

A RETROSPECTIVE STUDY OF THE IMPACT OF THE PEDIATRIC PATIENT-
CENTERED MEDICAL HOME MODEL ON HEALTH CARE UTILIZATION AND
REIMBURSEMENT

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This is dedicated to my daughter, Loretta Greer – Hasan, and my sister, Celestine Lee, for all their assistance, time and consideration all through this research. I am also dedicating this to my late granddaughter, Danielle Irene Hasan, who was always excited and eager to learn new things. Prior to completion of this dissertation, she passed on to new spiritual journeys.



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ABSTRACT

A RETROSPECTIVE STUDY OF THE IMPACT OF THE PEDIATRIC PATIENT-CENTERED MEDICAL HOME MODEL ON HEALTH CARE UTILIZATION AND REIMBURSEMENT

By Ernestine Greer

The pediatric patient-centered medical home (PCMH) model focuses on preventative, coordinated, family-centered care and increasing access by providing same-day appointments and expanding evening and weekend hours for sick children. This study investigated how participation in a PCMH impacted inpatient admissions, emergency department (ED) visits, urgent care (UC) visits as well as ED, UC, and pharmacy reimbursement. The medical practices studied were participants in the Children's Healthcare Access Program (CHAP) program, designed to increase primary care access for children on Medicaid by connecting the community's children to a PCMH to improve their health and decrease hospitalization rates and ED utilization.

The study involved a retrospective, quasi-experimental, longitudinal study of a group before and after PCMH model implementation. The research study included five pediatric practices in Kent County, Michigan. The study examined a sample of 2,962 children on Medicaid continuously enrolled in each practice and ages 0-15 years. The research study evaluated comparisons for the entire sample and disease-specific children with International Classification of Disease-9 (ICD-9) codes for diabetes, otitis media, and asthma. The study assessed claims data for the five practices participating in CHAP and compared data for January through June 2008 (pre-PCMH) and 2010 (post-PCMH).

Results indicated that implementation of a PCMH model, including chronic disease care coordination and management, decreased health care utilization and costs. Statistically significant relationships between PCMH interventions and ED visits and ED reimbursement emerged for the entire sample and children with otitis media after intervention. Specifically, improved access to care and implementation of interventions common to a PCMH practice model reduced emergency department visits and emergency department reimbursement. The results indicated no correlation between pre- and post-intervention inpatient admissions and UC visits. No correlation was found for inpatient admissions, UC, and pharmacy reimbursement. The study indicated other utilization improvements near the .007 significance level. One of the five practices implemented both office flow redesign and increased visit length. The findings for that practice demonstrated favorable improvements in ED visits and costs.

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LIST OF ACRONYMS AND ABBREVIATIONS

The following acronyms and abbreviations will be used throughout this document:

AAP	American Academy of Pediatrics
ACSC	Ambulatory Care-Sensitive Conditions, conditions for which good access to primary care reduced the need for hospital admissions.
ACP	American College of Physicians
AAFP	American Academy of Family Physicians
AOA	American Osteopathic Association
AHS	Avoidable Hospital Conditions, hospitalizations that would be avoided with timely appropriate outpatient care.
PCPCC	Patient-Centered Primary Care Collaborative
CHAP	The Children’s Health Care Access Program a demonstration project composed of a community collaboration that included Priority Health, medical clinics, pediatric practices, local hospital, human health service agencies and foundations.
EHR	Electronic Health Record, patient health information consisting of patient demographics, medical history, medications, vital signs, clinical notes, laboratory results, radiology reports, diagnostic reports, immunizations, and activities during a clinical patient encounter.
EMR	Electronic Medical Record, patient health information consisting of patient demographics, medical history, medications, vital signs, clinical notes, laboratory results, radiology reports, diagnostic reports, immunizations, and activities during a clinical patient encounter.
E - Prescribing	Electronic transmission of accurate, error free prescription directly to the pharmacy.
ED Visit	An emergency department visit (count of visits during a specific period)
FQHC	Federally Qualified Health Center
MM	A member month was a month during which a member or group of members had medical coverage on the fifteenth day of the month.
NCQA	National Committee for Quality Assurance
PCAT	Primary Care Assessment Tool, the tool measured “medical homeness” and included parallel survey instruments for patients, physicians, and staff. The tool compared reported PCMH areas of strengths and weaknesses and areas of difference.
PED	Pediatric Emergency Department
PGIP	Physician Group Incentive Program, PCMH certification to provide rewards to physicians who complete the transformation process.

DEFINITION OF TERMS

The following terminology will be throughout this document:

Accessibility	Availability of care through systems such as open scheduling expanded hours and new options for communication between patients, their personal physician, and practice staff. The primary care provider either provided care directly or served as a facilitator, directing patients to more appropriate sources of care at the appropriate time.
Comprehensiveness	A wide range of services in primary care and their appropriate provision across the entire spectrum of types of needs for all but the most uncommon problems in the population by a primary care provider.
Continuity	The longitudinal use of a regular source of care over time, regardless of the presence or absence of disease or injury.
Coordination	Linking health care visits and services, so that patients received appropriate care for all of their health problems, physical as well as mental.
Gate keeping	Process whereby a gatekeeper decided which and where services are received and UR processes of managing referrals and procedures that require preauthorization
IP Admission	An inpatient hospitalization (count of inpatient hospitalizations during a specific period)
Learning Collaborative	A short-term, usually 6 to 15 months learning system that brought together teams from hospitals and clinics to focus on a specific topic. The teams acted as consultants for each other to make improvements.
Patient-Centered Medical Home	An accessible, family-centered, continuous, comprehensive, coordinated, compassionate, and culturally effective practice.
Per Thousand Rate	A rate that tried to normalize sets of data by annualizing the membership and multiplying by one thousand. It was a standard measurement used in health care utilization.
Quality Measures	Priority Health's incentive based program, Partners in Performance.

CHAPTER I

INTRODUCTION

Reports by Kent County Health Department (1999) indicated that Medicaid children in Western Michigan had severe illnesses and poorer health outcomes than children in other counties. Previous research suggested Medicaid recipients had limited access to a personal physician and medical care, which resulted in higher health care costs, inappropriate use of resources, and poor health outcomes. The patient-centered medical home (PCMH) replaced fragmented care with comprehensive care.

Some studies suggested that interventions implemented through the PCMH concept assisted with improved quality of care and patient access as well as decreased cost. Rosenthal (2008) found that the PCMH model improved access to quality health care at a lower cost. Cooley, MacAllister, Sherrieb and Kuhlthau (2009) suggested the PCMH reduced health care cost, increased quality, and decreased ED visits and hospitalizations. Christakis, Mells, Koepsell, Zimmerman and Connell (2001) posit decreases in ED visits and hospitalizations were associated with a continuous relationship with primary care pediatric providers. The research examined a program designed to improve access to medical care for pediatric Medicaid recipients and reduce the cost of care using opportunities created through the PCMH program. Results indicated that use of the PCMH model optimized health care services at the primary care physician's practice and minimize ED visits and hospitalizations.

Recent research regarding PCMH served to assist health care planners and policy makers to craft informed decisions to improve access and provide equity in health care services. Health care reform 2010 provided a plan with mechanisms to reduce the financial burden of health care with an emphasis on restructuring the delivery system to minimize barriers to services. Patients needing to see a physician often encountered a shortage of primary care providers, lack of transportation, and lengthy appointment queue's. This study examined the PCMH model designed to equalize access to medical care for Medicaid recipients and reduce the cost of medical care for families with limited economic resources. The PCMH model hypothesized that interventions such as extended office hours, and telephone calls to patients after an emergency department visit would decrease emergency department use and in turn decrease the costs of health care.

Behavior Model

According to Aday and Andersen (1974), the behavior model of health care services suggested there was value in considering the economic and organizational aspects concurrently. Examination of a new health care policy and projects indicated PCMH successes for improving access to health care.

Purpose of the Study

The purpose of this research study was to examine how participation in a pediatric PCMH influenced the number of pediatric inpatient admissions, ED visits, Urgent Care (UC) visits, and reimbursement for inpatient admissions, ED visits, UC visits and pharmaceuticals. This study evaluated if implementation of PCMH interventions changed reimbursement and utilization for hospital admissions, ED visits, UC visits, and

pharmacy service. Practice interventions included use of patient and parent education, office flow redesign, group visits, electronic medical records (EMR), E-visits (visits by e-mail), telephone encounters, intensive diabetic case management, asthma case management, extended office hours, E-prescribing, online prescription refills, increased length of visits, telephone triage, disease registry, and disease specific initiatives.

Studies of relatively large health plans and a collaborative social health agency were scarce. Evidence-based results were necessary to help support government PCMH policy and help practices meet standards of accrediting and regulatory bodies. This study will assist primary care practitioners, health plan administrators, and health systems in planning effective health care models for implementation in their practices and community. The research study examined correlates of specific interventions provided by the PCMH that affected emergency department visits. Evidence-based studies on the subject of PCMH supported the effectiveness of interventions and the value of primary care medical homes. Children's Health Care Access Program (CHAP) and participating practices will receive the results to improve or implement interventions throughout the health system.

Children's Health Care Access Program

Children enrolled in Medicaid insurance account for 35% of children in Kent County, Michigan according to First Steps (2009). Children receiving Medicaid benefits in Kent County had poorer health outcomes. First Steps identified more severe illnesses that resulted in hospitalizations, higher rates of hospitalizations, higher rates for newborn readmissions after initial hospital discharge, more visits to the emergency room, and

increased respiratory illnesses, such as asthma. Kent County collaborators formed a community partnership to address this disparity. The partnership focused on shifting resources that concentrate on early intervention and prevention. The community partners ensured access to quality health care for 15, 000 Medicaid insured children living in Kent County. According to First Steps (2009) the partnership included Priority Health, a managed care company, Children's Healthcare Access Program, a First Step initiative, the Helen DeVos Children's Hospital, and Cherry Street Services, a Federally Qualified Health Center (FQHC).

Priority Health was one of Michigan's leading health insurance providers. The company began in 1986 in Grand Rapids, Michigan. Additional offices, opened in Holland, Jackson, Kalamazoo, Farmington Hills, and Traverse City, Michigan. There were 100 acute-care hospitals, more than 12,000 doctors, and other providers in the Priority Health network. Children enrolled in Priority Health Medicaid ranged in age from birth to 17. CHAP (n.d.) served as a free-standing referral source. Physicians faxed a referral to CHAP if a patient was found to have an increased amount of no-shows. CHAP provided patients linkages to community resources. According to CHAP (n.d.) services included nurse case management, free same day transportation to office visits, intensive asthma case management and education and home-based health education from a nurse or community health worker. The goal of the program were to connect the community's children to a quality medical home to improve their health and decrease hospitalization rates and emergency room utilization, thereby decreasing costs. PCMH was consistent with redirecting the American health care dollar to preventative interventions to obtain better health care outcomes for children. According to CHAP

(n.d.) the guiding principle was all children should have a constant medical home, a clinic or doctor's office to go to for regular medical care. The medical home model focused on preventative, coordinated, family-centered care. The PCMH model increased access by implementing same day appointments and expanding evening and weekend hours for sick children.

CHAP's primary purpose was to increase access to quality health care. Priority Health increased Medicaid reimbursement for a sick child office visit by approximately 60% for acute care office visits to encourage practitioners to accept additional Medicaid patients. Practices agreed to accept up to 50 additional Medicaid patients per full-time physician at the increased reimbursement rate. Four private pediatric practices, one hospital clinic, and one FQHC agreed to participate with CHAP. Priority Health provided practices pay for performance incentives if the practice reached established benchmarks. Each practice exhibited variability implementing different PCMH interventions. DeVos Pediatrics, a pediatric residency clinic, adjusted its schedule to accommodate same day appointments. Practices hired additional medical staff to assist with telephone triage and clinic operations. Approximately 15,000 children received health care services in the program. Participating practices that initiated medical home interventions included:

- Helen DeVos General Pediatric Clinic
- ABC Pediatrics, PC
- Alger Pediatrics, PC
- Forest Hills Pediatric Associates, PC
- Kent Pediatrics, PC

Children on Medicaid in Kent County had limited patient accesses to preventive, coordinated and comprehensive health care. This limited access resulted in poorer health care outcomes and higher health care costs. Episodic care based on illness was sporadic and fragmented for pediatric Medicaid recipients who could not find entry into a primary care practice. This problem with access to primary care forced parents to seek care for their children in emergency departments. Previous research indicated better health care outcomes when PCHMs provided increased access to prompt medical care provided by a personal physician. This study examined the impact that implementation of the PCMH model had on pediatric utilization and reimbursement for the entire pediatric sample and patients with otitis media and asthma.

CHAPTER II

LITERATURE REVIEW

Research Question

The research question asked was, “What effect does implementation of the patient-centered medical home model have on pediatric health care utilization and reimbursement for the pediatric sample and patients with otitis media and asthma?”

Review of Literature

The researcher used the phrases PCMH, hospital admission, and emergency department visit to search Google scholar, Off-Campus Library Services, and Pub Med. Literature was selected if the literature offered original research, evaluation of existing program, past literature reviews, and meta-analysis. The researcher reviewed CHAPS brochures, annual reports, and other literature. A comprehensive culmination of the literature review follows.

The Patient-Centered Medical Home Concept

Activities and interventions provided by a primary care practice model called, PCMH were examined in this study. According to the Patient Centered Primary Care Collaborative (2007) the American Academy of Pediatrics (AAP) introduced the medical home concept in 1967, initially referring to a central location for archiving a medical record for chronically ill and medically complex children. According to the Patient Centered Primary Care Collaborative (2007) in its 2002 policy statement, the AAP expanded the medical home concept to include operational characteristics: accessible,

continuous, comprehensive, family-centered, coordinated, compassionate, and culturally effective care. The Patient Centered Primary Care Collaborative (2007) stated the American Academy of Family Physicians (AAFP) and the American College of Physicians (ACP) had developed their own models for improving patient care called the “medical home” or “advanced medical home.” A policy paper presented in Washington provided proposals for resolving issues with the health care delivery system in the United States. The ACP released the paper during its annual report on the State of the Nation’s Health Care. The paper proposed to make fundamental, financial, and delivery changes in primary care (Patient Centered Primary Care Collaborative, 2007).

