health services use in a wide variety of populations (Andersen, 1995). Among other applications, the model has been used to evaluate effects of differences in state Medicaid programs on health services use (Barrilleaux & Miller, 1992); access to antiretroviral therapy among HIV-positive persons (Andersen et al., 2000); and health services use among homeless adults (Gallagher, Andersen, Koegel, & Gelberg, 1997).

Key Components of the Behavioral Model

Health services use or utilization is characterized by the type, site, purpose and time interval for care. Examples of utilization include ED visits, hospitalizations, and outpatient visits. Utilization and satisfaction are directly related. A satisfactory outpatient visit will increase the likelihood that a client will return for another visit. Conversely, dissatisfaction will decrease the likelihood of another visit unless other factors outweigh the dissatisfaction. The goal of utilization is improved health status; not use for its own sake (Andersen, Aday, & Chen, 1986). Utilization should be at the appropriate level for those who need it (Andersen, 1995).

Environmental variables include characteristics of the healthcare delivery system; external environment; and community, such as health policies and availability of providers. A commonly measured environmental variable is the presence of a usual source of care (Phillips, Morrison, Andersen, & Aday, 1998).

Population characteristics include individual, provider, and community characteristics and resources. These population characteristics are further subdivided into predisposing, enabling, and need-related variables. Predisposing variables relate to the individual's propensity to seek care. Enabling resources encompass those of the individual, the provider and the community. Perceived need for services is evaluated by the individual and provider.

Predisposing variables exist before the onset of illness episodes and describe the propensity of individuals to use services. This category is further divided into demographic, social-structure and health-belief subcategories. Demographic variables include age, sex, marital status, race, ethnicity, and immigration status. Social-structure variables include education, occupation, family structure, family size, religion, and

residential mobility. Health-belief variables include values concerning health and illness, past illness history, attitudes towards health services and providers, and knowledge about the disease. Health beliefs are not considered to be a direct reason for utilization but result in differences in inclination toward use (Andersen, 1995).

Enabling variables include health insurance, co-payments, usual source of care, travel time to source of care, average wait to be seen, region of residence, and place of residence. Provider-related variables that impact health services use are cost, availability, and internal economy. Provider-related variables that have been shown to interact with patient factors and influence utilization of primary care services include physician training and decision-making, physician gender, and constraints to practice due to managed care (Katz et al., 1996).

Need-related variables may be perceived by the individual or evaluated by the provider. Perceived need has been described as a social phenomenon encompassing whether or not patients judge their problems to be of sufficient importance and magnitude to seek help (Andersen, 1995). Taken in isolation, perceived need does not represent a measure of disease severity but has been shown to be the strongest determinant of health services use (Phillips et al., 1998). Perceived need is usually measured by self-report and includes symptoms, experiences, days of functional limitation, days lost from work/school, overall state of health, and disease severity. Evaluated need refers to needs that have been determined by a provider based on verification of symptoms, diagnoses by physical examination, or referral data.

To be useful in planning subsequent interventions, a variable must be considered changeable or mutable; or suggest a policy change that might bring about a behavioral

change (Andersen, 1995). Predisposing characteristics are rarely mutable. Enabling characteristics may be mutable (such as usual source of care, co-payment, as well as travel and wait times). Need-related characteristics were originally thought to be immutable but are now thought to be modifiable to some degree. For example, efforts prompted by managed-care systems to promote use of established clinical guidelines have resulted in a decrease in specialty care referrals from primary care providers (Andersen, 1995).

The Behavioral Model of Health Services Utilization (Andersen, 1995) is meant to be both explanatory and predictive. The intent of the model is to discover conditions that either facilitate or impede utilization in order to plan interventions. For this study of children with asthma, the model is used to discover the determinants of ED utilization and to attempt to predict the likelihood of follow-up care. While it seems appropriate to plan an intervention to enhance follow-up care without taking this initial step, Andersen cautions that the variance must first be observed in the current system.

Discussion of Terms

It is necessary to define terms that guide this study in order to proceed. The following definitions were accepted for this study.

Asthma

Asthma is a chronic inflammatory disorder of the airways in which many cells and cellular elements play a role (in particular mast cells, eosinophils, T-lymphocytes, neutrophils, and epithelial cells). In susceptible individuals, this inflammation causes recurrent episodes of wheezing, breathlessness, chest tightness, and cough, particularly at night and in the early morning. These episodes are usually associated with widespread but variable airflow obstruction that is often reversible, either spontaneously or with

treatment. The inflammation also causes an associated increase in the existing bronchial hyperresponsiveness to a variety of stimuli (National Institutes of Health, 1997).

Childhood Asthma

For this study, childhood asthma is defined as asthma affecting children aged 1 to 18 years.

Family

Family is defined as a dynamic system of at least one adult with at least one child who identified themselves as a family unit (Eddins, 1993). Originally, the focus of the Andersen model was on the family as a unit of access, for the medical care an individual receives is a function of the demographic, social, and emotional characteristics of the family (Andersen, 1995). However, the focus switched to the individual because of the difficulty developing measures at the family level that are also sensitive to individual family members. Nevertheless, family size and structure remain important variables, and have been measured in studies of health services use involving children (Eddins, 1993; Newacheck, 1996; Newacheck, 2000).

Usual Source of Care

Usual or regular source of care is defined as a person or place where the respondent goes for health care. The presence of a usual source of care is an important indicator of access to medical care (Gallagher et al., 1997). Individuals with a regular source of care are more likely to use care when ill; are more likely to seek and obtain preventive care; and express more satisfaction with the care received (Aday & Andersen, 1974). The regular-source-of-care measure is taken from the Robert Wood Johnson Foundation survey on access to care (Hayward, Bernard, Freeman, & Corey, 1991). Respondents were asked whether there was one person in particular or one place where they usually

went when they were sick or wanted advice about their health. Those who replied in the affirmative were judged to have a regular source of care.

Review of the Literature

The purpose of this review is to outline what is currently known about access to health care for children, ED utilization for childhood illnesses (particularly asthma), and efforts to influence utilization and educate families about asthma. This review guided study planning and implementation. An overall outline of the reviewed studies is given in Table 2-1.

Access to Health Care for Children

Lack of access to adequate health care for children has been associated with decreased health supervision and poor outcomes in terms of control and management of chronic illness (Davidson et al., 1994). Children who are poor, uninsured, or from minority racial backgrounds are more than twice as likely to lack a usual source of care than a reference group of white, nonpoor, insured children (Newacheck et al., 1996). Even when a usual source of care was identified, it was more often a public clinic or hospital setting; and these children were twice as likely to travel more than 30 minutes for care, and nearly three times more likely to wait 60 minutes or more for their care. Not surprisingly, these vulnerable children used less ambulatory care services, experienced lower immunization rates, and obtained less preventive care.

A 1993 analysis of use of medical care by children with chronic health conditions found that poor children, minority children, children who lived with only their mother or with someone other than their parents, those without insurance, and/or without an identifiable medical provider were most likely to experience financial barriers to access and were therefore less likely to seek care than were other children with comparable

needs (Aday, 1993). While one reason for poor access to care is a lack of health insurance, children from minority groups, and those living in poverty have reduced access to care regardless of insurance status (Newacheck et al., 1996). A comparison of three health care delivery systems concluded that merely extending health insurance coverage to low-income families was not sufficient to ensure care (Rosenbach, Irvin, & Coulam, 1999). Given that additional barriers to care (beyond insurance status) seem to exist for minority and low-income children, further attempts to identify these barriers are in order.

Emergency Department Utilization

Lack of access to primary health care providers has been associated with increased ED utilization for many populations (Grossman et al., 1998). Analysis of the 1988 National Health Interview Surveys on Child Health determined that African American children, children from single-parent households, children with mothers who did not complete high school, and children living in urban settings were more likely to cite the ED as a usual source of care (Halfon et al., 1996). Even when a more appropriate usual source of care existed, there was often a lack of after-hours and weekend coverage. Families who used neighborhood health centers for routine care were twice as likely to report use of ED for sick care than were those who used private physician's offices or HMOs (Halfon et al., 1996). These studies show that inappropriate ED utilization is not solely due to patient-related factors. Thus, the solution to inappropriate health services use is not as simple as merely having a more appropriate place to go. Not all primary care sites are created equal in terms of convenience and accessibility. Efforts to identify negative characteristics of primary care sites may assist health care providers to better understand and remedy inappropriate utilization patterns.

An earlier version of the Andersen Model was used in a study to explore predictors of ED use by young children of low-income families (Polivka et al., 2000). Low-income women (n=474) with children younger than six years completed face-to-face interviews at county health facilities in Ohio. Forty-nine percent of the children in the study had been treated in the ED in the previous year, with 15% experiencing a hospitalization. The variables that best predicted ED use were maternal ED use in the previous year (OR 2.2), place of residence (rural versus urban or suburban, OR 2.0), and health care plan type (Medicaid versus uninsured or Medicaid managed care, OR 1.7 times).

Few studies have been undertaken attempting to influence ED utilization for non-urgent childhood conditions. In an intervention designed to decrease ED utilization by children with Medicaid, subjects presenting to the ED with non-urgent needs were randomly assigned to one of three groups (Grossman et al., 1998). Subjects in the first group were given information by a clerical worker about the importance of maintaining primary care and were assisted in making appointments with their providers. Subjects in the second group received the information and appointment assistance from a health professional (a nurse or social worker). This group also received an additional three months of support in order to eliminate barriers to appropriate health services use. The third group received no intervention. In the six months after the study, when compared to the no- intervention group, the first and second group subjects experienced 11.1% and 14.5% fewer ED visits respectively, and an average cost reduction of \$20 per child. For the first group, the intervention was achieved at an expense of \$6.17 per child, resulting in a net savings of \$17 per child. While the second group subjects experienced a similar cost reduction, the intervention was estimated to cost \$30 per child, resulting in an overall

net loss of \$10 per child. The increased expense was due to the increased duration of support and higher salary costs for the health professionals. There was no difference among the three groups in number of preventive or ill-child visits at the primary care offices. Not surprisingly, without a concomitant increase in preventive care, the results were short-lived with no difference in ED utilization 6 to 24 months post intervention. Although the subjects presented to the ED less frequently, neither did they present to their primary care provider. It is possible that they presented elsewhere or went without treatment. The lack of long-term effectiveness of this intervention underscores the importance of assuring that children are actually seen by a primary care provider.

In another study of ED utilization, the effects of follow-up telephone calls were examined for 265 families with children presenting to the ED with a variety of common childhood illnesses (Chande & Exum, 1994). Most of the families (70%) relied on medical assistance, with the remainder receiving a mix of private insurance (20.8%) or no insurance (9.2%). Only 43% of participants were able to identify a usual source of care. Of those families with a usual source of care, 30.2% received care at a pediatric clinic, 24.5% at a community clinic, and 2.3% received no primary care. Asthma was the most common diagnosis for these children. Families in the intervention group (n = 133) were telephoned by a physician 12 to 30 hours after ED discharge; and were reminded to fill prescriptions, to call regular providers, and to follow other documented instructions. Families in the control group (n = 132) received no follow-up telephone calls. All families were called 10 to 20 days post visit to determine if prescriptions were filled and if follow-up care occurred. Type of insurance was found to be the key interaction variable. For subjects relying on medical assistance, 90% of the intervention-group

subjects reported calling a primary care provider versus 51.6% of the control-group subjects. For subjects with commercial insurance, 90% of the intervention-group subjects reported calling a primary care provider versus 72% of the control-group subjects. Prescriptions were reported filled by 88% of the intervention group and 87.6% of the control group, regardless of insurance type. While this study did not measure actual achievement of (but rather self report of) follow-up care, the researchers demonstrated that for a vulnerable group (i.e., those relying on medical assistance), even a simple intervention like a follow-up telephone call could make a difference in adherence to recommended follow-up care.

