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The Role of the Nurse Practitioner in the Patient-Centered Medical Home

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Abstract

The Patient Centered Medical Home (PCMH) was established to improve patient access to high quality, cost-effective primary care. Critical to this new model of care is the optimal utilization of nurse practitioners (NPs) in performing services traditionally offered by physicians. This study compared the roles of NPs and physicians in providing primary care in two PCMHs in a local health care system.

During the calendar year 2011, a total of 50,471 patient visits occurred in the two PCMHs. Each PCMH consisted of a Traditional Clinic that saw patients on a scheduled basis and a Convenient Care Clinic that accepted walk-in visits. Comparisons between NPs and physicians were conducted according to PCMH site and clinic type for the following variables: 1) number of patient visits per provider Full Time Equivalent (FTE); 2) patient age and gender; 3) level of patient health as measured by the Charlson Index; and 4) prevalent International Classification of Diseases, Revision 9 (ICD-9) diagnostic codes assigned to patients.

Generally, NPs saw fewer patients per FTE than physicians at the Traditional Clinics but more at Convenient Care. NPs also treated more female and younger patients across PCMHs. The Charlson Index showed patients in both PCMHs to be predominantly healthy but NPs tended to treat less complex problems than physicians. NPs' ICD-9 diagnostic codes more frequently concerned minor, acute illnesses or well person examinations compared to physicians who assigned codes indicative of chronic conditions. The differences between NPs and physicians across settings appear to be linked to PCMH organizational processes that disparately triage patients in the Traditional versus the Convenient Care Clinics. In conclusion, NPs are underutilized

regarding the range of patients and health conditions they could appropriately address in these settings. Suggestions for more strategic and efficient distribution of NP services were offered.

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Introduction

Evolution of the Nurse Practitioner Role

Since the development of the nurse practitioner (NP) profession in 1967, the role of the NP has continued to evolve within the United States (US) health care system (Sullivan-Marx, McGivern, Fairman & Greenberg, 2010). Lowe, Plummer, O'Brien and Boyd (2011) emphasized that understanding NP role utilization, or how the NP functions in a particular health setting or when treating specific health conditions, is an essential first step in effectively evaluating efficiency, cost-effectiveness and outcomes of care.

Historically, the NP role was developed to address health care disparities, particularly for children living in rural or underserved areas (Driscoll, Worrall-Carter, O'Reilly & Stewart, 2005). Over the past half century, Moote, Krsek, Kleinpell & Todd (2012) reported the contemporary NP role has expanded to include health services that traditionally were performed by physicians. Many meta-analyses and health outcome studies have demonstrated that primary care services provided by NPs yield outcomes similar or superior to those of physicians (Browne & Grimes, 1995; Hing, Hooker & Ashman, 2011; Horrocks, Anderson & Salisbury, 2002; Lenz, Mundinger, 2003). Yet, despite the passage of nearly 50 years since the formation of the NP profession, lack of clarity and understanding about the scope of practice and optimal utilization of the NP role in various care delivery models continues to exist (Fairman, 2008).

Scope of Practice and the Nurse Practitioner Role

Ambiguity regarding optimal utilization of the NP role and differences in descriptions of the NP scope of practice has been present since the founding of the

profession (Gardner, Chang & Duffield, 2007). The question is circular: Is the NP role defined by scope of practice or does scope of practice delineates the NP role? The interrelationship between these two concepts and the lack of a uniform description has contributed to the confusion about the NP role and how to fully identify and optimize the NP's contribution to care.

The American Nurses Association (2011) characterized scope of practice as the "who, what, where, when, why and how" of nursing practice, including advanced practice nursing. The American Academy of Nurse Practitioners (AANP, 2012) further defined the NP scope of practice as the intermingling of nursing and medical education, knowledge, and services for populations across age groups and care continua.

The NP scope of practice is in regular flux and continues to vary widely across the US. Seventeen states authorize the NP's full statutory authority of practice based upon NP education and training without mandatory physician oversight (AANP, 2012). Six states require physician involvement for NP prescriptive authority. The remaining twenty-seven states continue to mandate varying degrees of Board of Medicine involvement in the NP's legal scope of practice (AANP, 2012). The different scope of practice laws within the latter two groups of states impede NPs from performing to their highest capacity and consequently impact how the NP role is utilized in various care delivery models. Conversely, the role that the NP serves in health care environments with inconsistent state governing rules may expand or promulgate existing scope of practice differences (Christian & Dower, 2007).

Bryant-Lukosius, CiCenso, Browne and Pinelli (2004) described how the lack of clarity and definition of the NP role in various health systems can lead to underutilization

of the NP's skills with resultant adverse effects on care delivery. The authors reported that systematic planning using an evidence-based strategy to identify what the NP *is currently* doing and what the NP *could be* doing in patient care is crucial to optimal NP role implementation.

Carryer, Dunn and Gardner (2007) reported three practice domains that characterize the NP role in care delivery models: dynamic practice, professional efficacy and clinical leadership. Dynamic practice involves high level clinical practice skills and decision-making in patient care. Professional efficacy involves NP autonomy and accountability throughout the continuum of care. Clinical leadership derives from a foundation of clinical excellence and advanced education. The authors stressed that NP self-awareness of one's personal practice domains along with the health system's understanding of how the NP needs to function to reach goals are essential for efficient, accessible and best quality service.