In accordance with this model physicians worked in an organized practice (Kinsman and Blaser, 2006). To deliver better value and patient care coordination, a guide recommended a voluntary certification process, quality measures, quality reporting, patient friendly scheduling systems, recognition of practices that used health information technology, and other best practices (Kinsman and Blaser, 2006). Based on information from Kinsman and Blaser (2006) the health care model recommended educating and partnering with patients who had chronic illnesses to help them with managing their own condition and avoid complications. The health care guide suggested several interventions that included an innovative scheduling system to minimize appointment delays, use of computerized clinical decision guidelines, e-mail consultations, and telephone consultations for non-urgent medical advice (Kinsman and Blaser, 2006). Another model recommendation included information technologies to store test results and clinical data. The electronic medical record provided immediate physician access and availability to

physicians, health care professionals, and consultants. The key parts of a comprehensive set of policy proposals by the ACP to address the shortage in primary care physicians is the proposed advanced medical home model (Kinsman and Blaser, 2006).

The AAP developed and published a definition of medical home in 1992. According to Barr (2008) “The medical home: Ad hoc task force on definition of the medical home” (1992), posits that, “that the AAP believed that the medical care of infants, children, and adolescents ideally was ideally accessible, continuous, comprehensive, family-centered, coordinated, and compassionate.” The AAP suggested well-trained physicians deliver and direct medical care to manage or facilitate all aspects of pediatric care. Personal familiarity needed to be present between the physician, the child, and family to generate shared responsibility and trust (Barr, 2008).

Barr (2008) stated the AAP found that social and economic barriers made the ideal "medical home" unattainable for some children. Barr (2008) surmised The Ad Hoc Task Force (1992) delineated that comprehensive services include, “provision of preventive care, ambulatory and inpatient care for acute illnesses, 24 hours a day, 7 days a week, care over an extended period, identification of the need for subspecialty consultation and referrals, provision of medical information to consultants, provision of interaction with school and community agencies, and maintenance of a central record and database (American Academy of Pediatrics, 1992).” According to Barr (2008) a strong primary care structure supported an efficient and quality health care delivery system. Large employers encouraged the ACP, AAFP, AAP, and American Osteopathic Association (AOA) to create respective viewpoints into a unified concept. The collective

developed principles in 2006 and released the principles in February 2007. The organizations agreed to promote the Joint Principles of the PCMH collectively as a model of health care.

According to Barr (2008) other medical professional societies endorsed the principles and in March 2007 a Patient-Centered Primary Care Collaborative (PCPCC) was formed. There were more than 160 organizations in the PCPCC, and more than 50 million employees and beneficiaries who supported the PCMH model. These organizations and beneficiaries also supported testing of new methods of reimbursement and practice transformation elements. The Medicare Medical Home Demonstration Project authorized testing the PCMH in the Tax Relief Act of 2006 (Barr, 2008). The legislation formed the basis of several demonstration projects across the United States. The demonstration projects included state Medicaid agencies, multiple commercial payers, regional employers, national employers, quality improvement programs, business groups, and national, regional, and medical professional societies (Barr 2008). Collaboratives designed the demonstration project to measure the effects of the model on cost, quality, patient experience, and patient satisfaction. It was imperative, however, to test the model in a transparent and credible way in different environments (Barr, 2008). The Patient-Centered Primary Care Collaborative (2007) suggested the PCMH was a model of health care delivery that was associated with lower health care costs and better outcomes. According to the PCPCC (2007) a PCMH was built upon the documented value of primary care, responsible for all of the patient's health care needs, and used health information systems to provide data.

The Commonwealth Fund (2006) found that a medical home reduced or eliminated ethnic and racial disparities in quality and access. A medical home improved adult's access to care, management of chronic conditions, and receipt of routine preventative screening. The Commonwealth Fund (2006) also discovered that patients with chronic diseases had fewer complications, which led to fewer hospitalizations when effectively managed. According to the PCPCC (2007) the bottom line was, "Care delivered by primary care physicians in a PCMH was consistently associated with better outcomes, reduced mortality, fewer preventable hospital admissions for patients with chronic diseases, lower utilization, improved patient compliance with recommended care, and lower Medicare spending."

According to Kinsman and Blaser (2007) the, "PCMH was an approach to providing comprehensive primary care for children, youths, and adults. The PCMH was a health care setting that facilitated partnerships between the patient, the patient's family and the patient's personal physician. The AAP, AAFP, ACP, and AOA, representing approximately 333,000 physicians, developed joint principles to describe the characteristics of the PCMH." The PCMH joint principles addressed the inclusion of a personal physician, enhanced access, and whole person orientation (Kinsman and Blaser, 2007). According to Kinsman and Blaser (2007) "Medical home hallmarks included practices that advocated for their patients, a care planning process, evidence-based medicine, clinical decision-support tools, engagement in performance measurement, performance improvement, decision-making and feedback by patients, supportive information technology, completion of a recognition process by an appropriate nongovernmental entity, and quality improvement activities. In addition the PCMH joint

principles also included payment based on a structure that reflected the value of physician and nonphysician, paid for services associated with coordination of care, supported adoption of health information technology, supported enhanced communication access, allowed a separate fee-for-service payment for face-to-face visits, allowed physicians to share in savings, and allowed for additional payments for achieving measurable and continuous quality improvements.”

TransforMED, (n.d.) a subsidiary of the AAFP focused on practice redesign. TransforMED facilitators used lessons learned from pilot projects to offer facilitation services, collaboration environments, and learning opportunities (TransforMed, n.d.). According to TransforMed (n.d.) facilitators supported and empowered primary care practices across the country as they implemented the TransforMED Patient-Centered Model. TransforMED’s definition of PCMH was, “A continuous relationship with a personal physician, coordinating care for both wellness and illness.” The TransforMed components included clinician-patient communication, trust, respect, shared decision-making, patient engagement, provider-patient partnership, culturally sensitive care, continuous relationship, and whole person care. (TransforMed, n.d.).

According to NCQA (2008), “the PCMH was a model for care provided by practices that sought to fortify the physician-patient relationship by replacing episodic care with coordinated care and a long term curative relationship. The physician led team was responsible for providing all the patient’s health care needs, and arranged for apposite care with other qualified physicians.” The PCMH improved care through open scheduling, expanded hours, and communication between patients, physicians, and staff (NCQA, 2008). Registries facilitated care, information technology, and health

information exchange. The PCMH ensured patients obtained the indicated care in a location ethnically and linguistically appropriate (NCQA, 2008).

According to Friedberg, Lai, Hussey and Schneider (2009), the AAP originated the term medical home and professional physician organizations expanded the term to include elements of chronic care models and practice capabilities. Stevens, Pickering, Seid and Tsai (2009) identified seven key PCMH features. The seven PCMH features were coordinated, comprehensive, continuous, culturally effective, accessible, compassionate, and family-centered. Reid, et al. (2009) suggested core elements of a PCMH included access, coordination, comprehensiveness, longitudinal relationships, aligned PCMH reimbursement methods, improved patient access and outcomes, promoted a chronic care model, and maximized use of advanced information technology.

Emergency Department Utilization

Sturm et al. (2010) found children with Medicaid insurance used the pediatric emergency department (PED) for non-urgent conditions. Further, numerous factors influenced the non-urgent use of the PED. However, the most common factors were patients' statements, which indicated "other care not available." This statement indicated difficulty in scheduling appointments with primary care physicians or a lack of a primary care physician in a geographic location. Brousseau et al. (2002) found that when families perceived a problem in obtaining referrals or necessary care, and a family centered approach to care was not used by the primary care physician, these were important

contributors to non-urgent PED utilization. According to Sturm et al., (2010) children with Medicaid insurance of all ages and in all PED visits, use of physician extenders, an increase of more patients per clinician in the practice, fewer evening office hours, and higher proportions of Medicaid children were associated with increased PED visits.

Sturm et al. (2010) prospectively collected practice characteristics from 33 primary care offices. The researchers surveyed senior physicians and practice managers by mail in October 2007 to identify specific characteristics for each practice. Urgent and non-urgent visits to the PED were analyzed retrospectively. During the 12-months, there were PED visits totaling (n = 31,076), which represented 25% of patients in the network. The study classified 47% as non-urgent and used a discriminate analysis classification model to predict the frequency of non-urgent utilization. Discriminate practice characteristics helped predict non-urgent utilization of the PED. Predictive rules helped focus interventions on significant practice characteristics that would help reduce PED utilization, optimize pediatric services, pediatric policy, and improve continuity of care.

Dombkowski, Stanley and Clark (2004) found a relationship between emergency department utilization and the number of months children with Medicaid were assigned to a Michigan managed care plan. Children enrolled in Medicaid managed health plans were assigned to a primary care provider indicating a regular supply of care. The sample was, “nondisabled children (N = 518,982; age range = 1-18) on Medicaid in Michigan during the calendar year of 2000” (Dombkowski, Stanley and Clark (2004). The study classified claims as non complex or complex based on the diagnostic and procedure codes. The research study classified children based on the number of months enrolled in

the managed care plan. The study measured the resulting data using incidence rate ratios and annual visits per thousand member months.

Dombkowski, Stanley and Clark (2004) found the existence of statistically significant differences in ED utilization and children receiving Medicaid fee-for-service and those enrolled in Michigan Medicaid managed care health plans. Twenty-two percent of Medicaid children in Michigan not assigned to a Medicaid health plan visited the ED one or more times and 77% of the visits were for noncomplex services (Dombkowski, Stanley and Clark (2004). Medicaid children assigned to a Medicaid health plan for less than half of their enrolled months visited the ED 11% more frequently for noncomplex services and 37% more frequently for complex services than those enrolled only in Medicaid managed care health plan (Dombkowski, Stanley and Clark (2004). Medicaid children enrolled only in a Medicaid managed care health plan experienced ED utilization rates for both noncomplex and complex services. According to Dombkowski, Stanley and Clark (2004) results indicated members assigned to a Medicaid health plan experience less ED utilization. Noncomplex ED utilization was about three times more than those for complex visits, regardless to fee-for-service or managed care enrollment. The Dombkowski, Stanley and Clark (2004) study limited comparison of pediatric ED utilization to infants, federally qualified health centers and specific communities. These other studies proposed that because managed care health plans provided a standard source of preventative and sick care services the occurrence of a primary care resource influenced ED utilization.

Patient-Centered Medical Home Implementation

Kesler (2010) examined a managed care health plan that implemented a two-year pilot. The pilot designated a per patient, per year, amount of \$16 for primary care and hired additional clinical staff and physicians. Each physician was assigned 1,800 patients rather than the customary 2,300 patients and spent 30 minutes rather than 20 minutes with each patient. New interventions included daily team meetings to discuss patient needs and patient outreach activities and coordination of care. Emergency department costs dropped for Group Health by \$54 annually per patient (Kesler, 2010). The pilot compared the control group to the study group and found the number of emergency department visits dropped by 20%, and preventable hospitalizations dropped by 11% (Kesler, 2010).

Kesler (2010) found that the Geisinger Health Plan started a pilot by giving \$1,500 more per month to salary physicians in two practices. The plan hired clinical staff and nurse care coordinators using a \$5,000 stipend per 1,000 Medicare members from Geisinger. The study reflected a drop by 14% in hospital admissions and Geisinger realized a return on investments for more than two to one, realizing approximately 3.7 million dollars in net savings (Kesler, 2010). Each practice that participated in the PCMH project implemented one or more interventions making each an individual pilot. Interventions implemented included any combination of electronic medical records, electronic prescribing, transmitting data between the practice and other provider, Website e-mail access for patients, increasing patient access hours, patient tracking registries,

patient self-management support, performance improvement, and reporting. The results of the pilots indicated patients obtained access to providers with tools and provided time for physicians to become more active in their patient's care, thereby reducing costs and improving quality of care.

Washington State Department (2008) indicated, "A medical home was a team approach and the primary care provider was a physician or nurse practitioner who supported and directed the patient's care." The federal Maternal and Child Health Bureau, AAP, the Child and Adolescent Health Measurement Initiative and other national partners developed the standard measure of medical home. For the child to be considered as possessing a medical home, the parent of the child had to identify the presence of the following components. The child must have had: 1) preventive care by a personal nurse or doctor documented as, "usually" or "always," 2) care documented as, "usually" or "always," 3) family-centered care, 4) preventive care within the last year, 5) easy access to specialists or equipment and, 6) follow-up care after receiving specialist care or equipment documented as, "usually" or "always" (Washington State Department, 2008).

Washington State Department (2008) found medical homes supported healthier children and families had fewer unmet health needs, had less delayed care, fewer problems getting care and parents reported improved health care delivery and fewer hospitalizations. Children who had medical homes had fewer hospitalizations and emergency room visits. Washington State Department (2008) found barriers to PCMH development. The barriers were cost of care coordination, limited technological resources, cost of after-hours care, and inadequate reimbursement. Care coordination and developmental screening were usually not reimbursable. The department estimated the

cost of nonreimbursable pediatric care coordination to be \$6,600 for each full-time primary care provider (Antonelli and Antonelli, 2004). Health information technologies like electronic medical records were not usually coordinated across hospitals and different medical practices and systems. Many providers had no or limited access to health information technologies.

Washington State Department (2008) found intervention strategies such as learning collaboratives. Learning collaborative topics concentrated on incorporating the Medical Home Index (MHI), a validation tool. According to the Center for Medical Home Improvement the MHI was a classification tool used by providers to self-assess PCMH indicators and identify needed improvement. Washington State Department (2008) used the indicators to measure and quantify primary care practice's "medical homeness" modifying measures into tangible and observable health care behaviors and processes. The Washington State Department (2008) Senate Bill 5093 passed in 2007 by the Washington Legislature, required creation of performance indicators. A pay for performance system determined reimbursement rates utilizing the performance indicators.