ED Utilization for Childhood Asthma

In examining ED utilization specifically for the treatment of childhood asthma, several studies were reviewed. A retrospective analysis of the medical records of 445 children treated for asthma in the ED of a large urban hospital determined the following risk factors for ED use: being a younger aged child, greater number of days with symptoms, higher number of medications prescribed, prior hospitalization, lower level of parental confidence in the efficacy of medications prescribed, and failure to use a criterion for deciding to seek emergency care (Wasilewski et al., 1996). Although this study was limited by a retrospective design, it provided a large sample size and was well designed; with valuable triangulation of data from the parent, the provider, and the medical record. In fact, measures of asthma severity used in my study were modeled from the work of Wasilewski and colleagues (1996).

Multivariate analysis of the 1988 National Maternal and Infant Health Survey and 1991 Longitudinal Follow-Up Survey determined that poverty and African American race were the most important determinants of ED use for asthma (Miller, 2000). When

the effects of other sociodemographic factors and health behaviors were excluded, poor and near-poor children with asthma were more likely to have had one or more ED visits for asthma than were those from higher-income families (OR, 4.2 and 5.8 respectively). Similarly, across the income range, African American children were five to seven times more likely to use the ED use for asthma than were non-African American children.

In a study of 344 inner-city children presenting to the ED for asthma care, 84% of the respondents indicated that they were able to follow the ED recommendations regarding medications (Leickly et al., 1998). However, doubts regarding the usefulness of the medications occurred in 34% of those reporting adherence to ED recommendations and 54% who admitted non-adherence. Of the 29.4% of parents who reported being given follow-up appointments at the time of the ED visit, 69% reportedly kept the appointment. Thirty-nine percent of parents reported being told specifically to call for appointments, of which 60% reportedly made and kept the appointments. Finally, 30.6% of parents reported neither being given an appointment nor told to make one, and only 25.2% of these parents reportedly made and kept appointments. The most common reason for not making (or keeping) a follow-up appointment was that the child was well. Leickly and colleagues contend that parents may not realize the rationale behind continuing care or may perceive these visits to be unnecessary (1998). Given that a large number of children presenting to the ED will receive oral steroids, and experience a dramatic improvement in symptoms as a result, parents may develop a false sense of reassurance. It is important to identify which families are most at risk for failure to follow-up in order to determine where to best target interventions.

In a national study of 1,528 inner-city children with asthma, it was determined that 58% of study participants found it difficult to obtain care for asthma attacks as well as for follow-up visits (Kattan et al., 1997). The reported difficulty obtaining acute or follow-up care for asthma occurred despite the fact that over 92% of the children in the study had insurance coverage. The authors postulated that barriers to care, and lack of continuity of care, might contribute to morbidity among children with asthma.

Asthma Education Programs and the ED

Asthma education programs (AEPs) have been shown to increase knowledge about the disease; to increase feelings of confidence when dealing with asthma; to and decrease school absenteeism, activity restrictions, and parental workday absences (Talabere, 1990). While it seems self-evident that families who use the ED for childhood asthma require education, AEPs designed for this population have met with mixed results. An evaluation of an AEP designed specifically for parents of children who had experienced an ED visit or hospitalization for asthma in the previous four year period determined that only 38% of the parents in the experimental group (n = 127) attended one or more of the offered sessions, despite efforts to provide evening and Saturday classes (Shields et al., 1990). Although telephone instruction improved patient contact to 81%, there was no reduction in number of ED visits by the experimental group. The researchers contended that the AEP did not achieve success because of: poor attendance, lack of time to practice behavioral changes and thus to achieve mastery of the skills, and lack of motivation to change.

In a study of 80 children with asthma with a history of ED use, children in the intervention group received asthma care in a pediatric allergy clinic, along with close follow-up by an asthma outreach nurse (Kelly et al., 2000). Monthly phone calls were

made to provide support, education, and medication refills; and to arrange follow-up visits. Children in the control group received usual care, with monthly phone calls from the outreach nurse to track health care utilization. The intervention group experienced a significant reduction in mean number of ED visits and hospitalizations, with an estimated cost savings of \$721 per child/year, despite the cost of subspecialty care and the outreach nurse. The control group also experienced reduced health care utilization and a cost savings of \$178 per child/year. The researchers postulated that the reduction in health care utilization by the control group was due to the monthly phone calls from the outreach nurse. This study underscores the importance of follow-up care in order to control asthma symptom exacerbation and to reduce inappropriate ED utilization.

Review of Studies Using the Andersen Model

My study was modeled after two studies that were subsets of the 1991 UCLA Homeless Health Study. This large study of 1,563 homeless subjects utilized a revision of the Andersen model, which considered additional predisposing, enabling and need characteristics hypothesized to occur with vulnerable populations. Examples of these additional characteristics include competing needs, such as concomitant mental illness, entrenched homelessness and other variables that can be expected to have a larger impact among vulnerable populations. While these studies use a revision of the model, the underlying themes and data collection techniques are similar to the original model. The first study utilized multiple logistic regression to examine the determinants of a regular source of care among homeless adults in Los Angeles (Gallagher et al., 1997). The outcome variable for analysis was regular source of care. Subjects participated in face-to-face interviews by trained lay interviewers who asked structured questions about health

Table 2-1. Summary of studies of childhood asthma and pediatric ED utilization

Study	Sample	Design	Methods	Major findings
Polivka et al.,(2000) Predictors of hospitalization and ED by young low-income children.	474 children (under 6 years of age) from low-income families	Retrospective Descriptive Correlational	Face to face interviews at a county WIC office	49% of children treated in the ED previous year, 15% hospitalized Predictors of ED use : maternal ED use in past year (OR 2.2), rural versus urban or suburban residence (OR 2.0), Medicaid versus uninsured or managed care (OR 1.7)
Halfon & Newacheck, (1996) Routine emergency department use for sick care by children in the United States.	17,710 children 1-17 years as part of national survey	1988 National Health Interview Surveys on Child Health	Multivariate analysis	Factors associated with ED as USOC: African American race, single parent, mothers did not complete high school, urban residence Families who used neighborhood health centers for USOC twice as likely to report ED use for sick care than families with private MD or HMO
Davidson et al, (1994) Access to care among children visiting the emergency dept with acute exacerbations of asthma	170 children 2-17 years visiting the ED with asthma exacerbation	Descriptive comparative analysis	Prospective interviews	Patients with Medicaid were: Less likely to call MD before presenting to ED More likely to have had two or more visits to ED & admissions in the year prior to the study. Lack of access to health care associated with decreased health supervision and decreased management and control of chronic illness
Newacheck, Hughes & Stoddard, (1996) Children's access to primary care: differences by race, income, and insurance status	7,578 children (1-17 yrs)	Analysis of the 1987 National Medical Expenditure Survey,	Compared four groups of children Minority Poor Uninsured White, nonpoor, insured (reference group)	All of the comparison groups were more than twice as likely to lack USOC versus reference group If USOC identified, it was more often a public clinic or hospital setting. Also were Twice as likely to travel > 30 minutes for care Three times more likely to wait > 60 minutes for care Twice as likely to lack immunizations 1.5 times more likely to go without treatment for common childhood problems
Chande and Exum, (1994) Follow up phone calls after an emergency department visit.	265 children presenting to ED with variety of childhood illnesses	Quasi-experimental	Experimental group received phone call from MD 24 hours after ED visit.	43% had an identified USOC. Of those without USOC, 55% used a pediatric or hospital based clinic. Follow-up greater in patients with health insurance. For those without health insurance, follow-up increased in the intervention group.

Table 2-1. Continued.

Wade et al., (1997) Psychosocial characteristics of inner-city children with asthma: A description of the NCICAS psychosocial protocol. .	1,528 children (ages 4-9) with asthma and their caretakers.	Multi-center Repeated measures Prospective design.	Assessed overall asthma knowledge, response to hypothetical scenario, psychological distress, undesirables life events	Caretakers averaged 84% correct responses on Asthma Information Quiz When given a hypothetical problem situation, averaged: less than one helpful response and more than one maladaptive action Asthma prevalence for nonwhites is only slightly higher than for whites, Death, hospitalization, and ED visit rates for nonwhites are more than twice those for whites
Wasilewski et al., (1996) Factors associated with emergency department visits by children with asthma: Implications for health education.	445 children treated for asthma in the ED of a large urban hospital	Retrospective, Descriptive Correlational	Analysis of the medical records, and parent interviews	Risk factors for ED use for asthma: younger age, greater number of days with symptoms, higher number of medications prescribed, prior hospitalization, lower level of parental confidence in efficacy of medications, failure to use a criterion for seeking care More ED visits in parents describing less anger about asthma
Stoddard, St. Peter, & Newacheck, (1994) Health insurance status and ambulatory care for children.	7,578 children (1-17 years)	1988 National Medical Expenditure Survey	Multivariate analysis	Controlling for other sociodemographic variables, children without health insurance were 1.72 times more likely to receive no care for asthma than insured children
Aday et al., (1993) Health insurance and utilization of medical care for children with special health care needs.	2,628 children who met criteria for special health care needs	1988 National Health Interview Survey, Child Health Supplement	Multivariate analysis of children with special health care needs	Children lacking insurance or with Medicaid coverage more likely: Hispanic versus white (OR 1.98), To live with mother only (OR 1.51), To have mother with < HS education (OR 2.16). Children under five years with special needs four times more likely to have seen an MD, three times more likely to have taken a medication as compared to older children. Black children, living with someone other than parents much less likely to have taken a medication

Table 2-1. Continued

<p>Kattan et al., (1997)</p> <p>Characteristics of inner city children with asthma</p>	<p>1,528 children (ages 4-9) with asthma and their caretakers. Home visits on 663 children</p>	<p>Multi-center Repeated measures Prospective design.</p>	<p>Allergy testing, PFT, nicotine exposure Phone calls at 3 month intervals measured hospital, ED & MD utilization & symptom recall for previous 2 weeks.</p>	<p>73% African American, 20% Latino, 7% white or other. 66% of caretakers &/or mothers had HS education 61% below poverty level for household income 67% saw same provider for primary and asthma care 50% report that it was hard to get follow-up care for asthma 57% lived in apartments, 44 % in dwellings > 50 years old, Only 38% of homes had vacuum, 66% with roaches, 29% with mice 59% had at least one smoker</p>
<p>Miller, (2000)</p> <p>Effects of race/ethnicity and income on early childhood asthma prevalence and health care use.</p>	<p>8,117 respondents to survey who fell into categories of poor or near poor</p>	<p>1988 National Maternal and Infant Health Survey and 1991 Longitudinal Follow-Up</p>	<p>Multivariate analysis</p>	<p>Poverty and African American race determinants of ED use for asthma. Controlling for African American race found: Poor children with asthma 4.18 times more ED use. Near poor children 5.82 times more ED use. Controlling for poverty: African American children five-seven times more ED use</p>
<p>Lozano et al. , (1997)</p> <p>The economic burden of asthma in US children: Estimates from the National Medical Expenditure Survey.</p>	<p>Children (1-17 years) 667 with asthma 6,911 without asthma</p>	<p>1988 National Medical Expenditure Survey</p>	<p>Multivariate analysis</p>	<p>Children with asthma used 3.1 times as many prescriptions; missed three times as much school; experienced 1.9 times as many ambulatory visits, 2.2 times as many ED visits and 3.5 times as many hospitalizations as children without asthma 41% of children with asthma had no primary insurance</p>

status, presence of index conditions and utilization of health services. Predisposing characteristics that predicted a regular source of care were: female, age greater than 41 years, and veterans. Conversely males, Hispanics, and those less than 41 years of age were less likely to report a regular source of care. The female and age advantage occurred despite differences in health status and health insurance, which were controlled for in the multivariate model. Other significant determinants were entrenched homelessness (greater than five years), social isolation and subsistence difficulties. Gallagher et al reported that health status did not predict the likelihood of having a source of care in this population, a deviation from studies of the general population (1997).