Recognizing the importance of clear and consistent definitions describing the advanced practice role, the National Advanced Practice Registered Nurse (APRN) Work Group and the National Council of State Boards of Nursing (NCBSN) (NCSBN, 2008) created the Consensus Model for APRN Regulation: Licensure, Accreditation, Certification and Education (LACE). The document defined the APRN scope of practice and regulatory model, identified titles and roles, and presented recommendations and strategies for states' adoption of the LACE model by 2015. According to LACE, advanced practice nurses should be licensed as independent practitioners with full scope of practice authority regulated by the applicable State Board of Nursing (NCSBN, 2008).

Adoption of this model would promote uniformity of APRN regulation and allow for consistent understanding and definition of the NP role.

In 2010, the Institute of Medicine (IOM) released a cutting-edge policy statement regarding the nursing role in the US health system reform efforts. These recommendations encompassed the areas of scope of practice, education, leadership and workplace. In this policy statement, the IOM stressed that the growing demand for health care access and services and the impending primary care physician shortage require that NPs practice at the full scope of education and training. Identification of the role that NPs must serve in care delivery models to bridge the physician gap is a crucial first step toward meeting the health care needs of the population.

Primary Care Provider Supply and Demand

The American Association of Medical Colleges (2012) reported that the US will experience a deficit of 91,500 physicians by the year 2020. Fifty percent of this shortfall will be in the area of primary care. If recent U.S. health care reform proposals take effect, it is projected that this physician shortfall will increase by an additional 25% as more Americans are covered by universal health insurance and seek health services.

The American Academy of Nurse Practitioners (2012) reported the supply of NPs is growing faster than the supply of physicians. With over 89% of NPs educated in primary care, expansion of care provided by NPs will be a critical part of the solution to the primary care physician shortage (Cooper, 2010; Cunningham, 2010). The National Council for Health Statistics (2011) recommended examination of the current reliance and utilization of the NP role in care delivery as a necessary step for appropriate planning

on how the US health system can address the looming provider workforce shortage and meet the need for health services for the nation's population.

Development of the Patient-Centered Medical Home Model

Stange (2009) reported that traditional U.S. health care delivery is broken: afflicted with unsustainable escalating costs, access disparities, and poor quality and coordination of care. Fragmentation of health care services is the core problem that results in the ineffectiveness of the current system. In anticipation of US health care reform efforts, the impending physician shortage and the increasing prevalence of chronic diseases, many health systems are reorganizing the way primary care is delivered.

The Patient-Centered Medical Home (PCMH) is one of these evolving care delivery models. The Agency for Healthcare Research and Quality (AHRQ, 2012) defined the PCMH not as a place but a model of primary care that provides the core functions of primary health services. The PCMH is an innovative, coordinated care delivery model created to reduce the cost of health care and improve health outcomes through use of electronic technology, evidence-based medical guidelines and care teams. PCMH care teams may be led by NPs, physicians or physician assistants. The teams can apply for national credentialing and recognition as a PCMH (Joint Commission, 2011; National Credentialing for Quality Assurance (NCQA), 2010; AHRQ, 2011; Utilization Review Accreditation Commission (URAC), 2011).

The contemporary definition of a PCMH includes attributes of enhanced care access and continuity, identification and management of population-based care, promotion of self-care and community resources, tracking and coordination of care, and measurement and improvement of provider performance in meeting targeted health

outcomes (NCQA, 2010). The PCMH philosophy focuses on a patient-centered, coordinated, team-based approach to care delivery that requires full utilization of all team members' education and skills. In addition, team members share accountability for health care delivery outcomes.

The goals of a PCMH reflect the triple aims of the national health care agenda of cost containment, care quality and positive patient experience (AHRQ, 2012). As the physician shortage accelerates, there is increased awareness that NPs will be a crucial component of the PCMH care team's success in achieving the goals to improve health care access and meet the demand for health services (Deloitte, 2010). Mendez (2012) emphasized that health systems should have ongoing and up-to-date knowledge of the roles of all the health care team members. Failure to measure and fully employ the NP role and lack of knowledge of the interdependency between roles create barriers to goal achievement and effective health care quality improvement (Mendez, 2012).

The Utilization Dilemma of the Nurse Practitioner Role

A coherent method to identify and examine how the NP role is utilized when providing direct patient care is lacking (Hughes, 2010). Optimal utilization requires that each NP practice to the full extent of education and training (IOM, 2010). Lowe, Plummer, O'Brien and Boyd (2012) highlighted how variations in role definition and function contribute to barriers that hamper adequate utilization of the NP role, thus negatively impacting health care delivery. Inconsistency in state regulations governing NP scope of practice, historical precedents, institutional policies and procedures, and the NP's own self-determination of role are factors that contribute to the inconsistency in ideal utilization of NPs in care delivery.

Additional variables that may influence how the NP role is integrated into care delivery models involve core societal, medical and health system values (Hughes et al, 2010). For example, health system policies that intentionally triage those patients with lower acuity health issues to NPs, or that foster attitudes that physicians are the only providers who assure quality health care, prevent the NP from fully exercising role potential (Christian, Dower & O'Neil, 2007).

Newhouse et al (2011) stated that currently there is no consensus on which models of care work best or how effectively NPs can contribute to cost-effective, improved access and quality of care in new care delivery models such as the PCMH. As more PCMH initiatives develop and the health care workforce shortage worsens, there is growing recognition of the need to understand the NP role in care delivery, productivity, financial performance, and health outcomes. Reliable and valid data on the role of the NP in the PCMH will allow health systems and health care teams to determine if current NP utilization patterns are adequate for successful accomplishment of improved access, lower overall cost and improved health outcomes. Better comprehension and articulation of the distinctiveness of the NP role will also guide determination of what models of care best utilize and integrate NPs into the team-based collaborative care model.