Rosenthal (2008) found that "a medical home was a patient-centered, multifaceted source of personal primary health care. It was based on a relationship between the patient and physician and was formed to improve the patient's health across a continuum of referrals and services. Primary care organizations, including the American Board of Family Medicine, promoted the concept as an answer to government agencies seeking political solutions that made quality health care affordable and accessible to all Americans." Rosenthal (2008) evaluated both the medical home and patient-centered

primary care. Peer-reviewed documents indicated a reduction of errors, improved quality, and increased patient satisfaction when the patients could identify with a primary care medical home. Additional factors contributed to patient satisfaction, including patient choice, and autonomy. According to Rosenthal (2008) adoption of the patient care medical home required provider incentives and special efforts by providers. The incentive approach to primary care included a combination of case management fees and quality outcome incentives that effectively improved patient outcomes and patient experiences. Rosenthal (2008) found that the PCMH concept was an approach to improve access to quality care at a reduced cost. The patient's care coordination resided with a personal medical provider who worked with a team to meet the patient's need. The care team included, “social workers, care managers, pharmacists, physical therapists, dietitians, occupational therapists, family, and community” (Rosenthal, 2008).

As PCMHs matured they integrated medical and psychosocial care. Families with a primary care physician had reduced racial and ethnic health care disparities. How well a patient changed their behavior or complied with treatment was often a good way to judge primary care services. The longitudinal relationship between the patient and provider affected the way the patient utilized resources. Rosenthal (2008) found that Americans spent a reduced amount of time with their primary care physician than in other countries. Each visit established a continuous relationship that renewed opportunities to teach strategies, better manage the patient's progress, facilitate capacity for compliance, receptivity, and openness to change multiple medical conditions. Continuity of care allowed the physician to identify psychosocial problems that impacted the patient's health. “Gate keeping” models of primary care reflected an increase in primary care visits and

fewer emergency room, specialists, and nonphysician provider visits. The research indicated physician continuity of care was associated with quality of care at lower costs.

Rosenthal (2008) found that physician offices that used a coordinated team model, regardless to the team model structure, experienced improved quality of care. A coordinated team addressed the challenges of a 15-minute office visit, which demanded chronic disease management, present care, and new complaint care coordination. A coordinated team provided a solution to this challenge by increasing the contact point between the patient and health care providers. An example was a model that had a medical assistant remain in the room during the physician examination and stayed behind to debrief the patient after the visit and contacted the patient later. There were also disease specific team models that focused on one disease that produced good results. Multidisciplinary teams coordinated care for high-risk patients, and assisted with shifting costs to more appropriate sites. Rosenthal (2008) identified key elements of PCMH care for successful outcomes. The elements included a recheck following non-urgent conditions, medical care services from cradle to grave, strategic access management, specialist referrals, coordinated mental health referrals, integrated information technology to track quality measures and patient education, continuous patient relationship, the right access to timely care, feedback from patients to allow patients to participate in decision-making, PCMH recognition certification, extended hours, open scheduling, and options for communication such as e-mail and Internet-based communication.

Cooley, MacAllister, Sherrieb and Kuhlthau (2009) found that the PCMH model placed emphasis on family-centered approaches, care coordination planned care, and concept construct for primary care redesign. The authors stated previous studies had

shown reduced health care costs and increased quality. Cooley, MacAllister, Sherrieb and Kuhlthau (2009) systematically studied and found evidence-based studies lacked support that the medical home model was not formative and fragmentary. Consequently, Cooley, MacAllister, Sherrieb and Kuhlthau (2009) conducted a medical home model study to test the hypothesis that there was an association between a decrease in health services utilization and increased in patient satisfaction and increased primary care practice medical homeness. Their study included a sample of 43 practices and seven health plans in five states. The MHI measured each practice. The plan interviewed and collected data from each primary care physician from February 2005 through June 2006. Cooley, MacAllister, Sherrieb and Kuhlthau (2009) investigated health care utilization for, “asthma, diabetes, cerebral palsy, epilepsy, attention deficit/hyperactivity disorder and autism.” Parents completed a survey produced by Center for Medical Home Improvement. The plan surveyed each practice after completion of the MHI interview. Results reflected higher scores for chronic condition management, organizational capacity, care coordination, and fewer hospitalizations. Lowering emergency department use was associated with higher chronic-condition management scores. The overall MHI score indicated negative correlations between care coordination, chronic-condition management, organizational capacity and hospitalization rates. Results reflected a significant association between an increased MHI score and care coordination and chronic condition management and decrease in ED visit rates. Results indicated PCMHs with strong care coordination and chronic-condition management reduced both emergency department visits and hospitalizations (Cooley, MacAllister, Sherrieb and Kuhlthau, 2009). Results reflected a reduction in children hospitalized with chronic

conditions. Cooley, MacAllister, Sherrieb and Kuhlthau (2009) concluded that through enhanced primary care, a reduction in hospitalizations provided a case for new reimbursement strategies, which supported PCMH services.

Patient-Centered Medical Home and Health Care Reform

Brown and Nathan (2009) indicated the state of Minnesota hoped to introduce changes in health care functions that slowed health care spending growth in both the private sector and Medicaid and served as precursor to the next move toward universal coverage. Minnesota, a progressive state regarding health policy, passed a law in 2008 that addressed the growth of health care costs and the number of uninsured. Included in the law was the provision to encourage implementation of patient-centered health care homes first within Medicaid and later with employees in state government and the private sector. According to Brown and Nathan (2009) legislators said this was the time for moving chronic care beneficiaries in Medicaid from fee-for-service into health care homes equipped with care coordinators and making homes available to state employees and private sector. Brown and Nathan (2009) focused on the logistics of implementation. Implementation challenges PCMHs faced and issues considered were central to cost containment. Brown and Nathan (2009) agreed that integrated, coordinated consistent patterns of care were preferable to unsystematic and fragmented care. Brown and Nathan (2009) considered variations to care that sought access to generalized, integrated health systems, including, “prepaid group practice like managed care, alternatives to emergency visits, health service points of entry, and benefits of the medical home.” According to Brown and Nathan (2009) the Medicare Payment Advisory Council encouraged medical

home program initiatives and conveyed, “how medical homes helped beneficiaries support continuous and comprehensive care and sustain relationships with their primary care providers.” Minnesota initiated the Minnesota Pediatric Medical Home Learning Collaborative project in 2004 and the project expected an estimated five percent savings per patient per year (Brown and Nathan, 2009). The PCMH model had the potential to decrease medical care costs by reducing hospitalizations, emergency room visits, and duplication of tests and procedures. The project estimated a reduction, associated with hospital-charge savings, of the perforation rate of Medicaid children to private insured children to be \$46,130,640 (Brown and Nathan, 2009). The expectation for Minnesota health care homes was to get chronically ill children to coordinated care across the continuum of care and medical home providers, consequently, averting costly services such as unnecessary encounters, emergency department visits, and admissions.

According to Peskin (2009) a report in 2008 by Deloitte Center for Health Solutions estimated the net impact of the PCMH model. The center estimated that through better health care coordination, and the avoidance of unnecessary or duplicate services there was a 30% saving in inpatient and physician payment, 10% fewer admissions, 20% fewer ED services and 10%, less absenteeism. Based on Peskin (2009) the center forecasted a \$170 per member per month savings in disease management programs. Peskin (2009) also discussed one of the largest PCMH pilot programs in Michigan, which began in June 2009, included 1000 doctors in approximately 300 practices affecting nearly 2,000,000 patients. Blue Cross and Blue Shield of Michigan sponsored a pilot and introduced a payment code that allowed physicians to be paid for care coordination. The results indicated practices that participated and met PCMH

standards performed better than others in areas such as improved Healthcare Effectiveness Data and Information Set, quality health care performance reporting scores, generic prescribing rates and pay for performance (Peskin, (2009).

Practitioner Coordinated Care

Christakis et al. (2001) found decreased incidence of emergency department visits and hospitalizations when a pediatrician had a continuous relationship with a child. Previous adult patient studies indicated the benefit of continuity of care, but other previous researchers limited studies to those regarding children. As a result previous research study finding indicated varied results. Assignment of patients to a primary care provider was a standard requirement for managed care organizations and the researchers expected the assignment to enhance continuity of care. According to Christakis et al. (2001) other features of managed care that may have served to disrupt established relationships. For example, practitioners in a group saw patients for pediatricians who participated in large practice groups or practice networks. This reduced contact between a patient and specific pediatrician. Another example was employers and insurance companies who shifted allegiance with physician practices and networks as a cost containment strategy. This example required patients to change to new affiliated providers. The researchers used the patient's inpatient and outpatient medical data to assess the patient's primary care continuity, emergency department utilization, and hospital admission utilization. The researchers reviewed claims data from pediatric patients (n = 46,097) enrolled in Group Health Cooperative from January 1, 1993 through December 31, 1998 (Christakis et al., 2001). The researchers used an index called

continuity of care (COC) as the primary predictor variable to quantify the degree to which a patient experience a continued relationship with the pediatric provider. Results suggested parents of children on Medicaid experienced greater understanding of their child's disease and knowledge of when to seek care. Parents often initiated the emergency department visit. A higher incidence of hospitalization and emergency department utilization was found to be associated with lower pediatric primary care continuity of care. According to Christakis et al. (2001) the decrease in ED visits was a result of medical reliability, such as compliance with medication regimen, increased understanding of child's psychosocial conditions, better knowledge as how to handle the child's care at home, and greater interest in seeing a particular physician for nonemergent illnesses. Parents were willing to wait several hours for a pediatrician they knew and ED physicians would consider not admitting a child when follow-up was ensured. Christakis et al. (2001) found that forming an ongoing rapport between patients and providers represented a multifaceted interaction between individual enrollees and his health system. Failure to create a relationship with a regular provider indicated a detachment between the parent and the health care system. Parents played a critical role in the process when providers established a continuous relationship with the parents.

Berenson et al. (2008) conducted interviews with practicing physicians and completed a literature review. Researchers conducted site visits at various offices to observe whether practices implemented elements of the PCMH. During the interviews physicians emphasized differing opinions regarding PCMH rewards. There were also different and inconsistent expectations of what was accomplished by a medical home from physicians and medical advocates (Berenson et al., 2008). Open feedback from the

practicing physician gave an additional perspective in terms of how PCMHs performance impacted patient outcomes and expectations of performance (Berenson et al., 2008). Many independent and small group practices implemented EMRs; however, it was not practical to implement other elements of the PPC PCMH guidelines. Small offices that made the commitment met many of the PCMH goals using an EMRs without a team approach required by NCQA and CCM. Berenson et al. (2008) found some physicians were eager to reengineer their practices without financial incentives. Some physicians developed dissimilar outlooks about what they were willing to do for additional compensation. Some physicians failed to commit due to the emphasis on innovative tasks that implicated dependence on multiple EMR functions and critical characteristics of PCMH (Berenson et al., 2008).

Behavioral Model Support

Andersen (1995) developed a behavioral model of health services use with the goal to provide measures for medical care access. According to Andersen (1995) social relationships served as an enabling resource to facilitate or impede health services use and knowledge of health and health services, influenced people's perceptions of need of health care services. Andersen (1995) called values, knowledge, and attitudes "health beliefs" that provided a means of explaining how social structure influenced perceived need, enabling resources, and subsequent use. Based on Andersen's model (1995) both personal and community enabling resources needed to be present for use to take place. Therefore, facilities and health care personnel had to be available, where the person lived and worked. The person also required the means and knowledge of those facilities and

personnel to access the services. Some access factors were travel times, waiting times, health insurance, income, and a regular source of care. Andersen (1995) found that any model of health service had to consider, “how people viewed their own general health and functional state, how they experienced symptoms of pain, illness and worries about their health and whether or not they judged their problem as being significantly important and, the magnitude to seek professional help.” Andersen (1995) defined potential access as, “the presence of enabling resources, which provided a means for use and increased the possibility that the use would take place.” Anderson's behavioral model of health services use emphasized the “dynamic and recursive nature” of the health services’ use model, which included health status outcomes. According to Andersen (1995) the most recent model included feedback loops showing that outcome in turn affected subsequent predisposing factors and perceived need for services as well as health behaviors. In addition the most recent model revealed the multiple influences on health services use and subsequent effect on health status (Andersen, 1995).

Chronic Conditions

Gill, Mainous and Nsereko (2000) examined whether fewer ED visits were associated with use of one practitioner for medical continuity of care among Medicaid patients. The researchers examined continuity of care for patients with one practitioner for a year and the results of the study indicated that there was a high correlation between provider continuity of care and lower ED visits in the Medicaid population. Gill, Mainous and Nsereko (2000) independently examined asthmatic patients. The separate analysis reflected that the effects of continuity were no greater for asthmatics than that for the

general population. Gill, Mainous and Nsereko (2000) found high provider continuity satisfied patients. Services provided by one practitioner allowed for the establishment of trust between a physician and patient and led to increased knowledge. The establishment of a trusting physician-patient relationship made it easier for the physician to manage the patient's medical problems over the telephone or in the office and averted a hospital admission or ED visit. Previous studies supported the findings that patients used the ED less frequently when they had a regular source of care were supported. Physicians accumulated knowledge about their patient's medical condition and had a better understanding of the severity of each medical problem. Patients' decision-making process was affected when there was greater continuity of care (Gill, Mainous and Nsereko 2000). This finding was important because it was the patient rather than the physician who decided to seek care in the ED. According to Gill, Mainous and Nsereko (2000) patients who developed a sense of trust in their physician's knowledge were more likely to seek the opinion of their physician before going to the ED. Therefore, strategic plans that included patients seeing one provider for continuity of care is associated in lower health care costs, secondary to lower ED use and decreased likelihood of hospitalization.

Struijs, Baan, Schellevis, Westert and Van Den Bos (2006) conducted a study to estimate the effects of co-morbidities on the kind and amount of health care utilization of diabetic patients. Results indicated that both nondiabetes related co-morbidities, and diabetes related co-morbidities increased the demand for health care. All measures studied indicated an increase in utilization as a result of the increasing number of co-morbidities. Based on Struijs, Baan, Schellevis, Westert and Van Den Bos (2006) the study observed a significant correlation between the use of ambulatory care and hospital

admissions and the number of co-morbidities. Struijs, Baan, Schellevis, Westert and Van Den Bos (2006) recommended implementation of additional care models that embraced multiple diseases and integrated other disease care programs to meet the complex health care demands of patients with diabetes. Struijs, Baan, Schellevis, Westert and Van Den Bos (2006) found the disease management approach was not effective without focusing on model linked data registries and meeting diabetic patients' health care demands. Therefore, the investigators monitored diabetic patients with respect to co-morbidities. Additional care models that included multiple chronic diseases and extended diabetic care programs were more suitable for patients with diabetes.