A subset of data from homeless individuals in the UCLA study was analyzed in a study that focused on predicting two types of health services use (hospitalization and ambulatory outpatient visits) by examining predisposing, enabling and needs related factors (Stein, Andersen, Koegel, & Gelberg, 1998). The researchers contended that hospitalization could be considered to represent a substitution for outpatient care resulting from poor access to ambulatory services. A stratified random sub-sample of 485 subjects enrolled in the larger study were interviewed every two months over a one-year period. At the completion of the study, usable data existed for 363 subjects. The dichotomous outcome variables for this study were medical hospitalization and/or at least one outpatient visit within the past year. Analyses were performed with structural equation modeling and confirmatory factor analysis. A prospective path model was developed in which all baseline predisposing, enabling, and needs-related factors simultaneously predicted whether there was a hospitalization or an outpatient visit. In the final model, less education, African American ethnicity, more drug use, poorer health,

less community support, and more barriers to care predicted a hospitalization (Stein et al., 1998). An outpatient visit was predicted by having a usual source of care, prior poor health, drug use, fewer alcohol problems, female gender and more community support.

The Andersen Behavioral Model of Health Service Utilization has been applied to research studies examining health care utilization with other populations. Critical review of studies that utilize the Andersen model has shown it to be of great value as a conceptual and organizing framework for the evaluation of health services use. Families who utilize the ED for childhood asthma require close monitoring, support, and coordination of services in order to bridge the gap between emergent and primary care and to remove the barriers to appropriate use of services. For the current study of ED follow-up determinants, the model was used to examine characteristics of families who utilize the ED for childhood asthma care. The outcome variable of interest will be whether or not the child receives follow-up care.

Conclusion

The Andersen model is a well-established model of health services utilization. It has been used in many fields of study and is very useful in conceptualizing relationships between characteristics of families, the environment and the health care system as they relate to health care access and use of health services. It served as an organizing and theoretical framework for this study. The model was also tested for its ability to explain ED utilization for childhood asthma and to predict ED follow-up.

Few published studies have examined the patient and provider related characteristics associated with utilization of the ED for childhood asthma. Studies that examined follow-up care for children after an ED visit were not specific to asthma. Furthermore, these studies were limited by retrospective design, poorly defined

instrumentation, and a lack of theoretical justification for chosen variables. Identification of the underlying determinants for utilization patterns specific to childhood asthma is the first step in the development of interventions that encourage appropriate health services use, and promote cost effective, advantageous care in this vulnerable population.

CHAPTER 3 RESEARCH DESIGN

The purpose of this chapter is to outline the research design and methodology of this research study. The study sample, site characteristics, data collection methods and procedures will be described. Data analysis will be detailed and design and ethical considerations discussed.

This study utilized a comparative descriptive/correlational design. The variables measured were chosen based on the Andersen model and upon critical review of the literature of health care access for children, children with asthma, ED utilization, and use of the model with other populations. This study was conducted in the pediatric ED of a tertiary care center in central Florida.

Site Characteristics

The hospital chosen for this study is a 517-bed teaching and research center and the largest urban hospital in a seven hospital system serving the central Florida region. The 41-bed ED treats 85,000 patients per year, including 2,500 major trauma cases, and 26,000 pediatric cases (McKee & Oakley, 1993). The pediatric division consists of 12 beds attached to the main ED. In a 12-month period (July 1999 to July 2000), 7,745 children from 1 to 18 years of age were treated for asthma in this ED (J. Williams, personal communication, October 31, 2000).

Based on previous census data, this emergency department appeared to be an excellent site for clinical research about childhood asthma and health services use. There seemed to be a sufficient number of children using the ED for asthma care to ensure a

pool of available subjects. Although data about race, income and other personal identifiers were not available for analysis, key billing and accounting personnel assured this researcher that the site treated an ethnically diverse population, and large numbers of potential subjects were available (C. Dupreez, personal communication, October 8, 2000).

Sample

The parent or guardian (hereafter referred to as parent) of children (1 to 18 years of age) presenting to the ED with asthma were approached and asked to participate in the study. The following inclusion criteria for study participation were modeled on the study by Wasilewski and colleagues (1996):

1. The child had a diagnosis of asthma confirmed by a physician on or before the current visit (hereafter referred to as the baseline visit).
2. There was at least one previous episode of asthma that required medical treatment.
3. The parent or physician indicated verbally or on the medical record that the reason for the baseline visit was for a problem related to asthma.
4. At least one parent was able to speak and understand English.
5. The parent had indicated access to a working telephone so that the family could be contacted regarding follow up care or to supply missing information.

A power analysis was performed to determine the desired sample size. For the results to have 90% power, a medium effect size of 0.3 and an alpha level of 0.05, 168 subjects were required. Allowing for a possible 20% attrition rate, the enrollment goal was 200 subjects. Due to unforeseeable influences on the data collection process, enrollment fell far short of this goal and the result is that the study is underpowered. This will be discussed further in Chapter 5.

Data-Collection Methods

Data were collected from the parent, the medical record and the usual source of care. Demographic information was obtained from the medical records. Registered nurses explained the study to the family and obtained informed consent. When the principal investigator (PI) was available, ED staff identified potential participants and the PI obtained consent. The consent document indicated that the parent may be telephoned within a month to determine if, and where, follow up care occurred. The parent completed the consent form, a form granting permission to contact the usual source of care; and a study-specific questionnaire (Appendix A).

Demographic and Observational Variables

The following variables were obtained from the medical and billing records of the child and/or self report of the parent at the baseline visit.

1. Ethnicity
2. Age and gender of child
3. Annual family income (self report by parents)
4. Age of mother
5. Family size
6. Family structure
7. Level of education achieved by mother

The following dichotomous variables were recorded as yes or no responses on the questionnaire.

1. Does your child have health insurance?
2. If yes, is it Medicaid?
3. Is there a co-payment for an ED visit?
4. Is there a co-payment for an outpatient visit?
5. Do you have a usual source of care (USOC)?
6. If yes, is travel time to USOC greater than 30 minutes?
7. Is the wait time at USOC usually greater than one hour?
8. Does anyone who resides in the home smoke (either in the home or outside)?
9. Do you have a fur or feather bearing pet in your home?
10. Have you or your child used the ED for care before?

Wording of the above questions (with the exception of questions about pets and cigarette smokers) were derived from the government internet sites describing the Medical Expenditure Panel Survey (Agency for Healthcare Research and Quality, 2004) and National Health Interview Survey. (National Center for Health Statistics, 2004) For example, the question about the usual source of care was, “is there a doctor’s office, clinic, health center or other place that you usually go to if your child is sick or you need advice about his/her health?” The phrasing was taken directly from the NHIS question about usual source of care. These national surveys collect ongoing data about health care needs, health services use, and healthcare systems. Reliability and validity of the surveys were not examined before choosing items as these statistics were not available to the researcher.

Asthma Severity

There is a general lack of agreement on the best method of determining asthma severity. A common objective measure in adult asthma research and pediatric clinical trials is the use of peak expiratory flow rate (National Institutes of Health, 1997). While this measure has utility in childhood asthma research, results are age and effort dependent and are of limited validity for children less than five years of age, or those who are uncooperative, in significant respiratory distress, or inexperienced in peak flow meter use. Instruments are available which measure general health status of children with special health care needs (Kozinetx et al., 1999). These instruments have been found to be reliable and valid; however, none of them are specific to childhood asthma.

Additional measures of asthma severity have included pulmonary function studies, oxygen saturation rates, visual analogue scales, quality of life surveys and categorical descriptors (Fritz, Yeung, Wamboldt, Klein, & Seifer, 1996). The 1994-1995 National

Health Interview Survey indicators measure the impact of disability on affected children as follows: a) the degree to which disability limits participation in age specific social roles (to engage in school or play) and b) the average number of restricted activity days (Newacheck & Halfon, 2000).

Severity of asthma reflects both frequency and intensity of attacks, and is difficult to measure along a single dimension. The best data comes from more than one source. The methods of Wasilewski and colleagues (1996) were chosen for this study as they represented the best combination of provider and family evaluated need as well as questioned the family about the impact of their child's asthma in a manner similar to the NHIS and MEPS databases. However, reliability and validity of these methods of measurement were not reported. The first two measures determine severity from the standpoint of the ED provider as follows:

1. Severity of the baseline episode was categorized by the final treatment received in the ED as follows: (a) mild- no medications or only oral medications administered; (b) moderate - injected or inhaled medications are administered; and (c) severe - intravenous medications are administered or child is admitted to the hospital.
2. The severity of any available ED visits in the preceding 12 months were scored on the same scale.

For the remaining severity measures, the parent was asked to:

1. Categorize the seriousness (mild, moderate, severe) of the episode of asthma that provoked the baseline ED visit.
2. Categorize the overall seriousness of the child's episodes throughout the preceding year (mild, moderate, or severe).
3. Indicate how many days the child had symptoms in the preceding 12 months.
4. Indicate how many days the child was unable to carry out normal activities because of asthma.

Reliability and Validity of Questionnaire

An extensive search of the literature did not reveal a well researched tool which examined the variables of interest or reflected the variables in the model. Consequently, the parent questionnaire was developed by the researcher to measure the concepts of interest. Variables were chosen based on past research using the Andersen model, on past research of children with asthma, and on the researcher's clinical experience.

Asthma severity measures were taken from a similar study of childhood asthma in the ED (Wasilewski et al., 1996). Unfortunately, not using a well researched standardized tool raises reliability and validity concerns.

None of the reviewed published research using the Andersen model reported reliability and validity of measures. The lack of standardized concepts and measures has been a criticism of health services research (Patrick, 1997). In order to understand the reasons why, one must examine the history of the behavioral model. The model was originally designed to assist with the analysis of a national survey collected by the Center for Health Administration Studies at the University of Chicago (Andersen, 1995). Much of the subsequent research using the Andersen model has involved analysis of secondary data from large national databases (Phillips et al., 1998). One of the many benefits of using large databases for research is that methodological issues can be lessened by the power of large samples (Munro, 1997).