NP Role-Sensitive Characteristics

NP education and practice is based upon the nursing model of care. The core focus of the practice of nursing is the protection, promotion, and optimization of health and prevention of disease in individuals, families, and communities (ANA, 2012). The model is holistic with the focus placed upon the human responses rather than the disease itself. Alleviation of suffering from disease is approached through scientific inquiry,

evidence-based clinical decision-making and treatment of the illness within the context of the individual, social network and environment (ANA, 2012). In the nursing model, the NP provider works collaboratively with patients, families, physicians and other care team members and considers quality of life, costs, safety, significant relationships, and patient preferences and values when choosing clinical treatment recommendations (NONPF, 2012).

Central to the medical model is the concept of disease and illness within the human body. The medical model approach to human illness is focused on objective, measurable observations (Laing, 1971). The patient's physical examination findings and test results provide the ongoing empirical evidence for diagnosis and treatment of the disease (Zigmond, 2012). In the medical model, the physician is viewed as the expert and final authority on medical matters (Laing, 1971).

Understanding the differences and similarities between the nursing and medical model approach can help in recognizing the unique contributions that an NP can bring to the care team. Holistic, NP sensitive indicators such as relational skills, patient and family satisfaction, quality of life and functional status, promotion of wellness and health education, and care planning and coordination illustrate the complementary role that NPs perform with physicians (Ingersoll, McIntosh & Williams, 2000). Knowledge of these NP-sensitive indicators will promote a stronger understanding and provide greater direction in determining the optimal utilization of the NP as a partner with physicians in care delivery.

Review of Literature

Governmental sources, physician associations and policy leaders have issued repeated warnings regarding the impending physician shortages, particularly in primary care. The US health system is in crisis, experiencing escalating costs despite ongoing fragmentation of services. As a result, health systems are designing innovative care delivery models and directing more attention to the utilization of NPs as a cost-effective and quality way to meet health care demands. Little is known about the role that NPs serve in the new care delivery models. It is this current and predicted future status of US health care delivery and the need to understand the role of NPs in changing health care paradigms that provide the context for this review of literature and study. The review of supporting literature is divided into five sections: 1) Epidemiologic relevance of the primary care physician shortage; 2) NP workforce and physician shortage; 3) Quality of care provided by NPs; 4) Gaps in nursing science, and 5) The NP role: Asking the right questions.

Epidemiologic Relevance of the Primary Care Physician Shortage

The U.S. is facing a significant deficit of primary care providers that is expected to worsen in the coming years. According to the Department of Health and Human Services (2009), a proportion of 2,000 people to one primary provider are considered the maximum ratio to meet the primary care needs of a given population. This ratio may be overly optimistic. Bodenheimer and Phang (2010) reported that primary care practices handling a patient panel of 2,000 patients to one physician find it difficult to provide easily accessible, high quality care. Yarnall, Pollak, Ostbye, Krause, & Michener (2009) calculated that this ratio would require that the physician expend more than 17 hours

daily to provide the recommended preventive, acute and chronic disease management services. Together, the dual problem of physician shortage and inadequate hours to provide care will further exhaust the ability to meet health care demands (Bauer, 2011).

The Centers for Disease Control and Prevention (CDC) estimated that currently the United States needs an additional 16,003 primary care professionals to achieve the ratio of one physician for every 2,000 patients (CDC, 2012). Presently this represents a ten percent shortage and is consistent with the Healthy People 2020 estimate of the number of Americans that lack access to needed health care services. The limited availability of primary care services is particularly concerning for Missouri citizens. A study from America's Health Rankings (2011) rated Missouri 40th among the 50 states in overall health quality. The percentage of Missouri citizens living in health care shortage areas exceeds the national average. Kaiser (2012) indicates that 23% Missouri citizens live in primary care professional shortage areas compared to 11% nationally.

In 2011, the American Association of Medical Colleges (AAMC) issued a report that the physician shortage is anticipated to quadruple over the next ten years. The AAMC predicts Americans will need an additional 45,000 primary care physicians and 46,000 surgeons and specialists by 2020. This number may be an underestimate. Patients that have delayed seeking health care due to access problems may already have developed complex health problems that would further increase time demand on an already dwindling supply of providers (Hale, 2010). The shortage of primary care physicians threatens to develop into a major crisis if not addressed.

The primary care shortage is particularly critical within inner-city and rural areas, where access to health services is least prevalent. The U.S. Department of Health and

Human Services (HHS) reported that as of February 2012, there were 5,816 Primary Care Health Care Professional Shortage Areas in the United States with a combined population of 59.3 million people living in them. Availability of primary care professionals within a specific distance and the waiting time needed to receive services from the provider are considered when determining whether a region is a Professional Shortage Area. Americans, who are uninsured, have public health insurance, are racial minorities or have lower income are those most likely to live in such areas (HHS, 2012).

The Kaiser Commission on Key Facts (2011) reported that currently 255 million people in the U.S. have some type of private or public health insurance. Since the Supreme Court upheld the Individual Responsibility Mandate requiring all Americans purchase to health insurance, an additional 32 million Americans will be added to the ranks of Medicaid or publically insured populations (Cheung, 2012). More Americans seeking health care will further aggravate the primary care physician shortage that already exists and place a greater strain on providers and health systems attempting to meet health care demands.

Ku et al (2011) assessed how the addition of 32 million publicly insured Americans would be apportioned across the 50 states and District of Columbia. The ability of primary care providers to address the health needs of these additional insured patients, called a primary care capacity index, was evaluated for each region. An access-challenge index score was assigned to each region to identify the ability to meet primary care needs of this additional insured population. The local health system that will be involved in this study is located in the top 23% of those states expected to experience the greatest increase in demand for primary care services (Ku et al, 2011).