Herrod (2008), used hospital discharge data, “for five pediatric hospital admission avoidable diagnoses, asthma, short-term complications of diabetes, gastroenteritis, urinary tract infection and perforated appendix.” Herrod (2008) found children discharged with public insurance had five potentially avoidable hospitalization diagnoses. According to Herrod (2008) results suggested publicly insured children and African American children had, “significantly different discharge rates for pediatric, potentially avoidable hospitalizations than commercially insured and Caucasian children” as a result of less access to high quality, ambulatory care.

Harish et al. (2001) examined how an inner-city, asthma, comprehensive care program influenced hospital admission and ED rates for 129 asthmatic children ages 2 – 17. During the study patients continued to obtain care in either a specialty clinic or primary care office. However, the specialty clinic provided close monitoring, asthma education, medical treatment, environmental control and 24-hour availability. Harish et al. (2001) found that a comprehensive asthma care program was effective in reducing ED

visits. The study therefore supported preventative measures reduction of ED utilization, consequently reducing medical costs.

Finkelstein et al. (2000) compared Medicaid asthmatic children and asthmatic children not on Medicaid ages two to 18 enrolled in the same staff-model, health maintenance organization. Previous studies indicated that asthma was the most common chronic illness among children and affected low income and minority children disproportionately. The research examined hospital utilization, ambulatory visit patterns, medication use, and ED visits. The research study examined health care patterns and outcomes, and focused on ambulatory asthma visit rates and preventive pharmacotherapy. Each pediatric practice center offered an on-site pharmacy. Several health centers offered evening and weekend urgent care services and extended hours. Finkelstein et al. (2000) found that children insured with Medicaid had similar or slightly higher daytime visits with their primary care provider and urgent care centers when compared to children without Medicaid. Medicaid insurance eliminated direct medical costs to families for medical care. However, other barriers including transportation, extended office wait times and childcare, previously documented did not prevent these research participants from using primary care services. Varied results were thought to be from more complex causes that included nonmedical and medical factors.

Patient-Centered Interventions

Berry, Sieders and Wilder (2003) found that “Patient-centered access refers to a patient's ability to secure appropriate and preferred medical assistance when and where it is needed. The philosophy was to design the service system for its users.” Improved

access to care strengthened the provider-patient relationship. Berry, Sieders and Wilder (2003) found that if care was not timely from the physician and caused a delay in needed treatment, the delay sent patients to alternative providers, which included ED and urgent care centers. Patient care became discontinuous, fragmented, delayed, and inefficient, adding unneeded costs to the health care system. Patients who didn't obtain timely appointments became disappointed, and staff needlessly maintained waiting lists and made needless reminder calls to reduce the "no-shows" rate. Berry, Sieders and Wilder (2003) found a 20-minute slot for an appointment was not enough time to cover all of the patient's issues. The needs and preferences of diverse patients required a flexible model, which offered several entrance paths to the practice. More practices were using appointments with nonphysician providers, group appointments, telephone appointments, and online communications. Physician assistants, certified nurse midwives, and nurse practitioners, no longer required physician involvement in numerous states. Medical care provided by nonphysician practitioners within a physician- staff medical practice was increasing to the pressure to control health care costs and prevalence of chronic illnesses. Group appointments offered sessions that provided education, examinations, prescriptions, referrals, and individual counseling.

Berry, Sieders and Wilder (2003) found that telephone appointments were appropriate when a physical examination was unnecessary, and a patient-physician relationship already existed. The researchers successfully used telephone conferences to monitor depression, urinary tract infections, and asthma conditions. Telephone consultations improved the efficiency of the practice, quality of the encounter, and enabled nonambulatory patients, or working patients to confer with the practitioner

without using a slot for an office visit. Telephone appointments were more thorough and less rushed. Further, Berry, Sieders and Wilder (2003) found there were a growing number of medical practices with their own website for patient education and practice promotion. Online communications added benefits to the practice by offering patients services outside the physical site of the practice, and at its usual time of business. Provider services offered online included practice newsletters, prescription refills, appointment scheduling, consultations, test results, self-care guidelines, medical information sources and preventive health guidance. E-mails were not an alternative for face-to-face encounters and were a poor method for conveying urgent information (Berry, Sieders and Wilder, 2003). Patients were more interested in communicating with physicians by e-mail than physicians communicating with patients. According to Berry, Sieders and Wilder (2003) the E-risk Consortium, created e-mail risk reduction guidelines, which standardized informed consent, physician-patient relationship, addition of correspondence in the clinical record, apposite fees, and conditions and physician review of e-mail content. Some private health insurances were paying physicians for e-mail consultations.

According to Jaber, Braksmajer and Trilling (2006) in 1974 practitioners conceived group visits as a model for pediatric conferences. Group visits usually included a one-on-one medical evaluation in addition to group educational encounters, which emphasized patient self-supervision. Group visits included subjects such as nutrition, exercise, pharmaceutical management, medical management, and psychosocial causes to illness and health. Group visits were usually diagnosis or population-specific and consisted of the same patient's from visit to visit. Group visits varied in length of time

and frequency, some lasting for one session or a number of years (Jaber, Braksmajer and Trilling, 2006). Group visits allowed more time for physician-patient interactions, skill-building, group problem solving, social support, and self-management education. One powerful contributor to patient self-efficiency was seeing others overcome barriers and accomplish the desired behavior. Jaber, Braksmajer and Trilling (2006) found patients favored the group visit design since the arrangement allowed for group interaction. A sample of 120 underprivileged patients with type two diabetes demonstrated increased levels of trust in their physician after participating in group visits were examined (Jaber, Braksmajer and Trilling, 2006). According to Jaber, Braksmajer and Trilling (2006) the majority of studies that measured health service utilization found a decrease in ED visits, hospitalization rates, and visits to specialists. Jaber, Braksmajer and Trilling (2006) concluded there was adequate information to support the effectiveness of group visits in increasing physician satisfaction and patient satisfaction, decreasing ED visits, decreasing specialists visits, improving quality of life, and improving quality of care. The researchers determined quality of care improved and group visits proved to be a competent approach to chronic care management for motivated patients (Jaber, Braksmajer and Trilling, 2006).

Jaber, Braksmajer and Trilling (2006) found that group visits were associated with an increase in physician productivity and increased physician satisfaction. Physicians enjoyed their ability to treat group visit participants. Further, Jaber, Braksmajer and Trilling (2006) Maizels et al. found that prescription costs decreased after a group visit intervention. Jaber, Braksmajer and Trilling (2006) found higher frequency of patient teaching about medication administration from pharmacists and self-supervised practices

from nurses after participating in group visits. However, assessed total cost savings, which included hospital, professional, pharmacy, and health plan termination costs, were not found to be significant.

Jaber, Braksmajer and Trilling (2006) found interventions differed widely in structure, research quality, and processes of care. There was consensus that group visits improved quality of care indicators, quality of life and patient satisfaction. The extended time element allowed more exchanges between practitioners and patients, afforded physicians enough time to utilize guidelines, and time to examine specific chronic care guidelines. The results linked patient's self-efficacy and healthy behavior improvements to the patient's confidence level, presence of behavior-specific objectives, and facilitator's skills in motivational interviewing. The authors believed the point in time thorough nature of group visits required the selection of very encouraged participant to increase involvement. The investigators found that group visits improved physician and patient satisfaction, quality of life, and quality of care (Jaber, Braksmajer and Trilling, 2006). Group visits also decreased ED visits, specialist visits, and at times the rate of hospitalization or readmission. It was not proven group visits reduce the overall cost of service. The authors confirmed for motivated participants group visits were a competent approach to manage chronic conditions. Group visits also provided a mechanism for providing medical care in a manner that allowed time for education and maintained revenue and productivity.

Jantos and Holmes (2006) found that an electronic health record (EHR) or electronic medical record (EMR) included patient health information consisting of patient demographics, medical history, medications, vital signs, clinical notes, laboratory results,

radiology reports, diagnostic reports, immunizations, and activities during a clinical patient encounter. Implementation of an EHR was a big investment in terms of staff, time, and money. Software was expensive and extensive, and implementation of an EHR required the reengineering of the clinical workflow. The EHR allowed messaging between team members and follow-up actions by the team. The practices integrated an EHR with the practice management system, and supported e-prescribing, electronic lab result reporting and electronic lab ordering. Jantos and Holmes (2006) used a chronic disease management system (CDMS) to support care management for patients by providing and managing information on specific conditions. The researchers based CDMS on the management of the population, optimizing the management and population-based reporting of specific conditions across all patients. CDMS supported the team by allowing documentation to be seen simultaneously. CDMS usually had a one-way interface with the practice management system, and CDMS did not support e-prescribing, but CDMS required less intensive training than EHR.

Jantos and Holmes (2006) found that both the EHR and CDMS incorporated standards and guidelines, reminded providers about required and appropriate care, supported patient outreach tools, included instruction, and patient education tools. Both EHR and CDMS supported management for multiple co-morbid conditions, had standard reporting features, had ad hoc reporting features, prompted data, and retrieved relevant data easily at the point of the patient's visit. Jantos and Holmes (2006) found that new electronic tools required new workflows, training, and buy-in from every member of the team. Successful implementation of information technology required change management techniques. An EHR required greater computer literacy and significant

training for both physicians and staff. Before implementation of an EHR or CDMS, leadership had to become committed to the change, approve money for hardware, software, and connectivity. The health care team had to have computer skills and ability and readiness to change workflow processes and practices. CDMS supported and provided the opportunity to create innovative team working relationships. Jantos and Holmes (2006) found that EHR usually didn't support population management systems well and organizations had to have a separate population management system to parallel the EHR. The EHR usually required time intensive, expertise to customize the needed functionalities.

Barnett (2008) examined an electronic survey of Colorado Academy of Family Physician members. In the research study 32.6% respondents reported using chronic disease registries. Barnett (2008) verified the foundation of population management and clinical outcome data directed PCMH practice improvement activities, which were critical for delivering quality patient care. Use of patient care registries was a "must have" resource to support planned care visits and practice improvement. Disease registries allowed organization at the point of care, indicated changes in the practice over time, and facilitated setting up group visits. Barnett (2008) found that when defining disease registries there were three functional levels, individual patient, organization and team. Individual patient involved outreach reminders and individual care plans. Organization involved assessment of performance, identification of gaps, and improvement in systems. Team involvement included coordination of activities, identification of patient needs per plan and delivering the right care at the right time. Barnett (2008) found that disease registries facilitated quality patient care by proactively identifying relevant subpopulations, planning for individual care, and providing

practitioners and patients of timely reminders. Disease registries provided monitoring of care system, monitoring practice team performance, and assisted with coordination of care by sharing information with practitioners and patients. The disease registry identified, which measures required attention prior to the patient's visit. Barnett (2008) found that the demand for improvement in software and quality features would drive enhanced future functionality. Barnett (2008) found that it took about 12 months to get the disease registry up and running and time saving didn't occur until approximately 12 months after implementation.

Lumetra (2004) posits e-prescribing was the use of computer devices to enter, review, modify, and communicate patient prescriptions and medication regimes. Lumetra (2004) considered E-prescribing a key function of an electronic medical record. Key functional e-prescribing systems included system integration, medication selection/decision-support capability, educational capabilities, and patient specific information. System integration involved interconnectivity among various information databases, such as EHR, pharmacy benefit managers, and practice management. Medication selection/decision-support capability allowed access to evidence-based therapeutic reviews, prescribing guidelines, safety alerts, diagnoses-based medication menus, drug interaction screening, formulary checking, dosage calculation, and prescription renewal. Lumetra (2004) found that e-prescribing was one component of computerized physician order entry. E-prescribing had educational capabilities, created patient specific education material, prescription pattern provider feedback information, and patient-provider communication. Patient specific information maintained access to a selection of patient identification data or imported patient identification data, historical

patient data, and a current patient medication list. E-prescribing systems options included Internet access, handheld devices, laptop computers, desktop computers, tablets, and mobile phones. Lumetra (2004) found that e-prescribing reduced the incidence of adverse drug events, which was the most preventable and common errors in medicine, improved patient safety, increased office efficiency, and produced practitioner cost-savings.

Anand, Feldman, Geller, Bisbee and Bauchner (2005) examined e-mail content over a six-week period between parents and providers and parent's attitude about e-mails. E-mails allowed for continuous access to the health care system, allowed practitioners to embed practice guidelines, literature or other embedded Internet and written resources, and production of a full written record of communications. Anand, Feldman, Geller, Bisbee and Bauchner (2005) found that e-mail communications were about nonacute issues, included inquiries about medical questions such as administrative issues, medical update queries and subspecialty evaluation. Most e-mails were answered in one exchange between parents and pediatricians. One parent presented an office visit by attaching a digital picture of her youngster's skin complaint. Therefore, e-mails impacted health care utilization by preventing appointments and telephone calls. Anand, Feldman, Geller, Bisbee and Bauchner (2005) found that practitioners indicated they used up an average of 30 minutes responding to e-mails per day. However, physicians used up an average of 60 minutes on the telephone per day, and parents gave up trying to reach physicians when they had difficulty reaching their physicians by phone.

Anand, Feldman, Geller, Bisbee and Bauchner (2005) found that communication via e-mail was different from communication generated by telephone. Some e-mail exchanges related to medical issues resulted in office visits. One in four e-mails resulted

in multiple back and forth e-mails. Most e-mails involved one parent concern or request. Many e-mails were to update the pediatrician, 36% without request for help from the pediatrician. New information on pre-existing medical problems included complaints such as thrush, asthma, otitis media, and food allergies. Parents could communicate directly with the practitioner without office staff interception, and e-mail required a physician's response, which was unlike telephone calls. Parents seemed to limit their e-mail inquiries to those that pertain to a physician. Anand, Feldman, Geller, Bisbee and Bauchner (2005) found 98% of parents reported being satisfied with their e-mail interaction, and indicated they would use this to select a pediatrician and overwhelmingly endorsed the use of e-mails. According to Anand, Feldman, Geller, Bisbee and Bauchner (2005) previous national surveys indicated physicians were reluctant to use e-mail because of the lack of reimbursed time, the lack of security, and production of an increased workload. Anand, Feldman, Geller, Bisbee and Bauchner (2005) found that an essential ingredient for quality care in the 21st century was e-mail communication. The Institute of Medicine had a goal to eliminate handwritten medical information by the last part of the decade. E-mail documentation supported this goal because it was a superior alternative to telephone call transcription. Therefore, e-mail was found to be more efficient for documenting nonvisit care.