The behavioral model is meant to serve as a framework for analysis rather than a mathematical model so it does not dictate the precise variables and methods that must be used (Phillips et al., 1998). No simple right measure or best design exists to measure variance in the current complex health care system (Patrick, 1997). The inclusion and measurement of variables will depend on extent of prior research, research question,

study purpose and data availability. Andersen encourages innovative approaches to data collection stating that researchers are limited more by feasibility and cost than by conceptual limitations (1995).

Andersen, originally a sociologist, became a pioneer in the field of health services administration. By design, components of the model vary depending on the type of utilization. Examination of perceived need will help health care providers understand care seeking and adherence, for perceived need is thought to drive the decision to seek health services (Andersen, 1995). However, perceived need was “never meant to be a measure of pathology or disease devoid of social context” (Andersen, 1995, p.3). Thus, since perceived need was the concept of interest for this study of ED follow-up determinants, it was appropriate to rely on parental report of asthma severity, rather than biomedical measures.

Dependent Variable

The dependent variable was dichotomous, representing whether or not follow-up care occurred within 30 days of the baseline visit. Follow-up was verified by usual source of care rather than self-report of parent in order to enhance the accuracy of findings. The 30 day timeframe was chosen based upon clinical experience. However, this timeframe has been utilized in two recently published studies (Cabana, Bruckman, Bratton, Kemper, & Clark, 2003; Zorc et al., 2003). While the ideal timeframe for a follow-up visit is within three to five days of the ED visit, (National Institutes of Health, 1997) 30 days provided additional time to allow for possible difficulties obtaining appointments and arranging time off work and school in order to attend the appointments. A visit occurring beyond this timeframe would more likely be for another acute episode or a new concern

than for the ED recommended follow-up. Figure 3.1 depicts the analytical framework specific to this study.

Design and Ethical Considerations

No attempt was made to interfere with the usual education provided in the ED utilized for this study. The staff recommended follow-up care as per usual practice. In this ED, discharged patients sign a form with a final diagnosis and discharge instructions. On this form, the treating physician indicates that the child should be seen by their primary care provider for follow-up, generally within one week. Patients who cannot identify a usual source of care are assisted in obtaining one within their specific insurance guidelines. The two subjects who indicated that they lacked a usual source of care were referred to the outpatient pediatric clinic affiliated with the hospital. The identified source of care was contacted to determine if a follow-up visit had occurred within the timeframe.

The study proposal, informed consent for parents and assent for children greater than seven years of age were submitted and approved by two institutional review boards (IRBs), that of the University of Florida and the clinical site. Parents of children who met the inclusion criteria were approached by the ED staff and asked to participate in the study. Participants were informed of their rights as research subjects, including the right to decline without penalty, and assured that the care received in the ED would not change regardless of participation. Parents were asked to sign the approved informed consent document (Appendix B) and children older than seven years were asked to sign the assent document (Appendix C). The assent to participation explained to the older children their research rights in age appropriate language. Copies of the signed consents were provided to the family.

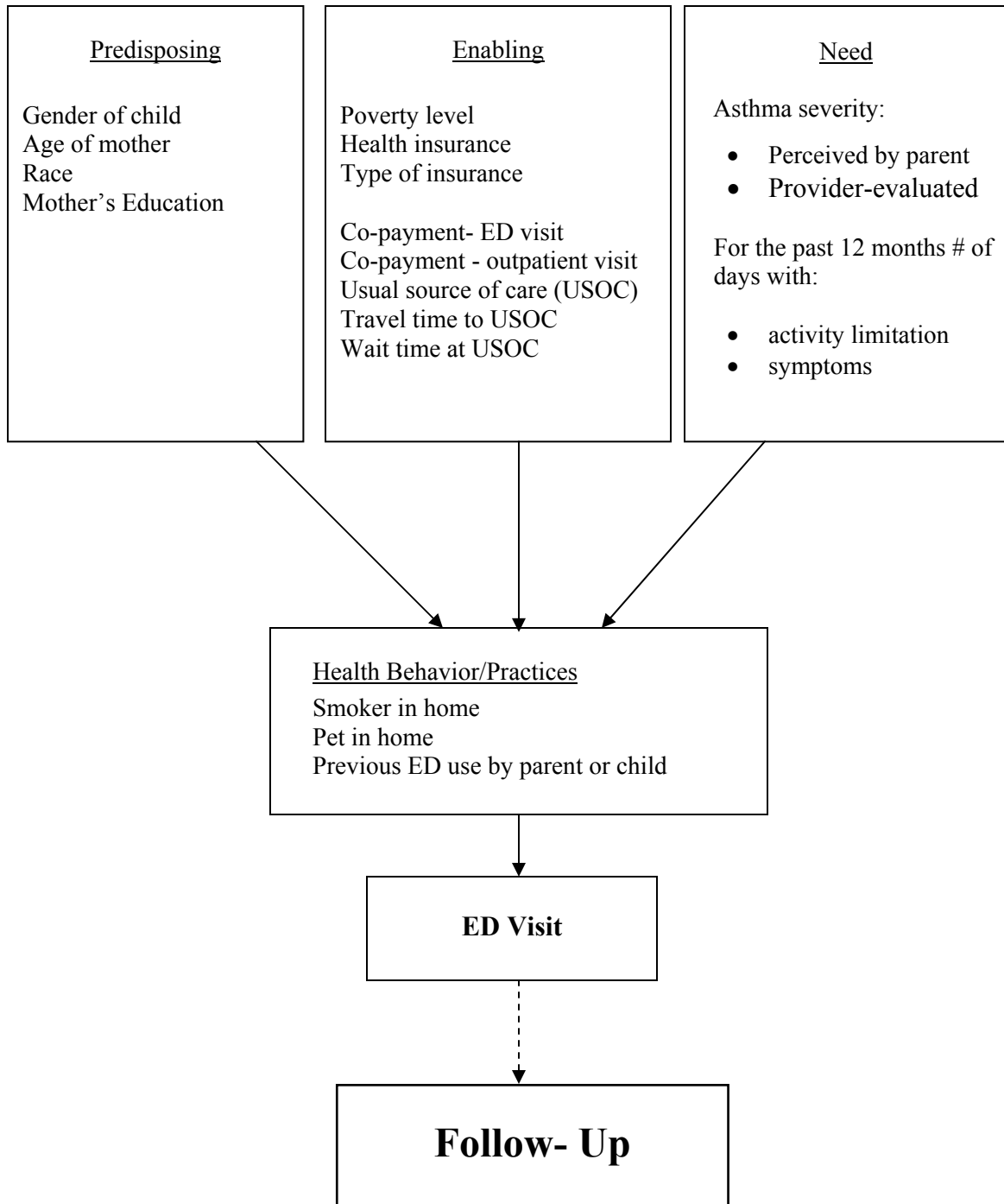


Figure 3-1: Analytical framework of variables related to ED utilization by children with asthma

Statistical Procedures

Data were analyzed using SAS statistical software (SAS Institute, 1987).

Descriptive procedures were used to obtain summary measures for the data. The frequency distribution for each variable was examined to identify data entry errors and outliers. Examining the frequency distribution is also essential for developing an appropriate approach to statistical analysis.

Hypotheses:

1. Families who obtain follow-up care will differ in predisposing, enabling, and need characteristics from families who do not obtain follow-up care.
2. Families who fail to obtain follow-up care will differ in predisposing, enabling, and need characteristics from families who obtain follow up care.
3. Families who utilize the ED as a source of care for childhood asthma will exhibit common predisposing, enabling, and need characteristics.

To address hypotheses 1 and 2, logistic regression techniques were used to control for confounders and estimate independent relationships between the predictive variables and the outcome variable. Logistic regression analysis was also used to explore potential differences between those who obtain follow-up care and those who do not obtain follow-up care with respect to the predictive variables. Modeling began by including all predictor variables that either have at least a marginal bivariate association with the outcome variables, or for which there is some rationale that the variable may be a confounder or effect modifier for other variables. In order to obtain more parsimonious models, variables were deleted in a stepwise fashion (provided that the overall model fit was not significantly diminished and estimates for the other predictors were not appreciably altered by the deletion). The determination of whether deleting the variable may reduce model fit was considered by computing the difference between the likelihood

ratio chi-square of the complete and reduced logistic regression models. Analysis of frequency and correlation analysis were used to address the third working hypothesis.

CHAPTER 4 ANALYSIS AND RESULTS

The primary purpose of this study was to investigate determinants of, and barriers to the achievement of follow-up care after an emergency department visit for children with asthma. Secondary purposes were to identify predisposing, enabling and need-related variables associated with use of the ED by children with asthma; and to test a leading model of health services use for predictive ability. Subjects were identified by staff of the select ED and enrolled between August, 2002 and December, 2003. Data were collected from subject medical records and parent questionnaires. Follow-up data were collected from the usual source of care identified at the baseline visit.

This chapter will first present descriptive statistics, including means, standard deviations and frequency data for each variable. The hypotheses were addressed using logistic regression analysis. This statistical method is useful to identify if determinants affect the probability of a particular outcome (Munro, 1997). In logistic regression, independent variables may be at any level of measurement and the outcome variable is categorical, in this case dichotomous. Step-wise logistic regression procedures were used to identify the optimal model. An additional advantage to logistic regression is that results include odds ratios that can add to data interpretation (Yarandi & Simpson, 1991).

Sample Characteristics

Over 75 potential subjects were screened for inclusion in the study. Sixty-four subjects met the inclusion criteria and were willing to participate. One older child refused assent to participate although his parent gave consent. This subject was excluded from

data analysis. A total of 63 subjects completed the protocol. Of these 16 were female and 47 were male. The average age of the children was 5.7 ± 3.8 years. However, there was a bimodal distribution with nine subjects each in the one year and five years categories. Furthermore, 55% ($n = 35$) of the subjects were five years of age and younger. The mothers' age ranged from 18 to 48 years, the average age of the mothers was 30 years.

Most of the questionnaire items were forced choice items in which parents were asked to choose from a numbered list of options. Other items required simple yes or no responses. Two questions asked parents to judge their child's asthma severity, respectively, on the day of the visit, and over the previous year.

Parents were asked to identify their ethnic or racial background from a choice of: Caucasian, Hispanic, African American, Native American, Asian or Pacific Islander, or other. The sample was ethnically diverse with 15.9% Caucasian, 30.2% Hispanic, 47.6% African American, 3.3% Asian or Pacific Islander and 3.3% other. This reflects the urban location of this ED and clientele.