The geographic disparities of primary care physicians are particularly relevant for the health system in this study. In almost every community where this health system provides services, the average number of physicians per 100,000 residents is 26% below the national average (Platform, 2010).

Cheung (2011) emphasized that the imbalance between supply and demand will leave many Americans with insufficient care. McKinlay and Marceau (2008) predicted that by 2025, most primary care physicians will have disappeared from the health care scene. The impending physician shortage is leading to an unsustainable US health system unless action is taken to resolve the shortage of providers.

A key component contributing to this growing shortage is the decreasing number of physicians choosing the primary care specialty. Fifty years ago, 50 per cent of physicians chose to pursue family medicine. By 2000, these numbers had decreased to 14 per cent. Today, just nine percent of medical school graduates seek a career specialty in primary care (American College of Physicians, 2008).

In addition, physicians are restructuring work schedules to accommodate personal lifestyle choices which will further decrease the availability of primary care physicians. The American Medical Group Association (2012) conducted a health care workforce survey that revealed 22% of male physicians and 44% of female physicians are working part-time. The U.S. Department of Health and Human Services (2012) reported that one third of physicians will be retiring by 2020, while the supply of physicians will increase by just seven percent.

The anticipated shortage of physicians is particularly acute in the State of Missouri. Becker and Porth (2011) issued a report indicating that 55% of Missouri

physicians are 50 years of age or older. This percentage jumps to 62% for physicians who practice in rural Missouri. The declining number of physicians entering the workforce and the anticipated baby boomer physicians exiting practice require new strategies to address future demands for primary care health services.

Another significant factor that will contribute to increased demand is the growing population of older adults with associated chronic health conditions that require more frequent and complex care. The AAMC (2012) and Centers for Medicaid and Medicare Services (CMS) (2012) have recommended increased financial support for primary care medical and NP residency programs and more effective utilization of advanced practice nurses and physician assistants.

Nurse Practitioner Workforce and the Physician Shortage

While the rate of physicians entering the primary care specialty is dwindling, the number of advanced practice nurses entering the workforce remains strong. An Advanced Practice Registered Nurse (APRN) is a registered nurse who pursues education at the master's or doctoral level (ANA, 2010). The APRN is educated with advanced knowledge and skills to care for special patient populations in both the ambulatory and acute care settings. There are four distinct roles of an APRN: the certified registered nurse anesthetist, the certified nurse mid-wife, the clinical nurse specialist and the NP. It is the role of the NP that is most critical to the future of primary care delivery (Naylor & Kurtzman, 2011).

The NP Healthcare Foundation (2011) reported that NPs represent the largest growing workforce of health care providers in the U.S. Between 1995 and 2006, primary care medical residency programs decreased by three percent while primary care

education programs for NPs increased by more than 60 percent (Cooper, 2009). Pohl (2010) reported that NPs are the group of health care professionals that have the greatest potential to help alleviate the growing primary care provider shortage.

As of 2011, there were over 158,000 NPs in the United States and the number continues to grow (AANP, 2011). The Government Accountability Office (2009) reported a nine percent NP growth rate over the past 10 years compared to a growth rate of just over 1 percent for physicians. The Kaiser Family Foundation (2010) reported there are approximately 8,000 newly graduating NPs entering the workforce each year and 7,000 of these new graduates are prepared as primary care providers (Pohl, 2010), which nationally represent 25 percent of all primary care providers (Bodenheimer & Pham, 2010).

Sargen, Hooker, and Cooper (2011) stressed that the decreasing primary care physician workforce will require the role of NPs and physician assistants in health care delivery to be expanded to help address the growing provider shortages. Stange and Sampson (2010) conducted an analysis on the distribution of NPs and physician assistants across the US. Their analyses revealed that in many counties across the nation, the NP is the principal provider of primary care services.

Health systems are increasingly seeking the services of NPs to meet health care demands. The CDC (2011) conducted a review of care provided by NPs in hospital outpatient departments from 2001 to 2009. Hospital outpatient visits attended only by NPs increased by 50%. NPs saw a higher percentage of visits where a new, undifferentiated problem was the major reason for the visit. A higher percentage of visits attended by NPs also occurred in rural and underserved areas. Lowes (2011) asserted that

research has demonstrated that NPs provide safe, quality patient care. Filling the growing demand for health services will never succeed without NPs assuming a significant part of the work previously performed by physicians (Sargen et al, 2011).

Integrating NPs into the primary care provider workforce may expand the capacity of primary care services and increase the number of health professionals to provide that care. Sargen, Hooker & Cooper (2011) indicated that utilization of NPs is necessary to sustain the primary care workforce but may not be sufficient to fully offset physician shortages. Moote et al (2011) calculated that even if the supply of NPs and physician assistants doubles by 2025, and all are involved in clinical practice, there will still be a 50% shortfall of primary care providers. Elimination of barriers that prevent NPs to practice to the full extent of education and training is recommended to create the most efficient use of this labor force (Sullivan-Marx et al, 2011). Redirecting physician services to address complex cases and transformation to an innovative, coordinated care delivery model are essential steps to ensure that the U.S. health care workforce can adequately meet Americans health care demands (Yarnall et al, 2009).

Quality of Care Provided by Nurse Practitioners

The role of the NP initially emerged in the 1960s specifically to address health care disparities for children living in underserved areas (NPHF, 2009). In the past 50 years since the creation of the NP role, repeated studies have demonstrated equivalence of NP and physician primary care delivery outcomes (Mundinger et al, 2000; Lenz et al, 2004; Fairman, 2008; Hughes et al, 2010).