Kleiner, Akers, Burke and Werner (2002) examined parents and physicians to see the capabilities that families, subspecialty pediatricians, and general pediatricians had when integrating e-mails with the pediatric delivery structure. The study also determined the attitudes and knowledge base regarding potential issues while utilizing e-mails for physician-patient communication. The research assessed the technological willingness of

physicians and families to communicate via e-mail. Kleiner, Akers, Burke and Werner (2002) found that most parents had an interest in using e-mails to get in touch with their youngster's physician for scheduling appointments, obtaining test outcomes, discussing a particular symptom and getting information. Most (57% to 66%) patients interviewed had access to e-mail based on the parent's education level, age, and family earnings. The results indicated parents between 31 and 40, had access to e-mail. Parents of children with chronic illnesses used the Internet for clinical information. Parents and their children were becoming more Internet knowledgeable, and admitted using the Internet to find answers to medical care questions. Kleiner, Akers, Burke and Werner (2002) found that e-mails provided a potential for monitoring patients with chronic conditions closely and provided better documentation of communication. Previous articles indicated patients were beginning to request e-mail service. Physicians indicated that e-mail communications saved time.

Kleiner, Akers, Burke and Werner (2002) hypothesized that physicians and parents both articulated concerns about confidentiality, but practitioners were the most concerned. The fear concerned the potential for communications to be visible to others or intercepted and misdirected, which influenced patient-physician confidentiality. Parents were more likely to favor communication, electronically, even though they had confidentiality concerns because the patients were children. Kleiner, Akers, Burke and Werner (2002) found that all respondents were capable of communicating electronically. The majority of physicians had hardware and software to correspond by electronic means, although 26% of general practitioners didn't have Internet access at their practices. Physicians opposed using e-mail in their practice, but agreed to have office staff

communicate with patients electronically. Physicians were accepting of the advantages ascertained in the survey, which involved interaction of office staff and patients. Physicians believed communicating with parents via e-mail, increased their workflow. Physicians had concerns about increased workload, time demand, and confidentiality. Kleiner, Akers, Burke and Werner (2002) found that electronic communication with parents directed through the office staff decreased the physician's time demand while meeting most of the families' desires. Parents needed to be aware that staff members would be screening e-mails sent to the physician. Bauchner, Adams and Burstin (2002) reports there were 32 million America Online subscribers. The practice of medicine and the American society were allowing e-mails to become an integral part of pediatric practice. The acceptance of e-mail communication induced cultural changes in the delivery of health care. Bauchner, Adams and Burstin (2002) found many advantages to communicating by e-mail. The major advantage was the ability to communicate without simultaneously being in contact with each other. E-mail communication eliminated telephone tag, was inexpensive, rapid, convenient, and simple. E-mail communication was available, night or day, weekend, or weekday. Electronic communication provided detail and cumulative information, conveyed anonymity, particularly when communicating sensitive information, and bypassed unhelpful intermediaries. Bauchner, Adams and Burstin (2002) found that physicians used e-mails to clarify advice provided in face-to-face encounters and over the telephone. E-mails were easier to save and became a part of the medical record. Physicians provided references to other information available on the Internet and allowed patients to become more empowered partners in

their own health care. Communication by e-mail enhanced open communication virtually anywhere with ease, speed, and reliability.

Borowitz and Wyatt (1998) developed a consultation form and inserted the form into a webpage for the Division of Pediatric Gastroenterology at the Children Medical Center at the University of Virginia in 1995 as a service for providers referring physicians and patients as a means of communication with the specialist physician. The hope was to increase the number of patient referrals to the university medical center. Faculty that participated agreed to review consultation requests daily and respond within 48 hours of receipt. Two faculty physicians responded to all inquiries. The central consultation theme was to identify and categorize e-mails as either a second opinion about recommended treatment or a diagnosis request for general information such as medication, treatment or concerning a disorder and specific questions about therapeutic interventions, appropriate diagnostic tests, and cause of a child's symptoms. Borowitz and Wyatt (1998) found that most consultation e-mail messages were brief and consisted of several paragraphs. Responses gave advice, recommended seeing a physician, suggested treatment, and directed patients to educational materials available on the World Wide Web or contained references. E-mails provided the ability for physicians to clarify or follow-up with advice given during an outpatient visit and directed patients to other clinical resources or educational materials available on the Internet. Borowitz and Wyatt (1998) found that 15% of the United States population used e-mail, 25% of adults in the United States accessed the Internet and more than 40% of patients used e-mail to converse with health care practitioners. Patients found e-mail communication increased their access to medical care. E-mail communication allowed exchange of simple

information and non-urgent requests such as communicating laboratory results, requesting prescription refills, and making appointments. More than 90% of patients used electronic communication to communicate sensitive and important medical information (Borowitz and Wyatt, 1998).

Nutting et al. (2010) found that practices in the NDP adopted some components like EMR early. However, other components presented a greater challenge. Components that created a greater challenge were wellness promotion, group visits, team-based care, e- visits and population management. Some practices had difficulty using e-visit templates they received from commercial vendors. Some practices perceived e-visit templates as being not efficient, and required a great deal of effort when encouraging e-visits to the patients. One practice used group visits prior to the NDP model reported, after implementing same-day visits, a rapid decline in patient interest in e-visits. Some practices reported a reduction in the number of phone calls after providing e-mail access. Some practices reported discontinuing group visits, indicated there was not enough value to justify the financial investment, and lacked enough time to support planning. Practices determined they would need at least seven to eight patients in each group session to break even financially. Some practices planned to continue exploring group visits, modifying the format to emphasize support groups, wellness, and education.

Nutting et al. (2010) found that some practices created physician-medical assistant teams, and located the teams in the same work area. However, these actions did not constitute a team-based care team. Team-based care required cross-training, ongoing training, and reconfiguration of patient flow and office workflow (Nutting et al., 2010). Office meetings and retreats developed a shared vision and bridged the gap in front-back

office communication. Team-based care also included daily huddles and establishing protocols and standing orders. According to Nutting et al. (2010) population management involved focusing on a practices' ability to proactively address health issues and monitor the health care status of subpopulations. Population management registries and population management overlapped for identifying selected patient groups, with characteristics such as diabetes. Nutting et al. (2010) found that the additional component of case management addressed processes for identifying, tracking, and taking action for complex cases with co-morbidities and preventing patients from falling through the cracks. Population management required a paradigm shift from care of one patient at a time to proactive population-based care of patient groups. According to Nutting et al. (2010) changes were difficult to implement if the changes required coordination across work units, necessitated additional expertise and resources, challenged the traditional model of primary care, and impacted multiple processes and roles. Nutting et al. (2010) found practices' adaptive reserve to be important in the success of adopting model components. There was a positive association between implementation of NDP model components, and baseline adaptive reserve. This finding suggested that as PCMHs adapt and transform to the rapidly changing demands of the health care environment, strengthening adaptive reserve would serve practices well over the next decade (Nutting et al., 2010).

CHAPTER III

METHODOLOGY

Conceptual Model

The researcher used a conceptual framework based on a primary care practice model called a patient-centered medical home (PCMH). According to the Primary Care Collaborative PCPCC (2007), the PCMH was a model associated with lower health care costs, better patient experience, more efficient use of resources, continuous access to a personal physician, who provides comprehensive and coordinated care, and documented value of primary care in achieving better health outcomes. PCMH comprehensive care included acute care, chronic care, preventive services, end-of-life care, and teams of health care professionals across the continuum of care.

As indicated by the National Committee for Quality Assurance (NCQA) (2008), the patient-centered medical home was a model for care provided by physician practices that sought to strengthen the physician-patient relationship. Strengthening the relationship was accomplished by replacing episodic care based on illnesses with coordinated care and a long term healing relationship. According to NCQA (2008) health care professionals on a patient care team, provided comprehensive care based on the best evidence on clinical effectiveness, empowered patients to partner with his personal physicians on decision-making, and provided care in a culturally and linguistically appropriate manner.

Research Questions

RQ0: What effect does implementation of the patient-centered medical home model have on pediatric health care utilization and reimbursement for the pediatric sample and patients with otitis media and asthma?

RQ1: How does implementation of the patient-centered medical home model affect utilization of pediatric inpatient admissions?

RQ2: How does implementation of the patient-centered medical home model affect utilization of pediatric emergency department visits?

RQ3: How does implementation of the patient-centered medical home model affect utilization of pediatric urgent care visits?

RQ4: How does implementation of the patient-centered medical home model affect reimbursement for pediatric inpatient admissions?

RQ5: How does implementation of the patient-centered medical home model affect the reimbursement for pediatric emergency department visits?

RQ6: How does implementation of the patient-centered medical home model affect reimbursement for pediatric urgent care visits?

RQ7: How does implementation of the patient-centered medical home model affect reimbursement for pediatric pharmaceuticals?

Hypotheses

Hypothesis One

$H_0: M_{\text{before}} - M_{\text{after}} = 0$ There is not a statistically significant difference in the medians for pediatric inpatient admissions after implementation of the patient-centered medical home model.

$H_1: M_{\text{before}} - M_{\text{after}} \neq 0$ There is a statistically significant difference in the medians for pediatric inpatient admissions after implementation of the patient-centered medical home model.

Hypothesis Two

$H_0: M_{\text{before}} - M_{\text{after}} = 0$ There is not a statistically significant difference in the medians for pediatric inpatient admissions after implementation of the patient-centered medical home model for pediatric patients with otitis media.

$H_1: M_{\text{before}} - M_{\text{after}} \neq 0$ There is a statistically significant difference in the medians for pediatric inpatient admissions after implementation of the patient-centered medical home model for pediatric patients with otitis media.

Hypothesis Three

$H_0: M_{\text{before}} - M_{\text{after}} = 0$ There is not a statistically significant difference in the medians for pediatric inpatient admissions after implementation of the patient-centered medical home model for pediatric patients with asthma.

$H_1: M_{\text{before}} - M_{\text{after}} \neq 0$ There is a statistically significant difference in the medians for pediatric inpatient admissions after implementation of the patient-centered medical home model for pediatric patients with asthma.

Hypothesis Four

$H_0: M_{\text{before}} - M_{\text{after}} = 0$ There is not a statistically significant difference in the medians for pediatric emergency department visits after implementation of the patient-centered medical home model.

$H_1: M_{\text{before}} - M_{\text{after}} \neq 0$ There is a statistically significant difference in the medians for pediatric emergency department visits after implementation of the patient-centered medical home model.

Hypothesis Five

$H_0: M_{\text{before}} - M_{\text{after}} = 0$ There is not a statistically significant difference in the medians for pediatric emergency department visits after implementation of the patient-centered medical home interventions for pediatric patients with otitis media.

$H_1: M_{\text{before}} - M_{\text{after}} \neq 0$ There is a statistically significant difference in the medians for pediatric emergency department visits after implementation of the patient-centered medical home model for pediatric patients with otitis media.

Hypothesis Six

$H_0: M_{\text{before}} - M_{\text{after}} = 0$ There is not a statistically significant difference in the medians for pediatric emergency department visits after implementation of the patient-centered medical home model for pediatric patients with asthma.

$H_1: M_{\text{before}} - M_{\text{after}} \neq 0$ There is a statistically significant difference in the medians for pediatric emergency department visits after implementation of the patient-centered medical home model for pediatric patients with asthma.

Hypothesis Seven

$H_0: M_{\text{before}} - M_{\text{after}} = 0$ There is not a statistically significant difference in the medians for pediatric urgent care visits after implementation of the patient-centered medical home model.

$H_1: M_{\text{before}} - M_{\text{after}} \neq 0$ There is a statistically significant difference in the medians for pediatric urgent care visits after implementation of the patient-centered medical home model.

Hypothesis Eight

$H_0: M_{\text{before}} - M_{\text{after}} = 0$ There is not a statistically significant difference in the medians for pediatric urgent care visits after implementation of the patient-centered medical home model for pediatric patients with otitis media.

$H_1: M_{\text{before}} - M_{\text{after}} \neq 0$ There is a statistically significant difference in the medians for pediatric urgent care visits after implementation of the patient-centered medical home model for pediatric patients with otitis media.

Hypothesis Nine

$H_0: M_{\text{before}} - M_{\text{after}} = 0$ There is not a statistically significant difference in the medians for pediatric urgent care visits after implementation of the patient-centered medical home model for pediatric patients with asthma.

$H_1: M_{\text{before}} - M_{\text{after}} \neq 0$ There is a statistically significant difference in the medians for pediatric urgent care visits after implementation of the patient-centered medical home model for pediatric patients with asthma.

Hypothesis 10

$H_0: M_{\text{before}} - M_{\text{after}} = 0$ There is not a statistically significant difference in the medians for pediatric inpatient admission reimbursement after implementation of the patient-centered medical home model.

$H_1: M_{\text{before}} - M_{\text{after}} \neq 0$ There is a statistically significant difference in the medians for pediatric inpatient admission reimbursement after implementation of the patient-centered medical home model.

Hypothesis 11

$H_0: M_{\text{before}} - M_{\text{after}} = 0$ There is not a statistically significant difference in the medians for pediatric inpatient admission reimbursement after implementation of the patient-centered medical home model for pediatric patients with otitis media.

$H_1: M_{\text{before}} - M_{\text{after}} \neq 0$ There is a statistically significant difference in the medians for pediatric inpatient admission reimbursement after implementation of patient-centered medical home model for pediatric patients with otitis media.

Hypothesis 12

$H_0: M_{\text{before}} - M_{\text{after}} = 0$ There is not a statistically significant difference in the medians for pediatric inpatient admission reimbursement after implementation of the patient-centered medical home model for pediatric patients with asthma.