The family income levels of the respondents ranged from less than \$10,000 to more than \$100,000 per annum. Overall, the sample was low income, 57% ($n = 36$) reported a family income less than \$20,000 per year. Of this lowest income group 28 respondents reported a family income of less than \$15,000 per year. There was an average of 4.7 ± 1.5 persons in the household, with a range from two to ten persons per household. The majority of the subjects (54%, $n = 34$) lived in a house where the mother is the only parent. Forty five percent of the subjects ($n = 27$) lived with both parents. Two respondents did not answer the questions regarding income or the education level of mother. Demographic characteristics of the sample are presented in Table 4.1

Table 4-1 Frequency and percent* of demographic data for the total sample and subjects who did, and did not achieve follow-up

	Total sample (N=63)	Achieved follow-up	Failed to achieve follow-up
	N (%)	N (%)	N (%)
Gender of child			
Male	47 (74.6)	15 (23.8)	32 (50.8)
Female	16 (25.4)	6 (9.5)	10 (15.9)
Race			
Caucasian	10 (15.9)	3 (4.8)	7 (11.1)
Hispanic	19 (30.2)	7 (11.1)	12 (19.0)
African American	30 (47.6)	9 (14.3)	21 (33.3)
Native American	0 (0)	0 (0)	0 (0)
Asian or Pacific Islander	2 (3.2)	1 (1.6)	1 (1.6)
Other	2 (3.2)	1 (1.6)	1 (1.6)
Income			
Did not answer	4 (6.3)	2 (3.2)	2 (3.2)
Less than \$10,000 (10K)	19 (30.2)	4 (6.3)	15 (23.8)
10-14.9K	9 (14.3)	2 (3.2)	7 (11.1)
15-19.9K	8 (12.7)	4 (6.3)	4 (6.3)
20-24.9K	6 (9.5)	3 (4.8)	3 (4.8)
25-29.9K	3 (4.8)	0 (0)	3 (4.8)
30-34.9K	3 (4.8)	2 (3.2)	1 (1.6)
35-39.9K	4 (6.3)	1 (1.6)	3 (4.8)
40-49.9K	0 (0)	0 (0)	0 (0)
50-79.9K	4 (6.3)	1 (1.6)	3 (4.8)
80-99.9K	2 (3.2)	1 (1.6)	1 (1.6)
100K or more	1 (1.6)	1 (1.6)	0 (0)
Child lives with			
Both parents	27 (42.8)	11 (17.5)	16 (25.4)
Mother alone	34 (54)	10 (15.9)	24 (38.1)
Father alone	1 (1.6)	0 (0)	1 (1.6)
Other than parents	1 (1.6)	0 (0)	1 (1.6)
Mother's education			
Did not answer	2 (3.2)	1 (1.6)	1 (1.6)
Less than high school	19 (30.2)	2 (3.2)	17 (27)
High school diploma	16 (25.4)	9 (14.3)	7 (11.1)
Some college	16 (25.4)	6 (9.5)	10 (15.9)
College graduate	3 (4.8)	0 (0)	3 (4.8)
Graduate school	7 (11.1)	3 (4.8)	4 (6.3)

*Total values may not equal 100% due to rounding

Predisposing, Enabling and Need Based Characteristics.

According to the Behavioral Model of Health Services Utilization, decisions to seek health care are based on predisposing, enabling and need based characteristics of consumers of care (Andersen, 1995). In addition to the demographic characteristics reported above, predisposing characteristics examined for this study were: gender of the child, race, and mother's education. Enabling characteristics were: income, health insurance, type of health insurance, presence of a usual source of care, co-payments for ED visit and usual source of care, travel time to usual source of care and wait time at usual source of care. Need based characteristics were parent and provider evaluation of asthma severity at the baseline visit and for the preceding 12 months. Table 4.2 and 4.3 compare the total sample, the follow-up, and no follow-up groups on predisposing and enabling characteristics respectively.

Table 4-2 Frequency and percent* of predisposing variables for the total sample, and subjects who did, and did not achieve follow-up.

	Total sample (N=63)	Achieved follow-up	Failed to achieve follow-up
	N (%)	N (%)	N (%)
Gender of child			
Male	47 (74.6)	15 (23.8)	32 (50.8)
Female	16 (25.4)	6 (9.5)	10 (15.9)
Race			
Caucasian	10 (15.9)	3 (4.8)	7 (11.1)
Hispanic	19 (30.2)	7 (11.1)	12 (19.0)
African American	30 (47.6)	9 (14.3)	21 (33.3)
Native American	0 (0)	0 (0)	0 (0)
Asian or Pacific Islander	2 (3.2)	1 (1.6)	1 (1.6)
Other	2 (3.2)	1 (1.6)	1 (1.6)
Mother's education			
Did not answer	2 (3.2)	1 (1.6)	1 (1.6)
Less than high school	19 (30.2)	2 (3.2)	17 (27)
High school diploma	16 (25.4)	9 (14.3)	7 (11.1)
Some college	16 (25.4)	6 (9.5)	10 (15.9)
College graduate	3 (4.8)	0 (0)	3 (4.8)
Graduate school	7 (11.1)	3 (4.8)	4 (6.3)

*Total values may not equal 100% due to rounding

Table 4-3 Frequency and percent* of enabling variables for the total sample, and subjects who did, and did not achieve follow-up.

	Total sample (N=63)	Achieved follow-up	Failed to achieve follow-up
	N (%)	N (%)	N (%)
Income			
Did not answer	4 (6.3)	2 (3.2)	2 (3.2)
Less than \$10,000 (10K)	19 (30.2)	4 (6.3)	15 (23.8)
10-14.9K	9 (14.3)	2 (3.2)	7 (11.1)
15-19.9K	8 (12.7)	4 (6.3)	4 (6.3)
20-24.9K	6 (9.5)	3 (4.8)	3 (4.8)
25-29.9K	3 (4.8)	0 (0)	3 (4.8)
30-34.9K	3 (4.8)	2 (3.2)	1 (1.6)
35-39.9K	4 (6.3)	1 (1.6)	3 (4.8)
40-49.9K	0 (0)	0 (0)	0 (0)
50-79.9K	4 (6.3)	1 (1.6)	3 (4.8)
80-99.9K	2 (3.2)	1 (1.6)	1 (1.6)
100K or more	1 (1.6)	1 (1.6)	0 (0)
Health Insurance			
Yes	61 (96.8)	21 (33.3)	40 (63.5)
No	2 (3.2)	0 (0)	2 (3.2)
Type of Insurance			
N/A or did not answer	1 (1.6)	0 (0)	1 (1.6)
Medicaid	40 (63.5)	11 (17.5)	29 (46.0)
Private	22 (34.9)	10 (15.9)	12 (19.0)
Co-pay for ED visit			
Did not answer	2 (3.2)	0 (0)	2 (3.2)
Yes	23 (36.5)	10 (15.9)	13 (20.6)
No	38 (60.3)	11 (17.5)	27 (42.8)
Usual Source of Care			
Yes	61 (96.8)	21 (33.3)	40 (63.5)
No	2 (3.2)	0 (0)	2 (3.2)
Co-pay at USOC			
N/A or did not answer	3 (4.8)	0 (0)	3 (4.8)
Yes	27 (42.8)	9 (14.3)	18 (28.6)
No	33 (52.4)	12 (19.0)	21 (33.3)
Travel time at USOC			
N/A or did not answer	1 (1.6)	0 (0)	1 (1.6)
Less than 30 minutes	50 (79.4)	17 (27.0)	33 (52.4)
Greater than 30 minutes	12 (19.0)	4 (6.3)	8 (12.7)
Wait time at USOC			
N/A or did not answer	4 (6.3)	0 (0)	4 (6.3)
Less than one hour	41 (65.1)	13 (20.6)	28 (44.4)
Greater than one hour	18 (28.6)	8 (12.7)	10 (15.9)

*Total values may not equal 100% due to rounding

The parent survey attempted to capture information that had been shown in the past to be useful determinants of health care utilization (Andersen, 1995). Specifically, questions that attempted to identify the number of days the child had asthma symptoms, the number of days the child's activity was affected by the asthma were asked in the survey. The items were worded in a similar manner to the 1994-1995 National Health Interview Survey (Newacheck & Halfon, 2000). However, for the current study, these items proved to be problematic. Only 52 of 63 respondents appropriately answered the questions regarding symptom and activity affected days. The remaining respondents left the item blank or wrote in descriptive sentences such as "most of the time" or "not that often." Of the respondents who replied appropriately, the average number of symptom days experienced in the previous year was 48. The average number of activity affected days was 33. Two respondents indicated that their children experienced symptoms every day with the symptoms affecting activity every day. Given the wide range of responses on this item the variables were dropped from the analytical results section. This finding may underscore a validity concern with symptom and activity affected day estimates from the national surveys.

Sixty respondents (95%) indicated they or their children had used the ED in the past for care. While this is of clinical interest and concern, this variable was deleted from the model for analysis. Since, in this sample, previous ED use was nearly universal the variable could not be expected to be a determinant of follow-up.

Perceived health status was determined by having the parent respondents indicate whether their child's asthma was severe, moderate or mild on the day of presentation to the ED, and over the preceding 12 months. The majority of parents rated their child's

asthma on the day of the visit as either severe (42%, n=26) or moderate (52%, n = 33).

Similarly, the majority of parents rated their child's asthma over the past year to be either severe (35%, n = 22) or moderate (42.8%).

Provider-evaluated severity for the current visit was determined to be severe in 14 cases (22.2%) and moderate in 41 cases (65.1%). For previous ED visits in the past 12 months, provider-evaluated severity was severe (14.3%, n = 9) and moderate (28.6%, n= 18). More than half (55.6%, n = 35) of the sample had not been seen in this ED over the previous 12 months. A summary of the need-related variables is listed in Table 4.4.

Table 4-4 Frequency and percent* of need-related variables for the total sample, and subjects who did, and did not achieve follow up.

	Total sample (N=63)	Achieved follow-up	Failed to achieve follow-up
	N (%)	N (%)	N (%)
Parent perceived asthma severity, for this visit			
Did not answer	1 (1.6)	0 (0)	1 (1.6)
Mild	3 (4.8)	1 (1.6)	2 (3.2)
Moderate	33 (52.4)	13 (20.6)	20 (31.7)
Severe	26 (41.3)	7 (11.1)	19 (30.2)
Parent perceived asthma severity, past 12 months			
Did not answer	1 (1.6)	0 (0)	1 (1.6)
Mild	13 (20.6)	2 (3.2)	11 (17.5)
Moderate	27 (42.8)	11 (17.5)	16 (25.4)
Severe	22 (34.9)	8 (12.7)	14 (22.2)
Provider-evaluated asthma severity, for this visit			
Mild	8 (12.7)	5 (7.9)	3 (4.8)
Moderate	41 (65.1)	11 (17.5)	30 (47.6)
Severe	14 (22.2)	5 (7.9)	9 (14.3)
Provider-evaluated asthma severity, past 12 months			
Mild	1 (1.6)	0 (0)	1 (1.6)
Moderate	18 (28.6)	6 (9.5)	12 (19.0)
Severe	9 (14.3)	4 (6.3)	5 (7.9)
Not applicable (no visit past year)	35 (55.6)	11 (17.5)	24 (38.1)

*Total values may not equal 100% due to rounding

Health beliefs are considered to be an integral part of Andersen model. Health behaviors are a translation of health beliefs. They are described separate from other predisposing variables as they would be considered mutable and disease specific. A summary of measured health behaviors is listed in Table 4-5.

Table 4-5 Frequency and percent* of health behaviors for the total sample, and subjects who did, and did not achieve follow up.

	Total sample (N=63)	Achieved follow-up	Failed to achieve follow-up
	N (%)	N (%)	N (%)
Smoker in the home			
Did not answer	1 (1.6)	0 (0)	1 (1.6)
Yes	16 (25.4)	3 (4.8)	13 (20.6)
No	46 (73.0)	18 (28.6)	28 (44.4)
Pet in the home			
Did not answer	1 (1.6)	1 (1.6)	0 (0)
Yes	12 (19.0)	3 (4.8)	9 (14.3)
No	50 (79.4)	17 (27.0)	33 (52.4)
Previous ED Use			
Yes	60 (95.2)	20 (31.7)	40 (63.5)
No	3 (4.8)	1 (1.6)	2 (3.2)

*Total values may not equal 100% due to rounding

Follow-Up Results

Overall, the follow-up rate was quite low. Of the 63 subjects enrolled in the study, 66.7% (n = 42) did not achieve follow-up as directed by the ED provider. These results will be discussed in chapter 5.