As early as 1974, a Canadian randomized trial comparing physicians to NPs found no significant differences between patient outcomes including mortality, patient

satisfaction, and overall patient functioning (Spitzer et al, 1974). The findings revealed NP care produced significantly lower hospital admissions, shorter hospital inpatient days, increased productivity of the medical practice and quality outcomes equivalent to physicians (Spitzer et al, 1974).

In 1986, the US Office of Technology Assessment (OTA) compared the care provided by advanced practice registered nurses and physician assistants to that of physicians and determined that the quality of care was equivalent. The OTA also found that practitioners were more adept at patient communication and preventive screenings than physicians. It was the OTA's opinion that studies comparing NPs to physicians, based on the medical model as the gold standard of care, were biased against NPs because the studies failed to capture their unique contributions (OTA, 1986). Additional investigation was recommended.

Brown and Grimes (1995) conducted a meta-analysis of patient outcomes of NPs and nurse mid-wives (NMWs) compared to physicians. The sample included a review of 38 NP and 15 NMW randomized studies. Thirty-three outcomes were analyzed. Findings indicated greater patient concordance with NP treatment recommendations, higher patient satisfaction and more frequent resolution of health conditions from NP care compared to physicians. Rates of drug prescribing were equivalent. Although not statistically significant, nurses ordered more laboratory tests. Nurse mid-wives used less anesthesia in obstetrical care than physicians. Neonatal outcomes of care provided by NMWs compared to physicians were equivalent (Brown & Grimes, 1995).

Mundinger et al (2000) conducted a randomized trial on the quality of NP care by comparing health outcomes on post emergency room patients randomly assigned to either

a primary care physician or NP at five primary care clinics in New York. The NP had the same degree of independence as physicians. Surveys completed by patients and review of health service utilization records were obtained on 1,316 patients. Findings indicated that NP and physician patient health outcomes were comparable at the initial visit and at six and twelve months. Lenz et al (2004) in a two year follow-up study found patient outcomes in the areas of health status, physiologic measures, patient satisfaction, and use of specialist, emergency room or inpatient services were equivalent for NPs and physicians.

Horrocks, Anderson and Salisbury (2002) conducted a systematic review of whether NPs working in primary care can provide care equivalent to physicians. Eleven randomized controlled trial and 23 observational studies comparing health outcomes, patient satisfaction, processes of care and costs between NPs and physicians as first point of contact for undifferentiated health problems in a primary care setting were reviewed. No differences in health status were identified. There was higher patient satisfaction with care provided by NPs. Prescribing patterns, consultation with other providers and referrals were equivalent (Horrocks, Anderson & Salisbury, 2002).

Laurant, Reeves, Hermens, Braspenning, Grol, et al (2009), in a 1999-2002 Cochrane Collaboration review of 25 articles on the substitution of nurses for doctors in primary care, reported that appropriately prepared nurses can produce high quality care equivalent to physicians. The authors did not limit the review to care provided solely by NPs but rather by any qualified nurse substituting for a physician. No appreciable differences were found when comparing health outcomes, processes of care, resource utilization or costs between physicians and nurses (Laurant et al, 2009).

More recent studies have produced similar results. Primary care provided by NPs has been repeatedly found equivalent to that of physicians in effectiveness, treatment and prescribing patterns, and overall patient health status outcomes (Hughes et al, 2010). Additionally, NPs frequently rated higher than physicians in overall levels of patient satisfaction, consultation time and preventive screenings (Mehrotra et al, 2009; Seale, 2006).

Newhouse et al (2011) conducted a systematic review of 107 studies published between 1990 and 2008 on outcomes of APRN care. The findings indicated that advanced practice nurses provided safe, effective, high-quality care in a variety of settings and populations. The authors recommended additional research into the APRN practice style to identify optimal utilization of the NP role as a provider of health care services.

Wright, Romboli, Ditulio, Wogen, and Belleni (2011) conducted a study comparing outcomes of hypertension treatment between physicians and NPs practicing in the northeastern US, where NPs have full scope of practice authority. The retrospective review of patients with similar demographics treated by NPs and physicians revealed a slightly better control of blood pressure in the NP group. The mean number of prescribed antihypertensive medications was lower in the NP group compared to the physicians.

It is important to understand that these studies demonstrate equivalent care outcomes to physicians when the NP is practicing within the context of the legal scope of practice. It is not to imply that NPs can replace physicians or that NP education is equivalent to that of physicians. What it does demonstrate is that NPs can help fill the shortage of primary care providers without compromising quality.

Gaps in Nursing Science

Despite years of research, chasms remain in nursing science on many aspects of care delivery by NPs, how the NP performs in the role and how it differs from that of physicians (Wilson, 2008). Jenkins (2003) reported that in the National Ambulatory Medical Survey, only two percent of participants were NPs. The researcher recommended that national surveys be expanded to include input from NPs.

Morgan, Strand, Qsbye and Albanese (2007) conducted a review of the 2003 data files from the National Ambulatory Medical Care Survey, the National Hospital Ambulatory Medical Care Survey, the Medical Expenditure Panel Survey and the Community Tracking Study. Findings revealed that current surveys fail to adequately capture information regarding the contributions of advanced practice nurses compared to other providers of health care services. Surveys that include activities from just one profession, that of medicine, without fully reflecting activities and roles of NPs and physician assistants may underestimate the full contribution and potential that other providers bring to the health care team. The authors recommended that national health surveys be redesigned to accurately analyze and summarize the NP role in care delivery models (Morgan et al, 2007).