$H_1: M_{\text{before}} - M_{\text{after}} \neq 0$ There is a statistically significant difference in the medians for pediatric inpatient admission reimbursement after implementation of the patient-centered medical home model for pediatric patients with asthma.

Hypothesis 13

$H_0: M_{\text{before}} - M_{\text{after}} = 0$ There is not a statistically significant difference in the medians for pediatric emergency department reimbursement after implementation of the patient-centered medical home model.

$H_1: M_{\text{before}} - M_{\text{after}} \neq 0$ There is a statistically significant difference in the medians for pediatric emergency department reimbursement after implementation of the patient-centered medical home model.

Hypothesis 14

$H_0: M_{\text{before}} - M_{\text{after}} = 0$ There is not a statistically significant difference in the medians for pediatric emergency department reimbursement after implementation of the patient-centered medical home model for pediatric patients with otitis media.

$H_1: M_{\text{before}} - M_{\text{after}} \neq 0$ There is a statistically significant difference in the medians for pediatric emergency department reimbursement after implementation of the patient-centered medical home model for pediatric patients with otitis media.

Hypothesis 15

$H_0: M_{\text{before}} - M_{\text{after}} = 0$ There is not a statistically significant difference in the medians for pediatric emergency department reimbursement after implementation of the patient-centered medical home model for pediatric patients with asthma.

$H_1: M_{\text{before}} - M_{\text{after}} \neq 0$ There is a statistically significant difference in the medians for pediatric emergency department reimbursement after implementation of the patient-centered medical home model for pediatric patients with asthma.

Hypothesis 16

$H_0: M_{\text{before}} - M_{\text{after}} = 0$ There is not a statistically significant difference in the medians for pediatric urgent care reimbursement after implementation of the patient-centered medical home model.

$H_1: M_{\text{before}} - M_{\text{after}} \neq 0$ There is a statistically significant difference in the medians for pediatric urgent care reimbursement after implementation of the patient-centered medical home model.

Hypothesis 17

$H_0: M_{\text{before}} - M_{\text{after}} = 0$ There is not a statistically significant difference in the medians for pediatric urgent care reimbursement after implementation of the patient-centered medical home model for pediatric patients with otitis media.

$H_1: M_{\text{before}} - M_{\text{after}} \neq 0$ There is a statistically significant difference in the medians for pediatric urgent care reimbursement after implementation of the patient-centered medical home model for pediatric patients with otitis media.

Hypothesis 18

$H_0: M_{\text{before}} - M_{\text{after}} = 0$ There is not a statistically significant difference in the medians for pediatric urgent care reimbursement after implementation of the patient-centered medical home model for pediatric patients with asthma.

$H_1: M_{\text{before}} - M_{\text{after}} \neq 0$ There is a statistically significant difference in the medians for pediatric urgent care reimbursement after implementation of the patient-centered medical home model for pediatric patients with asthma.

Hypothesis 19

$H_0: M_{\text{before}} - M_{\text{after}} = 0$ There is not a statistically significant difference in the medians for pediatric pharmaceutical reimbursement after implementation of the patient-centered medical home model.

$H_1: M_{\text{before}} - M_{\text{after}} \neq 0$ There is a statistically significant difference in the medians for pediatric pharmaceutical reimbursement after implementation of the patient-centered medical home model.

Hypothesis 20

$H_0: M_{\text{before}} - M_{\text{after}} = 0$ There is not a statistically significant difference in the medians for pediatric pharmaceutical reimbursement after implementation of the patient-centered medical home model for pediatric patients with otitis media.

$H_1: M_{\text{before}} - M_{\text{after}} \neq 0$ There is a statistically significant difference in the medians for pediatric pharmaceutical reimbursement after implementation of the patient-centered medical home model for pediatric patients with otitis media.

Hypothesis 21

$H_0: M_{\text{before}} - M_{\text{after}} = 0$ There is not a statistically significant difference in the medians for pediatric pharmaceutical reimbursement after implementation of the patient-centered medical home model for pediatric patients with asthma.

$H_1: M_{\text{before}} - M_{\text{after}} \neq 0$ There is a statistically significant difference in the medians for pediatric pharmaceutical reimbursement after implementation of the patient-centered medical home model for pediatric patients with asthma.

Design and Procedure

The investigation was a retrospective, quasi-experimental, longitudinal study of a group before and after PCMH intervention. The experimental group was children verified as active enrollees who received service with continuous enrollment at the same PCMH practice during 2008 and 2010. The study used a stratified purposeful sampling method to select children assigned to five CHAP PCMH practices for in depth research. The study extracted administrative claims data submitted for reimbursement by five practices for care provided in 2008 and 2010. The study categorized the claims data using International Classification of Disease-Clinical Modification, Ninth Revision (ICD-9-CM) to capture utilization of ambulatory and inpatient care. The study extracted data for all patients with ICD-9- CM code ranges of 250 (diabetes), 381, 382, 385, (otitis media) and 493 (asthma). The research study identified inpatient claims and linked them to children admitted from the emergency department. The researcher extracted duplicate claims. The researcher defined reimbursement as total amount paid by Priority Health for inpatient, ED, UC, and pharmacy services. Utilization reimbursement data included amount paid for patient services related to inpatient, pharmacy, urgent care, and emergency department care. These payments included reimbursement for professional, facility, and pharmaceutical services. The amount paid by Priority Health for 2008 and 2010 services remained the same because there were no changes in contracted rates

during the research study. The study compared six months of baseline (before) and intervention (after) measures using utilization event counts and actual reimbursement from January through June in 2008 and 2010. The data was limited to six months due to a claim lag time for the 2010 data. The researcher used IBM Statistical Package for the Social Sciences (SPSS), Chicago, Illinois version 19 to analyze the data.

The sample included 2962 children ages 0-15 years continuously enrolled in each practice. Each child was assigned a random member identification number, a random generated number that uniquely identified the child across all data. Of the 2962 enrolled children, 151 children did not present anywhere for health care services using Priority Health insurance or at their pediatric practice. A total of 990 children had health care utilization data in only one of the two years of the research, either 2008 or 2010. Therefore, 1141 children had some zeros (no activity, numbers or event count) in their utilization data and 1821 children had utilization observations in both 2008 and 2010. The study considered the 2962 children participants in the research study.

The data analysis examined the impact of PCMH interventions on all children collectively and with asthma, type one diabetes, and otitis media. The research analysis included children in each practice with at least one or more claims to determine utilization. The analysis examined reimbursement and utilization data for ED, UC, pharmacy, and hospital admissions for all children and those with the three chronic conditions.

The research identified skewed data, due to a large number of zeros, the distribution of the differences did not approximate a normal distribution, and therefore the paired t-test was not appropriate. The researcher used nonparametric methods to test

the hypotheses because the data were not normally distributed and did not meet the assumptions of a paired t test. A nonparametric test did not require the assumptions of normality or homogeneity and negated the influence of outliers. The researcher changed the data to an ordinal scale level because of the issue with data distribution. The researcher decided to group the data into data classes or segments. Therefore, the researcher bin ranked the data by taking the continuous numerical values and putting the values of the variables into certain numbers of bins. The researcher calculated frequency distributions, made decisions regarding what values the binned variables received, determined intervals for each variable based on the size of the bin, and divided the ranges to establish the specific bin size. Table 1 displays the bin ranked ranges established for the variables. The researcher bin ranked inpatient admissions from zero to greater than two admissions, emergency department visits from zero to greater than three, and urgent care visits from zero to greater than three. The researcher bin ranked inpatient admission reimbursement from zero dollars to greater than \$5,000, emergency department reimbursement from zero dollars to greater than \$300, urgent care reimbursement from zero dollars to greater than \$70, and pharmacy reimbursement from zero dollars to greater than \$750.

Table 1. Bin Ranked Ranges

Variable	Bin Range
Inpatient Admissions	0 Admissions
	>0-1 Admission
	>1-2 Admissions
Emergency Department Visits	0 Visits
	>0-1 Visit
	>1-2 Visits
	>3 Visits
Urgent Care Visits	0 Visits
	>0-1 Visit
	>1-2 Visits
	> 3 Visits
Inpatient Admission Reimbursement	\$0
	>\$0-\$3,000
	>\$3,000-\$5,000
	>\$5,000
Emergency Department Reimbursement	\$0
	>\$0-\$100
	>\$100-\$200
	>\$200-\$300
	>\$300
Urgent Care Reimbursement	\$0
	>\$0-\$35
	>\$35-\$70
	>\$70
Pharmacy Reimbursement	\$0
	>\$0-\$250
	>\$250-\$500
	>\$500-\$750
	>\$750

The study used a nonparametric test, the two-sample Wilcoxon signed ranks test also known as the Wilcoxon matched pairs signed rank test (Green and Salkind, 2005). The study used a repeated measures design with an intervention, measured the dependent variables on an ordinal scale (ranked data), and tested for significant differences between the two varied conditions of the independent variables where the same participants responded to both conditions. The study used the Wilcoxon test consistent with Green

and Salkind (2005) to analyze repeated measures study designs whereby an individual was assessed on two occasions. Based on Green and Salkind (2005), the non-parametric test combined data from two samples, and the raw observations converted to ranks (1 to $n_1 + n_2$). The Wilcoxon signed ranks test used the ranks of the differences, not only the direction of the differences in the computation, and generated the differences in each pair. The test ranked the differences in absolute values and the original sign of the differences was kept. The test statistic used the sum of the ranks of the lower frequency sign was. The research considered the zeros for before and after the PCMH intervention ties. The Wilcoxon test only ranked the nonzero difference observations.

According to Green and Salkind (2005) the Bonferroni method minimizes the chance of committing a Type I error (rejecting the null hypothesis when it is true). The Bonferroni method required the test alpha to be equal to the alpha .05 divided by the number of paired comparisons (seven). According to Green and Salkind (2005) the Bonferroni test reduced the alpha to .007 (.05/7).

The study collected the following variables from submitted administrative claims:

- 1) Age a control variable (level of measurement was ratio)
- 2) Gender a control variable (level of measurement was nominal)
- 3) Practice site (level of measurement was nominal)
- 4) Primary diagnosis (level of measurement was nominal)
- 5) Number of inpatient admissions (level of measurement was ratio)
- 6) Number of emergency department visits (level of measurement was ratio)
- 7) Number of urgent care visits (level of measurement was ratio)
- 8) Inpatient admission reimbursement (level of measurement was ratio)

- 9) Emergency department reimbursement (level of measurement was ratio)
- 10) Urgent care reimbursement (level of measurement was ratio)
- 11) Pharmacy reimbursement (level of measurement was ratio)

The study used the repeated measures Wilcoxon signed ranks test to analyze the demographic data. The study analyzed each dependent variable for the entire sample for each of the chronic conditions. The study also analyzed each of the chronic conditions for the five pediatric practices. The study used a data collection tool developed to be discussed and reviewed with each practice manager during a telephone conference. After the telephone conference the researcher identified PCMH interventions implemented at each practice after 2008. The data collection tool is shown in Appendix A.

PCMH Model Interventions

The researcher collected the following model interventions from the data collection tool:

- 1) Office work flow redesign
- 2) Electronic medical records (EMR)
- 3) E-visits (visits by e-mail)
- 4) Telephone encounters
- 5) Extended office hours
- 6) E-prescribing
- 7) Online prescription refills
- 8) Increased length of visit
- 9) Telephone triage

- 10) Disease registry
- 11) Group visits
- 12) Asthma initiative
- 13) Otitis media initiative
- 14) Participatory design workshops
- 15) Increased in staff positions
- 16) Team huddles

CHAPTER IV
PRESENTATION OF DATA

Data collected for the five pediatric practices included utilization data for children with the three identified chronic conditions. Table 2 shows the ICD-9 codes used to define the three chronic conditions and the distribution counts.

Table 2. International Classification of Disease-Clinical Modification, Ninth Revision (ICD-9-CM) Code

Chronic Disease	ICD-9-CM Codes	Distribution Counts
Diabetes	250.0 – 250.9	10
Asthma	381.00 – 381.4, 382.0 – 382.9, 385.1	377
Otitis Media	493.0 – 493.9	591

The researcher completed a descriptive statistical analysis for all children with utilization data and calculated statistics for age, gender, and the three chronic conditions. Table 3 described the demographic statistics. The mean age of the children was six point eight. The distribution of male and female patients was very similar with females accounting for 48% and males accounting for 52% of the population. The distribution of children with diabetes, asthma, and otitis media was very interesting. There were eight children identified with diabetes, 328 children identified with asthma, and children identified with otitis media. The mean age for the children with diabetes was 10.8, the mean age for the children with asthma was six point seven, and the mean age for the children diagnosed with otitis media was four point three.

Table 3. Summary of Sample Statistics of Children

Variable	<i>N</i> and (%)	Mean Age	(SD)
Total Patients	2962 (100%)		
Age (y)	0-15		
Male	1533 (51.8%)	7.19	4.189
Female	1429 (48.2%)	6.81	4.1
Diabetes	10 (.3%) M-5 F-5	10.50	4.007
Asthma	377 (12.7%) M-236 F-141	6.79	4.009
Otitis Media	591 (20%) M-307 F-284	4.44	3.685

Table 4 describes the location, size, and type of practice for each practice. Two practices (Alger and DeVos) were urban, three practices (ABC, Forest Hills and Kent) were suburban, three practices (ABC, Alger, and Kent) were medium-sized and two practices (DeVos and Forest Hills) were large sized practices. One practice (DeVos) was a community academic-residency hospital clinic and four practices (ABC, Ager, Forest Hills and Kent) were independently owned.

Table 4. Participating Practice Demographics

Practices	<i>n</i> (%)
Geographic	
Urban	2 (40%)
Suburban	3 (60%)
Rural	0
Size by number of MDs*	
Small, 1–3 MDs	0
Medium, 4–6 MDs	3 (60%)
Large, ≥7 MDs	2 (40%)
Ownership	
Independent	4 (80%)
Community Academic Hospital Clinic	1 (20%)

*MD indicates board certified pediatrician

The number of children enrolled in each of the five practices, their gender, and the number of children with diabetes, asthma, and otitis media appear in Table 5. Only the DeVos practice had children with diabetes. Otitis Media was the most common of the

three chronic diseases (20%) followed by asthma (12.7%). Fewer children had a diagnosis of diabetes (.3%). Complete analysis of utilization for the 10 diabetic children was not conducted due to the low volume. A diabetic chronic condition analysis would not have provided statistically significant results.