Analytical Results for Hypotheses

Continuous Variables

- Age of child
- Number of persons in household
- Age of mother

Categorical Variables

- Ethnicity (1= White, 2 = Hispanic, 3 = African American, 4 = American Indian, Aleut or Eskimo, 5 = Asian or Pacific Islander, 6 = Other)
- Annual family income (11 categories of income)
- Family structure (1= two parents and children, 2 = mother alone and children, 3 =father alone and children, 4 = other)
- Level of education achieved by mother (1 = did not complete high school, 2 = high school graduate, 3 = some college, 4 = college graduate, 5 = graduate school)
- Parent-evaluated severity this asthma visit (1 = mild, 2 = moderate, 3 = severe)
- Parent-evaluated severity preceding 12 months (1 = mild, 2 = moderate, 3 = severe)
- Provider-evaluated severity this asthma visit (1 = mild, 2 = moderate, 3 = severe)
- Provider-evaluated severity previous ED visits in the preceding 12 months (0 = not applicable, 1 = mild, 2 = moderate, 3 = severe)

Dichotomous Variables

- Gender of child (0 = male, 1 = female)
- Health insurance (1 = yes, 0 = no)
- Medicaid (1 = yes, 0 = no)
- Co-payment for ED visit (1 = yes, 0 = no)
- Co-payment for outpatient visits (1 = yes, 0 = no)
- Usual source of care (1 = yes, 0 = no)
- Travel time to USOC greater than 30 minutes (1 = yes, 0 = no)
- Wait time at USOC greater than one hour (1 = yes, 0 = no)
- Someone who smokes cigarettes in or outside the home (1 = yes, 0 = no)
- Fur or feather bearing pet in the home (1 = yes, 0 = no)
- Previous ED use for parent or child (1 = yes, 0 = no)

When each variable was evaluated individually, there was a significant association between mother's level of education and the likelihood of follow up (Fisher's Exact Test, $p = 0.0282$). Of the 61 mothers who answered the question about education, 41 (67%) did not achieve follow up. However, the lower educated mothers were overrepresented in the no follow-up group. Thirty percent ($n = 19$) of the mothers did not complete high school, 17 of these 19 least educated mothers did not achieve follow-up for their child. This represents 90% of the mothers without high school diplomas and supports the hypothesis that families who do not achieve follow-up care differ from families who do.

When evaluating the combined effects of the variables the level of significance was set at 10%. Given that the goal was to distinguish between the follow-up and the no follow-up group, and to avoid missing usual determinants of follow-up, or lack thereof, this higher level of significance was chosen (H. N. Yarandi, personal communication, December, 5, 2003). The 10% level has been reported in previous studies using logistic regression (Yarandi & Simpson, 1991). The combined effects of travel time to usual source of care, wait time, smoker in the home, fur-bearing pet in the home, parent-evaluated severity, provider-evaluated severity and provider-evaluated severity for the previous year predict no follow-up at the 0.10 level of significance. The best fitting model relating the likelihood of not achieving follow-up to the variables is presented in Table 4-6.

For the final step, the regression coefficients were used to calculate odds ratio estimates. Knowing a person's score on each variable and the regression coefficients, one can use the constant term e (the base of the natural logarithm, 2.718) to determine the odds of belonging to a certain population, in this case the no follow-up group (Munro,

1997). The statistical software program SAS calculates odds ratio estimates automatically with the formula shown in Equation 4-1.

$$\mathbf{Odds} = e^b \quad (\text{Equation 4-1})$$

Where e is the base of the natural logarithm (2.718) and b is the regression coefficient.

Given that

$$\text{Probability} = \frac{\text{odds}}{1+\text{odds}}$$

It is possible to calculate the probability of no follow-up for those determinants that reach the 95% confidence interval. Age of mother and provider-evaluated severity were the only determinants that reached 95% confidence limits. Older mothers were more likely not to follow-up than younger mothers (OR 2.141). Therefore, older mothers had a 68% probability of failing to achieve follow-up. Similarly, more severe asthma (as evaluated by the provider) increased the odds of no follow-up (OR 12.445). Children with severe asthma, as evaluated by the ED provider, had a 92% chance of not achieving follow-up.

Table 4-6. Results of a stepwise logistic regression model to the data for the dependent variable follow-up

Determinant	Regression Coefficient	Standard Error	Chi Square	P-value
Race: Caucasian	3.1255	21.2553	0.0216	0.8831
Race: Hispanic	-2.7834	21.2209	0.0172	0.8956
Race: African American	6.5197	21.4192	0.0926	0.7608
Race: Asian	1.0396	21.7915	0.0023	0.9620
Age of child	-0.7942	0.7146	1.2351	0.2664
Income	-0.1564	0.0342	0.2643	0.6072
Lives with both parents	-10.8905	174.8	0.0039	0.9503
Lives with mother alone	-3.5097	174.9	0.0004	0.9840
Education of mother	0.5761	0.5681	1.0284	0.3105
Co-payment in ED	37.9814	47.6820	0.6345	0.4257
Co-payment at USOC	-36.4784	47.5306	0.5890	0.4428
Previous ED use	-19.1728	180.6	0.0113	0.9154
Age of mother	0.7612	0.5249	2.1031	0.1470
Travel time to USOC	-9.9862	5.3070	3.5409	0.0599
Wait time at USOC	4.5714	2.3643	3.7384	0.0532
Smoker in home	-15.9347	8.1660	3.8078	0.0510
Pet	-12.8192	6.5605	3.8182	0.0507
Parent estimated severity (baseline)	5.8659	3.1325	3.5066	0.0611
Provider-evaluated severity (baseline)	2.5214	1.4074	3.2093	0.0732
Provider-evaluated severity (previous year)	-2.1364	1.1887	3.2299	0.0723

CHAPTER 5 DISCUSSION AND RECOMMENDATIONS

This study has examined the determinants of ED utilization and follow-up. A leading model of health services use served as the framework for this study and will guide the discussion. This chapter will describe study strengths and limitations. The descriptive and analytical findings will be discussed. Clinical implications will be detailed. Recommendations for future research will be provided.

Strengths

The proactive design of the study and triangulation of data were study strengths. The problem was significant to nursing and other health care providers. The statistical design and theoretical framework were well suited to the study purpose and consistent with the literature. Minority subjects were well represented, as were those of lower socioeconomic status. Verification of follow-up by usual source of care enhanced study validity as follow-up rates by self report are often higher than verified follow-up (Zorc et al., 2003). The study succeeded in providing additional insight about children who utilize the emergency department for childhood asthma.

Study Challenges

The most significant limitations of this study were inadequate sample size, nonrandom sample and use of self-report measures. Sixty-three subjects are far fewer than the projected 200 subjects required to achieve adequate power and to prevent a Type II error. While subject enrollment is always a challenge, significant unforeseeable changes at the study site negatively impacted enrollment. In April 2003, the Health

Insurance Portability and Accountability Act (HIPAA) went into effect nationwide. This legislation has clear guidelines for the sharing of health information that negatively affected this researcher's ability to recruit research subjects. Confusion over implementation of the HIPAA guidelines and staff turnover contributed to low subject enrollment. Although the enrollment period lasted 15 months, only four subjects were recruited in the final seven months of data collection. In light of this dramatic decrease, the decision was made to stop enrolling subjects.

Other reasons for the enrollment shortfall were examined. There is a possibility that enrollment projections based on past ED census figures were falsely high. During the period analyzed (July 1999 to July 2000) forest fires were blanketing the region. Perhaps the fires resulted in an unusually high number of asthma presentations during that period. Furthermore, a competing study was underway in the ED during the same time period as the study of children with asthma. This may have resulted in less staff availability to identify and enroll subjects.

External validity of this study was threatened by the use of a convenience nonrandom sample. Although efforts were made to enroll subjects on all shifts, it is conceivable that the available subjects differed from those who visited the ED at times the researchers were not available. Most of the subjects approached were willing to be involved in the study. It is however possible that the patients who refused participation differed from those who consented.

Items from the parent questionnaire were self-report items derived from the MEPS and NHIS data bases. Previous studies of children with asthma have used secondary data from these surveys with significant findings (Lozano et al., 1999; Newacheck & Halfon,

2000). Additional methods of measuring asthma severity were derived from the work of Wasilewski and colleagues (1996). However, self-report is well recognized as a potential cause of deviation in data collection; and therefore, it remains likely that the items in the parent questionnaire did not reflect reality. It is not known to what extent self-report limits the validity of national survey data. In this study of ED follow-up determinants, parents had difficulty answering at least two of the items.

Sample Demographics

Almost 75% of the subjects were male. This percentage is approximately 10-15% higher than that of previous studies (Cabana et al., 2003; Kelly et al., 2000; Lara et al., 2003). There is evidence from national data that asthma is more prevalent in males (Newacheck & Halfon, 2000). A prospective study of children with a family history of asthma found a higher percentage of males developed asthma (Klennert et al., 2001). Despite this higher preponderance of males, gender of the child did not predict follow-up. Sixty eight percent of the males and sixty two percent of the females did not receive follow-up.

The mean age of the presenting children was 5.7 ± 3.84 years. However, this variable had a bimodal distribution, with nine subjects at one and five years of age respectively. Furthermore, 55% ($n = 35$) of the subjects were five years of age or younger. Previous research suggests that younger children are more likely to utilize the ED for childhood asthma (Kelly et al., 2000; Wasilewski et al., 1996). Studies reporting older mean ages usually had inclusion criteria restricting the youngest children, for example ability to perform a peak flow analysis (Davidson et al., 1994; Lara et al., 2003; Shields et al., 1990; Zorc et al., 2003). In the current study, age of the child was not a determinant of follow-up.

The sample was ethnically diverse. African American and Hispanic children comprised 48% and 30% of the sample respectively. These results are consistent with many previous studies that have found African Americans to be disproportionately affected by asthma (Lozano et al., 1999; Miller, 2000; Newacheck & Halfon, 2000). In the current study, ethnic identity was not found to be a predictor of follow-up. Although it is possible that a larger sample size may have altered the results, recent studies examining ED follow-up for childhood asthma have supported this finding (Cabana et al., 2003; Zorc et al., 2003) and refute commonly held assumptions that minorities are less likely to be adherent to recommendations.

Over half of the subjects lived with their mothers in single parent households. Fifty-seven percent reported a family income of less than 20,000 per year. National data have found asthma to be more prevalent in poor children and single parent households (Newacheck & Halfon, 2000). Previous research has found single parent households to utilize the ED more frequently for sick child care (Halfon et al., 1996). Poverty has been an independent predictor of asthma prevalence (Miller, 2000; Newacheck & Halfon, 2000) and ED utilization (Polivka et al., 2000).

Lack of insurance was not a concern for this sample, 97% of the subjects were insured. The majority of insured children in the sample were Medicaid recipients, a finding supported by many studies of childhood asthma (Davidson et al., 1994; Grossman et al., 1998; Halfon et al., 1996; Nash, Childs, & Kelleher, 1999). Previous research has found that Medicaid patients were less likely to access continuing and primary care and more likely to utilize the ED (Lozano, Fishman, Von Korff, & Hecht, 1997).