Fletcher (2011) conducted a study on the perceptions of NPs and physicians regarding NPs' roles as primary care providers in seven Midwestern Veterans Administration (VA) health centers. NPs in the VA system practice at the full scope of practice without the requirement of mandatory physician oversight. Fletcher (2011) indicated that health outcomes of patients treated by physicians and NPs were equivalent. Fletcher (2011) also reported that NPs in the study were more likely to be caring for

patients with lower comorbid health conditions than physicians. No inquiry was conducted regarding the variables that may have contributed to the NP role in caring for patients with less complex health problems. Survey findings suggested that physicians tend to underestimate the NP role and what NPs do autonomously for patients.

The Nurse Practitioner Role: Asking the Right Questions

Advanced practice nursing continues to evolve and push the traditional boundaries of practice, leading to rising degrees of professional autonomy (Wong & Chung, 2006). This autonomy has led to the founding of NP-led medical homes, private clinics, and various NP delivered services (Lowe, Plummer, O'Brien, & Boyd, 2012). It is nursing's ever expanding scope of practice that makes it even more critical to delineate the role the NP serves in contemporary care models. Bryant-Lukosius et al (2004) emphasized that the search for role clarity should be approached with the mindset that NPs provide care from a nursing perspective that is patient-centered and health focused, and complementary rather than a substitute or extension of traditional medical models. For NPs to have an impact on health delivery and outcomes, a clear understanding of NP practice is essential (Lowe et al, 2012).

Application of advanced nursing knowledge and experience defines the very essence of traditional nursing practice. NPs have the unique ability to move back and forth between the professional boundaries of medicine and nursing. It is this role overlap, to the chagrin of professional medical associations, which elicits protests of patient safety and quality concerns from some physicians. Hughes et al (2010) suggested that rather than narrowing the inquiry to physician/NP comparability, the focal point should be centered on contexts of NP care. Solely using physician practice as the gold standard to

measure NP effectiveness of care may not capture those values that are reflective of advanced practice nursing (Ingersoll, McIntosh, & Williams, 2000).

Identifying what the NP is doing within evolving care delivery models is essential to capture role clarity (Lowe et al, 2012). This knowledge will allow for further discussion and evaluation of whether implementation of the NP role is on target to reach the desired outcomes. Expanding inquiry questions to explore under which circumstances NPs are the best choice for meeting patients' and health system needs can then be explored (Hughes et al, 2010). Articulating a clear identity of roles that can be assumed by NPs under the right circumstances in team-based, patient-centered care models is essential.

Literature Review Conclusion

Physician shortages are anticipated to worsen over the next decade, particularly in primary care. The NP workforce is growing. Despite well-documented studies demonstrating that NPs provide safe, high-quality patient care, confusion continues to exist about the role that NPs should optimally assume in new care delivery models. Understanding how the NP role is utilized in the PCMH allows for accurate assessment and future planning that the health system must implement to enhance organizational effectiveness and meet future health care demands.

Background of the Study

Description of the Study's Patient-Centered Medical Home

In 2010, a local health system situated in the Midwestern United States began participation in a patient-centered medical home (PCMH) pilot study. The local health system was transforming its care delivery and recognized the importance of other

professional disciplines in a team-based model of meeting health care needs. Two medical clinics of this local health system were chosen as medical home pilot sites. At these sites, the local health system adopted a physician-led medical home model collaborating with care team members who may be composed of NPs, physician assistants, nurse care managers, pharmacists, ministers and other health care workers.

The two medical home pilot sites earned Level Three National Credentialing for Quality Assurance (NCQA) accreditation, the highest recognition possible for a PCMH (NCQA, 2011). PCMH recognition is contingent upon the practice meeting specific criteria in six standard categories. These categories include: 1) access during office hours, 2) using data for population management, 3) care management, 4) self-care process, 5) referral tracking and follow-up, and 6) implementation of a continuous quality improvement process (NCQA, 2011).

One of the primary goals of the local health system's medical home concept was to increase access and improve health outcomes through convenient extensions of primary care access points (Sock & Hale, 2009). Kirby (2010) reported that providing enhanced access to care can lead to earlier diagnosis, prompt treatment for acute or changing chronic health conditions, and prevention of potentially more serious health emergencies. To increase the capacity to provide health care services and improve overall health care access, the two pilot sites hired additional NPs.

In addition to increasing the number of providers, the local health system established a Convenient Care Clinic (CCC) adjacent to the two traditional primary care clinics. The CCCs offer extended hours for patients to receive services without an appointment. The Traditional Clinic (TC) provides patient care by appointment only. The

NPs are an integral part of the PCMH, alternating between the CCC and TC. Physicians of both PCMHs treat patients at the TC location. While physicians initially worked in the CCC, they now consult and treat patients only at the request of the NP.

The Health System's Electronic Medical Record

Patient data is managed through EPIC, the electronic medical record (EMR) used by the local health system. EPIC is easily accessible at all of the health system's patient care locations as well as through mobile devices and allows for easy tracking and care coordination. Data can also be collected for population and care management, referrals and quality improvement processes. The local health system's technology team built an infrastructure within EPIC to track physician metrics such as the impact of the PCMH on Emergency Department admission and readmission rates, number of patients treated and specific health outcomes.

Currently, EPIC PCMH dashboards are designed to record patient data only under a physician's name. EPIC is not configured to retrieve information under a NP provider name or identify the setting where the NP provided care. Information regarding NP services is aggregated within the physician team data and therefore is invisible to any internal review.

This study is unique in that it queried and extracted data associated with the role of the NP in the PCMH that previously had been inaccessible. This study was an essential first step to identify the value of the NP in the PCMH. The local health system also expressed interest in a follow-up study to assess the quality gains from inclusion of the NP on the PCMH team (T. Hale, personal communication, April 13, 2012).