Table 5. Entire Sample Statistics by Pediatric Practices

Practice	Total Patients N and (% of Population)	Male N and (% of Population)	Female N and (% of Population)	Diabetes N and (% Practice Population)	Asthma N and (% Practice Population)	Otitis Media N and (% Practice Population)
ABC Pediatrics	92 (3.1%)	41 (44.6%)	51 (55.4%)	0	6 (6.5%)	28 (30.4%)
Alger Pediatrics	426 (14.4%)	222 (52.1%)	204 (47.9%)	0	42 (9.9%)	109 (25.6%)
DeVos General Pediatric Clinic	2100 (70.9%)	1093 (52.0%)	1007 (48.0%)	10 (.5%)	295 (14.0%)	368 (17.5%)
Forrest Hills Pediatric	167 (5.6%)	100 (59.9%)	67 (40.1%)	0	28 (16.8%)	48 (28.7%)
Kent Pediatrics	177 (6.0%)	77 (43.5%)	100 (56.5%)	0	6 (3.3%)	38 (21.5%)

CHAP Practices

ABC Pediatrics, PC. There were 92 children enrolled in ABC Pediatrics, PC, 51 female, 41 male, zero diabetic, six asthmatics, and 28 with otitis media. ABC Pediatrics had five pediatricians on staff. Prior to 2008 ABC Pediatrics utilized E prescribing, an EMR, and accepted same-day appointments. ABC had a website that contained demographic and health care information for all their parents and patients to view. In 2009 they began to use the CHAP otitis media video. To extend practice hours, they added one-hour each morning Monday through Friday for a total of five hours per week. They began a new asthma initiative in 2010 and developed a disease registry to track high-risk children. During the research period, ABC Pediatrics added two nurses and one

pediatrician. ABC Pediatrics had one registered nurse to retire. ABC Pediatrics, PC, was Physician Group Initiative Program (PGIP) certified by Blue Cross Blue Shield of Michigan, which certifies practices as PCMH using care coordination criteria.

Alger Pediatrics PC: There were 426 children enrolled in Alger Pediatrics PC, 204 female, 222 male, zero diabetic, 42 asthmatics, and 109 with otitis media. Alger Pediatrics had six pediatricians on staff. Prior to 2008 Alger Pediatrics had extended office hours, added a disease registry, and used team huddles. Alger had a website that contained demographic and health care information for all their parents and patients to view. In 2009 they began a new asthma initiative, E prescribing, team-based care and a new nursing telephone triage process. Alger Pediatrics did not extend their office hours; however, they increased the number of spaces available for same-day appointments. Alger Pediatrics did not use the CHAP otitis media video; instead they developed an otitis media brochure. Alger Pediatrics PC used the CHAP brochure titled “Your Child's Medical Home.” This brochure included specific information regarding their walk-in clinic, doctor on -call, phone nurse, website, prescription refills, urgent care, pediatric evening service hours, location, and when it was appropriate to access the emergency department. Alger Pediatrics PC was PGIP certified.

DeVos General Pediatric Clinic: There were 2100 children enrolled in DeVos General Pediatric Clinic (a residency teaching practice), 1007 female, 1093 male, 10 diabetic, 295 asthmatic, and 368 with otitis media. DeVos General Pediatric Clinic had eight pediatricians and residents on staff. DeVos had a website that contained demographic and health care information for all their parents and patients to view. Prior to 2008 DeVos General Pediatric Clinic provided telephone triage, asthma case

management, and used team huddles. During the study period DeVos General Pediatric Clinic increased their office hours by adding 1.5 hours each evening, Monday through Friday for a total of 7.5 hours per week, began to use group visits, used the otitis media video, implemented a disease registry, increased the length of patient visits from 20 minutes to 30 minutes with the senior resident and 40 – 50 minutes with an intern, redesigned office work flow and added a medical assistant position. DeVos General Pediatric Clinic moved their practice during the research time frame, and had two licensed practical nurses, and one medical assistant to retire. DeVos General Pediatric Associates was PGIP certified.

Forest Hills Pediatrics Associates, PC: There were 167 children enrolled in Forest Hills Pediatric Associates, PC, 67 female, 100 male, zero diabetic, 28 asthmatics, and 48 with otitis media. Forest Hills Pediatrics had nine pediatricians and one physician assistant on staff. Forest Hills had a website that contained demographic and health care information for all their parents and patients to view. Prior to 2008 Forest Hills Pediatrics provided telephone triage, extended office hours, and used team huddles. During the study period Forest Hills Pediatrics began to use group visits, the CHAP otitis media video, a disease registry, an EMR, online prescription refills, E prescribing, and began an asthma initiative, which included hiring a certified asthmatic educator, and added one pediatrician. One of their pediatricians attended a Lean design workshop. Lean transformation thinking eliminated waste and created processes that need less human effort, space, capital, and time resulting in fewer errors and less costs (Lean, n.d.). The main idea was to maximize patient values while minimizing waste. Forest Hills Pediatrics was PGIP certified.

Kent Pediatrics PC: There were 177 children enrolled in Kent Pediatrics PC, 100 female, 77 male, zero diabetic, six asthmatics, and 38 with otitis media. Kent Pediatrics had four pediatricians. Kent Pediatrics did not have a website, did not offer any extended office hours, did not use an EMR, team-based care, otitis media video, work flow redesign, disease registry, or E prescribing. Kent Pediatrics had not implemented any PCMH interventions. Kent Pediatrics did not seek PGIP certification.

Practice Summary

Certified pediatricians worked at all five pediatric practices. All five practices referred children to Grand Rapids Area Pediatric Evening Services (GRAPES) or urgent care services after their normal business hours. Only DeVos General Pediatric Clinic had a laboratory, radiology, pharmacy, and urgent care center, GRAPES. Four of the five practices were Physician Group Incentive Program (PGIP) certified. According to Blue Cross Blue Shield of Michigan (2009) the PGIP certification process required practices to meet specific care coordination elements to become a PCMH. According to Blue Cross Blue Shield of Michigan (2009), the PGIP elements included reporting outcomes, documenting patient discussions, offering 24-hour patient access, setting individualized health goals, documenting timely and effective patient follow-up, providing communication and collaboration across the care continuum, providing preventive health education, screening, and counseling, coordinating specialist referrals, and offering community services. The last elements included providing self-management support and education to patients, monitoring and tracking patients' long term care with a patient registry, and using technical tools to provide electronic communication for patients.

Table 6 summarizes the PCMH interventions implemented at each practice. Forest Hills implemented an EMR. Two practices (Alger and Forest Hills) implemented E prescribing. Three practices (ABC, DeVos, and Forest Hills) implemented disease registries and extended office hours. DeVos implemented an office work flow redesign, DeVos and Forest Hills implemented group visits, and Alger and Forest Hills implemented team-based care. All four practices began asthma case management initiatives, implemented otitis media initiatives, and became PGIP certified. Three practices hired additional staff (ABC, DeVos, and Forest Hills). DeVos increased the length of visits.

Table 6. Implemented PCMH Model Interventions

PCMH INTERVENTION	ABC	ALGER	DEVOS	FOREST HILLS	KENT
EMR				X	
Telephone Encounters					
E Visits					
Group Visits			X	X	
Online Prescription Refills				X	
E Prescribing		X		X	
Telephone Triage		X			
PCMH Workshop				X	
Office Flow Redesign			X		
Hired Additional Staff	X		X	X	
Extended Hours	X		X	X	
PGIP Certification	X	X	X	X	
Disease Registry	X		X	X	
Increased Access	X	X	X		
Team-Based Care		X		X	
Otitis Media Initiative	X	X	X	X	
Diabetes Initiative					
Asthma Initiative	X	X	X	X	
Increased Length of Visits			X		

Wilcoxon Signed Ranks Test Results

The researcher conducted the Wilcoxon signed ranks tests for all variables.

Negative ranks represented the case when the value in 2010 was lower than the value in 2008. Similarly, positive ranks represented the case when the value in 2010 was higher than in 2008. Figure 1 provides the Wilcoxon rank results for the entire sample ED visits. The mean of the ranks (negative ranks) in favor of 2010 ED visits was 381.52, whereas the mean of ranks (positive ranks) in favor of 2008 ED visits was 365.21. The test result indicated a statistically significant difference between ED visits 2008 and ED visits 2010, $z = -4.082, p < .001$.

Figure 1. Wilcoxon Rank Test Results for Entire Sample ED Visits

Ranks		N	Mean Rank	Sum of Ranks
ed_visits.2010 -	Negative Ranks	426 ^a	381.52	162529.00
ed_visits.2008	Positive Ranks	322 ^b	365.21	117597.00
	Ties	2214 ^c		
	Total	2962		

a. ed_visits.2010 < ed_visits.2008

b. ed_visits.2010 > ed_visits.2008

c. ed_visits.2010 = ed_visits.2008

Test Statistics^b

	ed_visits.2010 - ed_visits.2008
Z	-4.082 ^a
Asymp. Sig. (2-tailed)	.000

a. Based on positive ranks.

b. Wilcoxon Signed Ranks Test

Figure 2 provides the Wilcoxon rank results for the entire sample otitis media ED visits. The mean of the ranks (negative ranks) in favor of 2010 ED visits was 124.35,

whereas the mean of ranks (positive ranks) in favor of 2008 ED visits was 111.35. The test result indicated a statistically significant difference between ED visits 2008 and ED visits 2010, $z = -5.398$, $p < .001$.

Figure 2. Wilcoxon Rank Test Results for Entire Sample Otitis Media ED Visits

		Ranks		
		N	Mean Rank	Sum of Ranks
ed_visits.2010 - ed_visits.2008	Negative Ranks	159 ^a	124.35	19772.00
	Positive Ranks	80 ^b	111.35	8908.00
	Ties	352 ^c		
	Total	591		

a. ed_visits.2010 < ed_visits.2008

b. ed_visits.2010 > ed_visits.2008

c. ed_visits.2010 = ed_visits.2008

Test Statistics^b

	ed_visis.2010 -ed_visits.2008
Z	-5.398 ^a
Asymp. Sig. (2-tailed)	.000

a. Based on positive ranks.

b. Wilcoxon Signed Ranks Test

Figure 3 provides the Wilcoxon rank results for the entire sample otitis media ED reimbursement. The mean of the ranks (negative ranks) in favor of 2010 ED reimbursement was 116.19, whereas the mean of ranks (positive ranks) in favor of 2008 ED reimbursement was 138.40. The test result indicated a statistically significant difference between ED reimbursement 2008 and ED reimbursement 2010, $z = -3.611$, $p < .001$.

Figure 3. Wilcoxon Rank Test Results for Entire Sample Otitis Media ED Reimbursement

Ranks		N	Mean Rank	Sum of Ranks
ed_reimbursement.2010 - ed_reimbursement.2008	Negative Ranks	165 ^a	116.19	19171.00
	Positive Ranks	81 ^b	138.40	11210.00
	Ties	345 ^c		
	Total	591		

a. ed_reimbursement.2010 < ed_reimbursement.2008

b. ed_reimbursement.2010 > ed_reimbursement.2008

c. ed_reimbursement.2010 = ed_reimbursement.2008

Test Statistics^b

	ed_reimbursement.2010 - ed_reimbursement.2008
Z	-3.611 ^a
Asymp. Sig. (2-tailed)	.000

a. Based on positive ranks.

b. Wilcoxon Signed Ranks Test

Figure 4 provides the Wilcoxon rank results for DeVos entire sample ED visits.

The mean of the ranks (negative ranks) in favor of 2010 ED visits was 293.63, whereas the mean of ranks (positive ranks) in favor of 2008 ED visits was 281.62. The test result for ED visits indicated a statistically significant difference between ED visits 2008 and ED visits 2010 for the entire population, $z = -3.710$, $p < .001$.

Figure 4. Wilcoxon Rank Test Results for DeVos Entire Sample ED Visits

Ranks		N	Mean Rank	Sum of Ranks
ed_visits.2010 - ed_visits.2008	Negative Ranks	330 ^a	293.63	96897.00
	Positive Ranks	246 ^b	281.62	69279.00
	Ties	1524 ^c		
	Total	2100		

a. ed_visits.2010 < ed_visits.2008

b. ed_visits.2010 > ed_visits.2008

c. ed_visits.2010 = ed_visits.2008

Test Statistics^b

	ed_visits.2010 - ed_visits.2008
Z	-3.710 ^a
Asymp. Sig. (2-tailed)	.000

- a. Based on positive ranks.
b. Wilcoxon Signed Ranks Test

Figure 5 provides the Wilcoxon rank results for DeVos otitis media ED visits. The mean of the ranks (negative ranks) in favor of 2010 ED visits was 85.96, whereas the mean of ranks (positive ranks) in favor of 2008 ED visits was 78.14. The test result indicated a statistically significant difference between ED visits 2008 and ED visits 2010, $z = -4.610, p < .001$.

Figure 5. Wilcoxon Rank Test Results for DeVos Otitis Media ED Visits

Ranks		N	Mean Rank	Sum of Ranks
ed_visits.2010 - ed_visits.2008	Negative Ranks	112 ^a	85.96	9627.00
	Positive Ranks	54 ^b	78.14	4234.00
	Ties	202 ^c		
	Total	368		

- a. ed_visits.2010 < ed_visits.2008
b. ed_visits.2010 > ed_visits.2008
c. ed_visits.2010 = ed_visits.2008

Test Statistics^b

	edvisits.2010 - ed_visits.2008
Z	-4.610 ^a
Asymp. Sig. (2-tailed)	.000

- a. Based on positive ranks.
b. Wilcoxon Signed Ranks Test

Figure 6 provides the Wilcoxon rank results for DeVos otitis media ED reimbursement. The mean of the ranks (negative ranks) in favor of 2010 ED reimbursement was 82.19, whereas the mean of ranks (positive ranks) in favor of 2008

ED reimbursement was 97.33. The test result indicated a statistically significant difference between ED reimbursement 2008 and ED reimbursement 2010, $z = -3.333$, $p = .001$.