Ninety seven percent of the parents indicated that they had a usual source of care for their child. One study found that the lack of a usual source of care to be a determinant of ED use (Chande & Exum, 1994). However, recent studies support the finding that many children who use the ED have a usual source of care (Davidson et al., 1994; Lara et al., 2003; Zorc et al., 2003). The presence of usual source of care is a common measure of access in studies which employ the Andersen model (Phillips et al., 1998). Given the high percentage of subjects reporting a usual source of care in this study, it is not surprising that this variable was not a determinant of follow-up.

The presence of a co-payment at the usual source of care has been postulated to be a barrier to achieving follow-up (Arnold & Ku, 2000). In the current study, over half of the subjects did not have a co-payment at the usual source of care. While lack of a co-payment has been blamed for frequent ED use (Grossman et al., 1998), the presence or absence of a co-payment was not a determinant of follow-up.

Follow-Up

The follow-up rate was very low for this study. Sixty-six percent of the subjects did not follow-up within 30 days of the ED visit, a finding consistent with previous research (Chande & Exum, 1994; Leickly et al., 1998; Wasilewski et al., 1996). A recently published retrospective analysis of claims data for 561 pediatric ED asthma visits found that 66% of children did not follow-up within 30 days (Cabana et al., 2003). It was interesting to note that families did not follow-up despite the fact that they agreed to be in a study specifically interested in ED follow-up. There was some concern that the Hawthorne effect would result in falsely high follow up. It seems that this did not occur.

Hypotheses

1. Families who obtain follow-up care will differ in predisposing, enabling, and need characteristics from families who do not obtain follow-up care.
2. Families who fail to obtain follow-up care will differ in predisposing, enabling, and need characteristics from families who obtain follow up care.
3. Families who utilize the ED as a source of care for childhood asthma will exhibit common predisposing, enabling, and need characteristics.

The results of this study provide partial support for the first two hypotheses. There is a significant difference in terms of at least one research variable. Families who did not follow-up were significantly different ($p < 0.0282$) from those who did follow-up with respect to the mother's level of education. This variable has been found to predict ED utilization in previous studies of sick children (Aday, 1993; Halfon et al., 1996) as well as children with asthma (Kattan et al., 1997). This researcher has been unable to locate published studies which support or refute the finding that mother's level of education predicts follow-up. This finding has clinical significance and warrants further study.

None of the enabling or need based characteristics were significant determinants of follow-up. However, as previously discussed, these findings have a high risk for a type II error because of the low observed power. A larger sample might have produced additional significant determinants of follow-up.

The final hypothesis was that families who utilize the ED as a source of care for childhood asthma would exhibit common predisposing, enabling and need based characteristics. This hypothesis was supported. Subjects were remarkably similar in terms of socioeconomic status, insurance status, presence of a usual source of care, and previous ED use. The majority of the children lived with their mother alone and were Medicaid recipients. The majority of the mothers reported a high school education or

less, low travel and wait times at the usual source of care, and no smokers or pets in the home. Finally, the majority of the subjects did not follow-up as directed. A previous study, which utilized the Andersen model, found similar characteristics were associated with ED use for sick care (Halfon et al., 1996).

When the combined effects of the variables were considered at the ten percent level of significance, the following variables predicted no follow-up:

- Enabling variables
 - Travel time to usual source of care greater than 30 minutes ($p = 0.0599$)
 - Wait time at usual source of care greater than one hour. one hour ($p = 0.0532$)
- Health Behaviors/Practices
 - Presence of a smoker in or outside the home ($p = 0.0510$)
 - Presence of a fur or feather bearing pet in the home ($p = 0.0507$)
- Need-related variables
 - Parent-evaluated severity at baseline visit ($p = 0.0611$)
 - Provider-evaluated severity at baseline visit ($p = 0.0732$)
 - Provider-evaluated severity for the previous year ($p = 0.0723$)

Analysis of the 1997 National Medical Expenditure Survey found that minority, poor and uninsured children are more likely to travel more than 30 minutes and wait more than one hour for access to primary care (Newacheck et al., 1996). Although the majority of subjects in my study indicated that this was not the case, these variables contributed to the model predicting no follow-up.

Similarly, the majority of this sample did not have either a cigarette smoke user or a pet in the home (73% and 79% respectively). Nevertheless, these two variables contributed to the model of no follow-up. Certainly cigarette smoke exposure and pet dander have long been considered asthma triggers (National Institutes of Health, 1997). It is not possible to determine whether this finding is a reflection of nonadherence to medical advice or from some other cause.

In the final section of data, odds ratios and probabilities were reported. Older mothers were twice as likely not to achieve follow-up as younger mothers. No studies were found to support or refute this finding. There is an assumption among health care providers that young mothers are the least likely to comply with recommendations. A possible explanation for this finding is that older mothers believe they have more experience with asthma management (with this or another child) and do not require follow-up. This study did not ask parents if there were other children with asthma in the family, a question for future research. Another possible explanation is that older mothers have additional conflicting needs which predispose them to not achieve follow-up.

More than one-third of parents estimated their child's asthma to be severe on the day of the ED visit and over the previous 12 months. This contrasts with provider evaluations of severity. If, as Andersen contends, perceived need predicts care-seeking behavior, high perceived need may explain use of the ED rather than primary care for the study population. Previous studies suggest that perception of asthma severity drives the decision to seek ED care (Cabana et al., 2003; Wasilewski et al., 1996).

If ED utilization occurred based on the perception of acute need, lessening of that need might explain why follow-up care did not occur for the majority of participants. Previous studies suggest that parents may not follow-up because they believe their child's asthma to be improved (Leickly et al., 1998; Zorc et al., 2003) or because barriers to follow-up are high (Chande & Exum, 1994).

It is interesting to note that children judged by providers to have more severe asthma were 12 times more likely not to achieve follow-up. A possible explanation for this finding is that the children with more severe asthma represent those whose asthma is

most poorly controlled and who have received neither education about asthma, nor preventive medications. These children and families may be stuck in a cycle of exacerbation and remission that they do not understand and do not have the knowledge to break.

A hypothesis of the original behavioral model was that different factors would explain use depending on type of health service. More serious problems resulting in hospitalizations would be primarily driven by need and demographic variables, while more discretionary services would be explained by social structure, beliefs and enabling factors (Andersen et al., 2000). If this is the case, the high levels of asthma severity reported by parents may reflect high levels of perceived need, and explain the ED utilization. According to the model's original tenants, a lessening of need would change the forces driving decisions to seek care. For less acute care, such as follow-up care, enabling and health belief variables would play more important roles in health services use. Barriers to care (poor enabling factors) and the belief that follow-up was no longer needed (health beliefs) act to lessen the likelihood of follow-up.

Clinical Implications

It is clear from this study and review of the literature that post ED follow-up is not occurring at the desired level. Since the data indicate that current discharge instructions are not being followed, it is not sufficient to continue the current practice of merely recommending follow-up in writing. Additional steps to remove barriers to follow-up should be taken, for those at highest risk of failure to follow-up, and for those at highest risk for poor outcomes. At the very least, concentrating efforts to improve follow-up among children with severe asthma could improve clinical outcomes.

Parents of children with more severe asthma were less likely to follow-up. This finding demonstrates a lack of understanding of the chronic nature of asthma and represents a focus for intervention. Clinicians must anticipate that parents may believe follow-up is not needed if their children improve. The importance of follow-up, regardless of clinical improvement, must be underscored at discharge. Parents must understand that underlying airway inflammation is present for all children with asthma and that lack of symptoms does not mean that the asthma is gone.

Efforts to remove barriers to appointment scheduling are required. The act of scheduling the appointment has been shown to improve ED follow-up rates children with asthma (Zorc et al., 2003). However it should be noted that three-fourths of the visits could not be scheduled on the first attempt. The strategy of scheduling appointments, although labor intensive, could be employed for the highest risk patients. Given the cost of ED care as compared to primary care visits, and the opportunity for improved clinical outcomes, the time and money spent may be worthwhile. If adherence is conceptualized as partnership between the parent and provider, ED providers must work to facilitate parent's understanding of asthma, underscore benefit of ongoing treatment and decrease barriers to follow-up (Leickly et al., 1998).

Given that health beliefs and behaviors are difficult to modify, additional strategies would be to focus on improving coordination of care and education of primary care providers (Wasilewski et al., 1996). Many researchers have called for improved linkages between ED providers and primary care (Cabana et al., 2003; Lara et al., 2003; Zorc et al., 2003). Primary care providers must be targeted to receive additional education

regarding the use of preventive medication in asthma control. In some cases, it may be necessary to initiate preventive medications in the ED (Zorc et al., 2003).

Nurses play an integral role in developing clinical strategies to improve follow-up. The discipline of nursing focuses on caring for children and families in the context of the healthcare system. This care must occur beyond the acute illness. Nursing must continue to lead the health care team in efforts to identify ways to improve asthma outcomes for this vulnerable population of ED utilizers.

Recommendations for Future Research

Replication of this study with a larger sample and more than one research site could help explicate further determinants of follow-up. Further exploration of the effects of patient education and case management in order to remove barriers to follow-up could be undertaken. Methods to improve coordination of care between the ED and primary care could be explored.

Another focus for future research is the quality and content of asthma follow-up. Recent discussion in the literature has suggested that provider nonadherence to NIH guidelines may be a concern (Cabana et al., 2003; Lara et al., 2003; Zorc et al., 2003). Follow-up will not improve outcomes if preventive medications are not instituted, and if education is not provided to patients.

Simple regression methods have been most often used in research based on the Andersen model (Phillips et al., 1998). When the goal is explanation rather than prediction, hierarchical linear regression analysis models are needed to analyze multilevel data. These methods require specialized software and expertise beyond the abilities of this researcher. Studies utilizing advanced statistical models could be explored in order to better explicate the dynamic relationship between patient and provider.

Conclusion

For children with asthma, lack of ED follow-up may reflect a combination of healthcare system, provider and patient related factors (Zorc et al., 2003). The Andersen Behavioral Model of Health Services Utilization has served as the theoretical framework for this study examining the determinants of ED utilization and follow-up for children with asthma. The model is well suited to the research of this clinical problem. This initial study holds promise that determinants of follow-up can be explicated. The results have clinical implications for nursing as well as other health care providers. Replication of this study, with a larger sample, would likely reveal additional determinants of follow-up. However, in future research, variations related to demographic, socioeconomic and clinical factors need to be explored. Finally, interventions that improve the incidence, quality, and outcome of follow-up care warrant further study.

APPENDIX A
PARENT QUESTIONNAIRE

Dear Parent:

You have been asked to complete this questionnaire as part of a study about childhood asthma. It is important that you answer all questions truthfully. Please close and seal the envelope after you have finished the questionnaire. Please print your name on the envelope so that we may match your answers with your child's medical records. None of the staff of the hospital or emergency department will be aware of your answers. Only Lynn Smith, ARNP, the main researcher will know how you answered these questions.

For questions 1-16, place a mark in the box that best answers the question. Pick only one answer.