Project Rationale

National and Local Health Care Initiatives

Healthy People 2020 identified a 10% baseline of Americans that experience barriers to health care services and targets a 10% improvement by the year 2020 (healthypeople.gov, 2011). Accordingly, Healthy People 2020 cited several objectives such as increasing the number of people who have health insurance, expanding coverage for preventative services, and providing a regular source of primary care and evidence-based clinical services. Ultimately, the Healthy People 2020 goal is to decrease the number of Americans who either lack, or experienced delay in receiving, timely medical and dental care or medication.

In alignment with the Healthy People 2020 objective to improve access to health services, the local health system instituted a redesign of traditional health care delivery called the New Model of Care (Sock & Hale, 2009). The mission of the New Model of Care is to provide timely health care at the "right place and right time" (Sock & Hale, 2009). A major component of the New Care Model is the alignment of physicians and NPs to maximize access to multiple touch-points of care (Bodenheimer, 2010). Consistent with the local health system's mission, PCMH pilot studies were initiated (AAP, 2008).

Statement of the Problem

PCMHs are being created across the nation in an attempt to reverse the fragmentation of the nation's health care system and improve access to coordinated, cost-effective high quality care. NPs working in collaborative teams with physicians and other health professionals will increasingly be relied upon to plug the gap in the shortage of

primary care physicians. However, little data is available about the role or function of the NP in PCMH care delivery models.

Statement of Purpose

The purpose of this study was to delineate the NP role in providing direct primary patient care in the PCMH. The specific aims of this study were to:

1. Describe the NP role enacted within two PCMHs of a local health system in 2011
2. Compare the NP role to that of physicians in those PCMHs

Conceptual Framework

The Strong Model of Advanced Practice (Ackerman, Norsen, Bartom.Wiedrich, & Kitzman, 1996) was the conceptual framework that guided this study. This model was originally developed in 1994 by advanced practice nurses (APN) and academic faculty from Strong Memorial Hospital at the University of Rochester Medical Center to describe and guide advanced practice nursing (Ackerman et al, 1996). Patient-centeredness is a core component of the model.

Five Practice Domains of the Strong Model

The Strong Model identifies five practice domains that define the advanced nursing role in direct or indirect patient care. These domains are: 1) Direct Comprehensive Care, 2) Support of Systems (Facilities), 3) Education, 4) Research, and 5) Publication and Professional Leadership. The five domains have fluid borders, reflecting that these realms of practice may intersect with each other. There is no hierarchy to the domains. The APN may easily move from one domain to another or reside in several domains simultaneously (Ackerman et al, 1996).

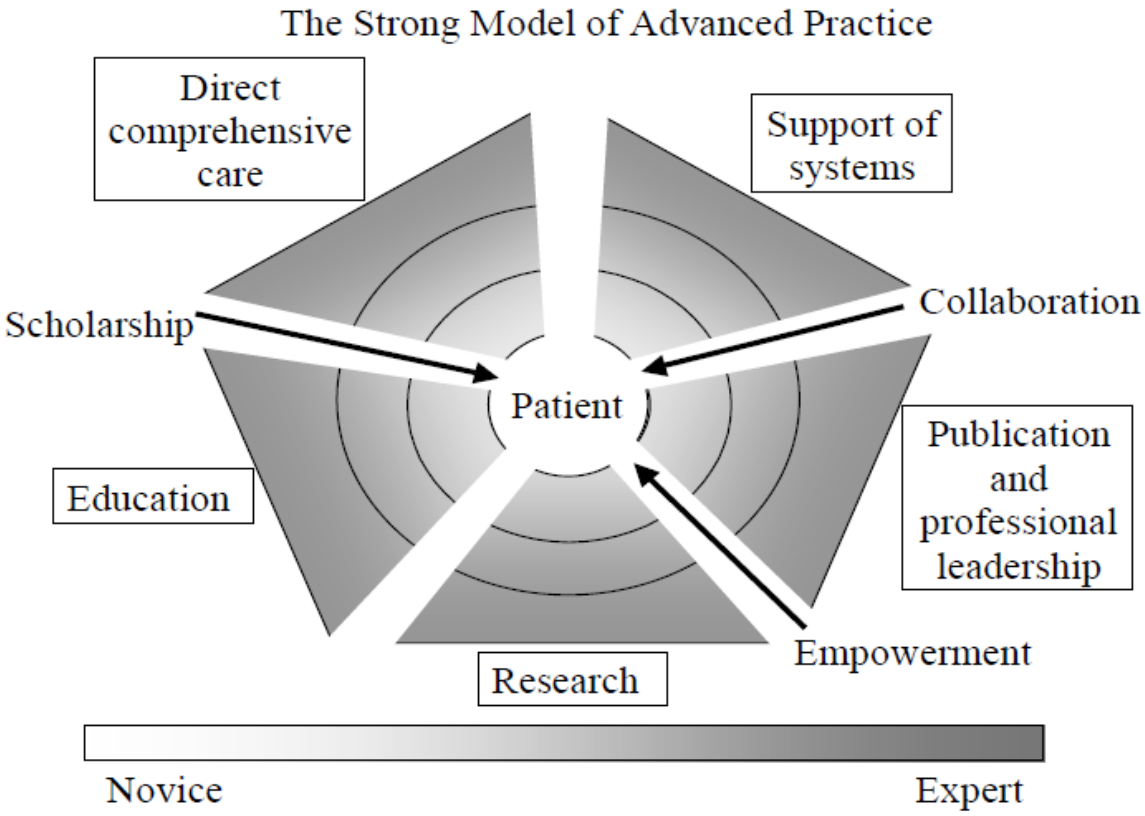
Ackerman et al (1996) provided explanation of the patient-centered service parameters that constitute each domain. The domain of Direct Comprehensive Care is described by APN activities such as assessment and treatment, procedures, interpretation of patient data and patient or caregiver counseling. Support of Systems (facilities) represents those professional advanced practice factors that contribute to the optimal functioning of nursing service within the health system. The domain of Education includes the APN's personal learning and health teaching of patients, family, students and communities. Translation of research findings or conducting research that improves the body of scientific knowledge to support evidence-based practice represents the Research domain.