Figure 6. Wilcoxon Rank Test Results for DeVos Otitis Media ED Reimbursement Ranks

		N	Mean Rank	Sum of Ranks
ed_reimbursement.2010 - ed_reimbursement.2008	Negative Ranks	118 ^a	82.19	9698.00
	Positive Ranks	55 ^b	97.33	5353.00
	Ties	195 ^c		
	Total	368		

a. ed_reimbursement.2010 < ed_reimbursement.2008

b. ed_reimbursement.2010 > ed_reimbursement.2008

c. ed_reimbursement.2010 = ed_reimbursement.2008

Test Statistics^b

	ed_reimbursement.2010 - ed_reimbursement.2008
Z	-3.333 ^a
Asymp. Sig. (2-tailed)	.001

a. Based on positive ranks.

b. Wilcoxon Signed Ranks Test

Significant Findings

The researcher identified significant finding for emergency department visits and emergency department reimbursement. Regarding ED reimbursement results, more individuals fell into a lower category in 2010 than in 2008. Some individuals had no ED reimbursement in 2008, but fell into higher categories in 2010.

Entire Sample

The test result for ED visits indicated a statistically significant difference between ED visits 2008 and ED visits 2010, $z = -4.082$, $p < .001$ ($p = .00004$) using Bonferroni (.05/7 alpha was .007), $p < \alpha$ (.007). The researcher rejected the null hypothesis because the results indicated an observation difference.

Otitis Media

The test result for ED visits indicated a statistically significant difference between ED visits 2008 and ED visits 2010, $z = -5.398$, $p < .001$ ($p = .000001$) using Bonferroni (.05/7 alpha was .007), $p < \alpha$ (.007). The researcher rejected the null hypothesis because the results indicated an observation difference. The test result for ED reimbursement indicated a statistically significant difference between ED reimbursement 2008 and ED reimbursement 2010, $z = -3.611$, $p < .001$ ($p = .0003$) using Bonferroni (.05/7 alpha was .007), $p < \alpha$ (.007). The researcher rejected the null hypothesis because the results indicated an observation difference.

DeVos

Otitis Media

The test result for ED visits indicated a statistically significant difference between ED visits 2008 and ED visits 2010 for the entire population, $z = -3.710$, $p < .001$ ($p = .0002$) using Bonferroni (.05/7 alpha was .007), $p < \alpha$ (.007). The researcher rejected the null hypothesis because the results indicated an observation difference.

The results for the Wilcoxon test for DeVos General Pediatric Clinic reflected that there were no statistically significant differences in inpatient admissions, inpatient

reimbursement, urgent care visits, urgent care reimbursement, and pharmacy reimbursement in 2008 to 2010. Results for ED visits indicated a statistically significant difference between ED visits 2008 and ED visits 2010, $z = -4.610$, $p < .001$ ($p = .000004$) using Bonferroni (.05/7 alpha was .007), $p < \alpha$ (.007). The researcher rejected the null hypothesis because the results indicated an observation difference. The observation distributions for 2010 and 2008 ED visit variables are shown in Figure 5. The test result for ED reimbursement indicated a statistically significant difference between ED reimbursement 2008 and ED reimbursement 2010, $z = -3.333$, $p < .001$ ($p = .0009$) using Bonferroni (.05/7 alpha was .007), $p < \alpha$ (.007). The researcher rejected the null hypothesis because the results indicated an observation difference.

Wilcoxon Test Results for Other Practices

The Wilcoxon test results for ABC Pediatrics PC, Alger Pediatric PC, Forest Hills Pediatric Associates, and Kent Pediatrics PC reflected that there were no statistically significant differences in inpatient admissions, inpatient reimbursement, urgent care visits, urgent care reimbursement, pharmacy costs, emergency department visits and emergency department reimbursement in 2008 to 2010.

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

Summary of Interpretation of Findings

This study examined the effect of implementation of the PCMH model on utilization of Medicaid children's health care services in Kent County, Michigan. The researcher hypothesized that implementation of the PCMH model would significantly contribute to changes in utilization. The Wilcoxon results for the entire sample and children with otitis media found a difference in ED visits and ED reimbursement. All of the significant findings for ED utilization indicated an increase in the number of zeros (no visit or reimbursement) for ED visits and ED reimbursement in 2010, which supports the decrease in utilization, and reimbursement (decrease in the number of binned statistics). An increase in the number of zeros was favorable because it represented a decline in the number of services utilized. The decrease in one visit statistics ranged from 12% to 29%. The decrease in two visits ranged from 21% to 47%. The decrease in three plus visits ranged from 56% to 74%. The decrease in the binned reimbursement amount that was greater than \$0 - \$100 ranged from 45% to 55%. The decrease in the binned reimbursement amount greater than \$100 - \$200 ranged from 17% to 33%. The decrease in the binned reimbursement amount greater than \$200 - \$300 was 13%. The decrease in the binned reimbursement amount greater than \$300 ranged from 45% to 54%. Kent Pediatrics, PC did not implement any PCMH interventions and inadvertently served as a control practice. Kent continued to provide health care as usual and their statistical data neither became better nor worse. The Wilcoxon results for children enrolled in DeVos

General Pediatric Clinic found a statistically significant difference in ED visits and ED reimbursement. This research supported previous studies that reported a reduction in emergency department visits and emergency department costs after implementation of the PCMH model. The findings also supported the use of the PCMH model to contain costs by promoting increased access and care coordination. The p value (critical value or level of significance) used to reject the null hypothesis was less than alpha .007. There were significant differences in the ED visits in the entire sample ($p < .001$) and children with otitis media ($p < .001$), and for DeVos General Pediatric Clinic's entire sample ($p < .001$) and children with otitis media ($p < .001$). There were significant differences in ED reimbursement in the entire sample for children with otitis media ($p < .001$) and DeVos General Pediatric Clinic children with otitis media ($p < .001$). Significant findings for DeVos General Pediatric Clinic indicated it followed the same significant findings for the entire sample and children with otitis media. Based on the research findings, the researcher rejected the null hypothesis for hypotheses number four, hypothesis number five and hypothesis number 14 because $p < \alpha$).

$H_1: M_{\text{before}} - M_{\text{after}} \neq 0$ There is a statistically significant difference in the medians for pediatric emergency department visits after implementation of the patient-centered medical home model.

$H_1: M_{\text{before}} - M_{\text{after}} \neq 0$ There is a statistically significant difference in the medians for pediatric emergency department visits after implementation of the patient-centered medical home model for pediatric patients with otitis media.

$H_1: M_{\text{before}} - M_{\text{after}} \neq 0$ There is a statistically significant difference in the medians for pediatric emergency department reimbursement after implementation of the patient-centered medical home model for pediatric patients with otitis media.

The results suggested that PCMH model health care service coordination, including chronic disease care coordination and management, decreased health care utilization and subsequent costs. The PCMH model service interventions that may be responsible for the decrease in emergency department use included office flow redesign, increased length of visits, PGIP certification, extended office hours, use of a disease registry, and use of GRAPE after normal office hours, and chronic condition care coordination and management.

Recommendations for Future Research

Recommendations for future research include future studies of similar design utilizing a larger number of primary care practices and using a systematic measurement of patient-centered “homeness,” which allows for examination and consideration of other functional and clinical outcomes. Future research could consider the power of two specific interventions of the PCMH model, office flow redesign and increased length of visits. Future research could consider examination and analysis of other types of practitioners and practices, using more stringent safeguards against confounders. Utilization assessment of PCMH diabetic children could be undertaken, because there were only 10 children diagnosed with diabetes in this study. Completion of future research in this geographic could investigate the low incidence of type one diabetes. Future research could examine the relationship between high costs events and high risk

children with chronic condition who may utilize more health care services at all sites. A detailed cost analysis may demonstrate better cost-effectiveness.

Limitations

The researcher used caution in generalizing the findings of this study. First, the researcher only gathered data on Medicaid children in only one state, Michigan, and only one county, Kent. Second, the researcher limited the number of chronic conditions included in the research to otitis media and asthma. The research did not allow for generalizability to diagnoses that were not included in the analysis, limiting the involvement of other conditions to the results. Third, generalizability for provider analysis of conditions by practice beyond the study's two chronic conditions, limited the observation for all other chronic conditions, for which PCMH interventions may have had a different or greater impact for children with other conditions. Fourth, an increase or decrease in emergency department utilization may have been secondary to the emergency department location, due to the structure of the primary care practice, and availability of other health care services. Parents and children may have had other health-seeking behaviors that improved utilization. Fifth, data extracted from submitted claims were subject to how providers coded diagnoses and procedures they used to obtain reimbursement. Validity threats during the research were history because anticipated outside events occurred during the study and maturation because the children matured over the three-year period. Sixth, there may have been some bias as a result of healthier Medicaid children selecting HMO and CHAP practices. The researcher did not randomly

select the children; therefore selection bias may have influenced the results. There may have been other explanations for the utilization effects since patients were not randomly selected.

Minimal numbers of children were admitted to the hospital, used the emergency department, urgent care, and the pharmacy; therefore, there were many zeros (no visit or no prescription) in the database. The low number of observations may have been because the fact that the research only looked at six months of data in each period. Data for this study only included the months of January through June and therefore not generalizable for the months of July through December. Some PCMH interventions implemented prior to 2008 may account for the low number of hospital admissions and ED visits in 2008 and 2010 for all five practices. The low hospital admission and ED visits may also have been due to parents and children having established an interpersonal relationship with the pediatrician prior to 2008. Further, practices' increased knowledge and understanding of managed care concepts, which included, gate keeping, and close monitoring of hospital admissions may also influence low admissions and visits.

This research did not address urgent versus non-urgent use of the emergency department, did not consider health care quality and provided results only applying a statistical analysis. This quasi-experimental design lacked the element of random assignment because the researcher used a predetermined experimental group. The longitudinal collection of data over a period of two years and measurement of more than one interval allowed for conditional changes over time. The researcher based the results on coded claims data and Priority Health enrollment files. The decrease in emergency department visits may have occurred in the midst of an existing downward trend of

emergency department use. The research did not address patient compliance with treatment plans, parent, or child related determinants. The research did not address health seeking behaviors, which may have accounted for changes in ED visits and ED reimbursement. There was no case mix adjustment made among the five practices.

Conclusions

The findings of this study indicated that the PCMH practice model changed utilization patterns associated with avoidable emergency department visits. The study found that implementation of interventions related to the PCMH model had the capability to improve access to primary pediatric care. Implementation of this model in several pediatric practices promoted practice redesign and transformation that included use of comprehensive measures that went beyond gate keeping (Gadomski, Jenkins and Nichols, 1998). The PCMH practice redesign components included patient engagement, provider-patient partnership, whole person care, culturally sensitive care, respect, shared decision-making, trust, and clinical-patient communication. Four practices implemented open scheduling methods to increase access to care that affected pediatric health care utilization. The increased access allowed for individual care provided by the PCMH practices and facilitated the establishment of a relationship with the patient and parent. The increased amount of time spent with the patient and parent enabled planned health care education, preventive health care services and well childcare.

Managed care gate keeping interventions employed by the practices appeared to be more effective in reducing hospital admissions, but the researcher required a different strategy to impact ED visit utilization. Coordinated, continuous, compassionate,

comprehensive, accessible, family-centered, and culturally effective care were the operational characteristics included in the implementation of the PCMH practice model. One implemented practice model strategy included utilization of physician-led health teams comprised of pediatricians, nurses, and case managers. These teams offered medical home elements, such as access to a health care practitioner, care coordination, education, and prevention activities. The PCMH model was advantageous in the treatment of otitis media by decreasing fragmented, episodic care in the ED. Four of the pediatric practices offered targeted interventions, such as an otitis media education program and disease registry. The data analysis indicated that otitis media program interventions were associated with a decrease in ED use for children with otitis media. One pediatrician provided the essential services associated with PCMH model interventions of acute care treatment, sick visits during the day, increased evening hours, and continuity of care (Brousseau, Dansereau, Linakis, Leddy and Vivier, 2002). The PCMH model afforded the perspective of a stable medical home that decreased the risk of the patient and parent seeking care in the ED.

Previous to the availability of the PCMH model some Medicaid children in Kent County rarely had access to primary pediatric care. This access disparity deferred Medicaid pediatric care to the ED, which lacked the element of continuity of care and pervaded fragmented care. Implementation of the PCMH model provided the opportunity to close the disparity gap and provide positive health outcomes. Based on the analysis of these outcomes, Medicaid children in Kent County had health care access barriers reduced resulting in decreased ED visits and ED reimbursement. This study supported the Kent County Health Department report, “Monitoring child health in Kent County: Report

to the community” (1999). Both the analysis and the report indicated that avoidable ED visits could be prevented by timely, effective primary care. In conclusion this study demonstrated that improved primary health care services provided to Medicaid children by PCMH model practices changed emergency department utilization. The researcher will share the results with Priority Health and participating practices to assist with ongoing programmatic assessment and strategic planning. Managed care organizations, other payers, health care providers, and policy makers should strategically consider PCMH implementation as an improved model of care.

APPENDIX A

PCMH MODEL INTERVENTION DATA COLLECTION

Name of Practice _____

Implementation Date _____

Type of Interventions from January 1, 2009 to December 31, 2009

- Patient and parent education
- Office flow redesign
- Electronic medical records (EMR)
- E-visits (visits by e-mail)
- Telephone encounters
- Intensive diabetes/asthma case management
- Extended office hours Hours _____
- E-prescribing
- Online prescription refills
- Increased length of time spent during visits
- Telephone triage
- Disease registry
- Group visits
- Asthma initiative
- Otitis media initiative
- Direct access to specialists
- Participatory Design Workshops
- Increased Staffing Position _____
- Team Huddles
- Same Day Appointment _____
- ED telephone follow-up call
- Asthma/diabetes/otitis media follow-up call
- Instructed patients to use the emergency department when they could not get a same day appointment

Other interventions and process improvements: _____

Number of family practice physicians _____

Number of general internists _____

Number of pediatricians _____

Other physicians type _____ Number _____

Number of nurse practitioners _____

Number of physician assistants _____

Laboratory in the office _____

Pharmacy in the office _____

Radiology in office _____

Urgent care in office _____

Urgent care nearby _____

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