1. What is your ethnic or racial background?
 - White
 - Hispanic
 - Black
 - American Indian, Aleut, or Eskimo
 - Asian or Pacific Islander
 - Other

2. Which category represents the total combined income of all members of this family during the past 12 months? This includes money from jobs, net income from business, farm or rent, pensions, dividends, interest, social security payments and any other money income received (by members of this family who are 15 years of age or older.)
 - Less than \$10,000 35,000 to 39,999
 - 10,000 to 14,999 40,000 to 49,999
 - 15,000 to 19,999 50,000 to 79,999
 - 20,000 to 24,999 \$80,000 to 99,999
 - 25,000 to 29,999 \$100,000 or more
 - 30,000 to 34,999

3. Who does this child live with most of the time?
 - Mother and father
 - Mother alone
 - Father alone
 - Someone other than mother and father, and children

4. What is the education level of the child's mother?
 - She did not complete high school
 - She has a high school diploma
 - She has attended some college
 - She has a college degree
 - She had a Bachelor's degree or higher

5. Do you have health insurance for this child? If no please skip to question 8.
 - Yes
 - No

6. If you have health insurance, is it Medicaid?
 - Yes
 - No

7. Is there a co-payment for emergency department visits?
 - Yes
 - No

8. Is there a doctor's office, clinic, health center or other place that you usually go to if your child is sick or you need advice about his/her health? This will be called a usual source of care for the rest of the survey.
 - Yes
 - No

9. If yes, is there a co-payment for a visit at this usual source of care?
 - Yes
 - No

10. Is the travel time to the usual source of care more than 30 minutes?
 - Yes
 - No

11. If you are on time for the appointment, is the wait time at the usual source of care usually greater than one hour?
 - Yes
 - No

12. Does anyone who lives in the home smoke (either in the home or outside)?
 - Yes
 - No

13. Do you have a pet with fur or feathers in your home (for example a dog, cat, or bird)?

- Yes
- No

14. Have you or your child used the emergency department for asthma care before?

- Yes
- No

15. In your opinion, how serious was the asthma attack that made you seek care for your child today?

- Mild
- Moderate
- Severe

16. In your opinion how serious have your child's asthma attacks been in the past year?

- Mild
- Moderate
- Severe

For the following questions please write in the answers.

17. How many days has your child had symptoms in the past 12 months? _____

18. How many days was your child unable to carry out normal activities (such as attending school or playing sports) because of asthma? _____

19. How old is the mother of this child? _____

20. How many people live in your household? _____

21. Please write in the name of the place where you usually take your child for regular asthma care.

APPENDIX B
PARENT CONSENT

Childhood Asthma: Emergency Department Follow-Up Determinants

Good medical care includes obtaining informed consent before beginning any experimental procedure. The patient or subject should be told the nature, purpose, alternative and possible side effects of the therapy. This experimental research study is being conducted by Lynn Smith, MSN, ARNP, the University of Florida and Orlando Regional Healthcare System

1. PURPOSE OF RESEARCH STUDY: The purpose of this study is to learn the characteristics of families who use the emergency department and the differences between families who obtain or do not obtain recommended follow-up services for the treatment of asthma.

Although it is your child who has asthma, we are asking you to answer the study questions. Since you make the decisions for your child and you manage the asthma we are interested in your opinions.

2. EXPECTED DURATION: You can expect to be part of this research study for about 30 minutes. One month later we may contact you by telephone for a final interview. This interview will take less than 10 minutes.

3. PROCEDURES TO BE FOLLOWED: You will be asked to read this form carefully. If you agree to participate you will fill out a short form asking questions about your family and your child's usual source of care (the place you take your child for regular care or asthma care). Some of the information is about your child's asthma and about where you usually take your child for care when the asthma gets worse. Some of the questions may seem unusual to you but they are important. After you have finished reading this form you will sign a form agreeing that we can contact your usual medical provider in one month. We will ask them how your child's asthma has been in the month since you were in the emergency department. We will also ask them if your child has had any visits to that office or to the emergency department during that month. We may call you and ask you the same questions. We will also look at your child's emergency department medical record. You do not have to do anything else and participating will not increase the amount of time you are in the emergency department today. After one month you will have no further responsibility.

4. IDENTIFICATION OF EXPERIMENTAL PROCEDURES: The form that you complete is the experimental part of the procedure.

5. POTENTIAL RISKS AND DISCOMFORTS: Some of the questions might be uncomfortable to answer. There are no other risks to you or your child for participating in this study.

6. POTENTIAL BENEFIT TO SUBJECT OR OTHERS: There will be no direct benefit to you for participating in this study. If you do not have a usual place to go for your child's asthma care, we will give you some information and assist you in making an appointment for care. However, you or your insurance company will still need to pay for this or other care. You do not have to change your usual source of care. It is hoped that by learning more about childhood asthma we may be able to improve asthma care for all children.

7. ALTERNATIVE PROCEDURES OR TREATMENTS: The alternative to taking part in this study is doing nothing. If you do not want to take part in this study, tell the Principal Investigator or his/her assistant and do not sign this Informed Consent Form.

8. CONFIDENTIALITY OF RECORDS: Authorized persons from the University of Florida, Orlando Regional Medical Center, and the Institutional Review Board have the legal right to review your research records and will protect the confidentiality of them to the extent permitted by law. Otherwise, your research records will not be released without your consent unless required by law or a court order.

If the results of this research are published or presented at scientific meetings, you and your child's identity will not be disclosed. Your child's research records will be coded without his or her name. Only the principal investigator will have the key to that code and will know your child's name. These records will be kept in a locked and secured area at the University of Florida.

9. COMPENSATION: There is no compensation or payment for your participation in this study.

10. RESEARCH RELATED INJURY: No injury is expected as a result of participating in this study. In the event that injury occurs as a result of this research, treatment will be available. However, you will not be reimbursed by Orlando Regional Healthcare System Inc., the University of Florida, or the investigator for these costs. Hospital expenses will have to be paid by you or your insurance provider. No other compensation is offered.

11. VOLUNTARY PARTICIPATION: You are free to refuse or stop participation in this research study at any time without penalty or loss of benefits to which you are otherwise entitled. You are free to seek care from a physician of your choice at any time. If you do not take part in or withdraw from the study, your child may continue to receive care for which you will be financially responsible.

12. **ADDITIONAL RISKS:** None

13. **INVOLUNTARY TERMINATION:** You may be withdrawn from the study without your consent for the following reasons: You do not qualify to be in the study because you do not meet the study requirements.

14. **PROCEDURES FOR WITHDRAWAL:**

You are free to withdraw your consent and to stop participating in this research study at any time. If you do withdraw your consent, there will be no penalty, and you will not lose any benefits you are entitled to.

If you decide to withdraw your consent to participate in this research study for any reason, you should contact Lynn Smith, ARNP at (407) 823-4941.

If you have any questions regarding your rights as a research subject, you may phone Allisun Feazell at (321) 841-5895.

15. **NEW FINDINGS:** None

16. **NUMBER OF PARTICIPANTS:** The approximate number of patients involved in the study at this site will be 200.

17. **ADDITIONAL COST:** There is no cost to you for participating in this study.

18. **FINANCIAL DISCLOSURE:** This research study is not funded by any sponsor.

Childhood Asthma: Emergency Department Follow-Up Determinants

19. SIGNATURES: My signature indicates that I consent and authorize _____ and whomever he (she) may designate as his (her) assistant(s) including Orlando Regional Healthcare System, Inc., its employees and its agents to perform upon _____ (name of patient or "myself") the research described above. If any unforeseen conditions arise in the course of the research calling in the Doctor's judgment for procedures in addition to or different from those planned, I (we) further request and authorize the Doctor to do whatever he (she) deems advisable.

I AM MAKING A DECISION WHETHER OR NOT TO PARTICIPATE (OR HAVE MY CHILD PARTICIPATE) IN THIS STUDY. I HAVE READ, OR HAD READ TO ME IN A LANGUAGE THAT I UNDERSTAND, ALL OF THE ABOVE, ASKED QUESTIONS, RECEIVED ANSWERS CONCERNING AREAS I DID NOT UNDERSTAND, AND WILLINGLY GIVE MY CONSENT TO PARTICIPATE IN THIS STUDY. UPON SIGNING THIS FORM I WILL BE GIVEN A COPY.

Signature of Subject, Parent or Legal Representative _____
Date

Signature of Witness _____
Date

I have explained and defined in detail the research procedure in which the patient has consented to participate.

Investigator's Signature _____
Date

Translator/Interpreter

Name _____

Phone# _____

Address _____

APPENDIX C
ASSENT FOR CHILDREN AGE 7-17 YEARS

Childhood Asthma: Emergency Department Follow-Up Determinants

ASSENT FOR CHILDREN AGE 7 to 17 YEARS

We are asking you to take part in a research study. We are trying to learn more about children with asthma.

If you agree to be in this study, you do not have to do anything. Your parent will be asked to answer some questions about your family and your asthma. We will also want to look at your chart.

There are no risks to you for being in this study. Please talk to your parents about this study before you decide if you want to participate. We will also ask your parents if it is all right with them for you to take part in this study. If your parents say that you can be in the study, you can still decide not to participate.

You can ask any questions that you have about this study and we will try to answer them for you. If you have questions that you think of later, you can call Lynn Smith at 407-823-4941.

Taking part in this study is up to you. No one will be upset if you don't want to participate. If you decide to participate, you can also change your mind and stop any time you want.

I agree _____, I do not agree _____ to participate in the above-outlined study, which I have read or has been explained to me by _____
_____.

Signature of Child Date

Signature of Witness Date

Signature of Principal Investigator Date

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BIOGRAPHICAL SKETCH

Lynn Smith began her nursing career in Toronto, Canada. After graduating from Ryerson Polytechnical Institute, School of Nursing in Toronto, Canada she worked in pediatric critical care at the Hospital for Sick Children from 1983 until 1990. She then accepted a position at King Fahad Hospital in Riyadh, Saudi Arabia. After the 1991 Gulf War 1991 she moved to Florida. In 1993, she accepted a position in the pediatric pulmonology division at the Arnold Palmer Hospital for Children and Women in Orlando, Florida. Her role combined clinical and research responsibilities. In 1997, she received a Bachelor of Science in Nursing from the University of Central Florida in Orlando, Florida. She immediately enrolled in the graduate program at the University of Florida, in Gainesville, Florida, achieving a Master of Science in Nursing in 1998. Upon graduating, she began clinical practice as a Pediatric Nurse Practitioner. She began doctoral studies at the University of Florida in August 1999. After three years of full-time private practice, she accepted a newly minted position as coordinator of the Pediatric Nurse Practitioner Program at the University of Central Florida, School of Nursing.

Her research and clinical interests are childhood asthma, emergency department utilization, and disaster preparedness and response. She serves on a federal disaster medical assistance team (DMAT) with the National Disaster Medical System, now a division of the Department of Homeland Security. She has been deployed to a number of disaster-affected communities, including the World Trade Center after September 11, 2001. She is the president of the Florida Chapter of the National Association of Pediatric

Nurse Practitioners and immediate past president of the Central Florida Chapter of the American Lung Association.

Lynn received a small chapter grant from Sigma Theta Tau (Theta Epsilon Chapter) for support of her dissertation. She has presented posters at local and regional research conferences. Lynn graduated in May, 2004, with a Ph.D. in nursing. She plans to continue to work in academia with an emphasis on teaching and research.