The fifth domain of Publication and Professional Leadership is described as those activities that promote dissemination and translation of advanced practice knowledge beyond the daily patient-care arena. Professional presentations on the local, state or national level, serving on community boards or leading health care policy initiatives are activities of this domain. Ackerman et al (1996) explained that all of the activities represent possible examples of the five domains and are not meant to be all-inclusive.

Connecting Strands: Scholarship, Empowerment and Collaboration

Ackerman et al (1996) described how the five domains are connected by conceptual strands of Scholarship, Empowerment, and Collaboration. These strands are woven in a circular, unbroken pattern throughout the practice domains as noted in Figure 1. The unifying strands are crucial components that further define the role of the APN. Ackerman et al (1996) depicted the conceptual strand of Scholarship as the base

component which connects the practice domains. Scholarship represents professional knowledge, competence, and self-confidence in clinical excellence.



Empowerment is the second conceptual strand of the Strong Model of Advanced Practice. Empowerment is most successful when the APN is practicing in a non-hierarchal, shared-decision making environment where all team members are equal partners in the care delivery process. The strand of Empowerment represents the APN's knowledge, authority and autonomy to make practice-related decisions. Autonomy to make decisions does not represent an independent approach to patient care but rather an approach linked through the third strand of Collaboration (Ackerman et al, 1996).

Collaboration occurs throughout all levels of the advanced practice nurse's practice domains and signifies the skills and contributions of all members of the health care team. Cooperation, assertiveness, responsibility, communication, coordination and

autonomy are the primary characteristics that define the concept of Collaboration (Ackerman et al, 1996). Successful collaboration occurs at all levels of practice whether in direct patient care or interactions with major health system stakeholders.

Benner's Novice to Expert Stages for Advanced Practice Nurses

Benner's (1982) principles of professional growth are an important part of the Strong Model. Benner (1982) reported that increasing degrees of talent from Novice, Advanced Beginner, Competent, Proficient to Expert represent Advanced Practice Nurses' (APNs') passages through increasing levels of professional growth. While APNs may have been at the Expert level as staff nurses, new APNs revert back to the Novice level when initially assuming the APN role. Benner (1982) explained that an APN's level and progression of role development and expertise in the practice domains will vary based upon education and experience. The level of clinical role development may or may not be evenly balanced throughout the five practice domains as the opportunity for growth in each of these areas may not be uniform. Recognition of these stages of professional growth is crucial when seeking to evaluate the APN role (Benner, 1996).

Application of the Strong Model to Care Delivery

Several researchers conducted studies into the validity of using the Strong Model of Advanced Practice framework when investigating the role of the APN. Mick and Ackerman (2000) applied the Strong Model of Advanced Practice as the framework to differentiate the advanced practice roles of clinical nurse specialist (CNS) and NP. A secondary aim of the research study was to clarify whether the CNS and NP roles could be merged under a single title of advanced practice nurse (APN) or instead should be separated into two distinct role characteristics and responsibilities. The survey findings

revealed distinct differences that characterized the APN and CNS role. Mick and Ackerman (2000) found the domains of Direct Comprehensive Care and Support of Systems were more representative in the NP role while the domains of Education, Research and Leadership scored higher for practice patterns of the CNS. Thus, the authors reported that the Strong Model of Advanced Practice served as an appropriate framework to investigate the practice and role differentiation between the CNS and the NP (Mick & Ackerman, 2000).

Gardner, Chang and Duffield (2007) conducted a study to identify and validate an appropriate framework that could be used to investigate the APN and NP role. Critique of four existing advanced practice models was conducted. Service parameters that provided the tools to identify, establish and evaluate the APN role were considered necessary to effectively clarify these roles. The authors reported that the practice domains of the Strong Model of Advanced Practice (Ackerman et al, 1996) provided the foundation for inquiry and appropriate parameters of practice to differentiate and investigate the APN and NP role (Gardner, Chang & Duffield, 2007).

Using a Delphi technique, Chang, Gardner, Duffield and Ramis (2010) conducted a study with practicing APNs to further validate the Strong Model of Advanced Practice as a tool to investigate APN role delineation. A Delphi technique is a structured communication process used to collect and rank data from a group of people without requiring face-to-face contact. Findings indicated that the practice dimensions of the Strong Model adequately provided the framework to evaluate the depth and comprehensiveness of the APN role and assess optimal utilization of the advanced practice nursing workforce (Chang, Gardner, Duffield and Ramis, 2010).

Application of the Strong Model to this Study

The Strong Model of Advanced Practice (Mick & Ackerman, 1996) served as the optimal framework to guide this exploratory study into the role and utilization of NPs in the PCMHs. Patient-centered Direct Comprehensive Care is one of the core components of both the Strong Model (Ackerman et al, 1996) and the PCMH. The five practice domains of the Strong Model are represented directly or implicitly throughout this investigation.

The practice domain of Direct Comprehensive Care provided the primary context for the evaluation of patient volume, predominant diagnostic codes and level of care provided by the NPs. The Support of Systems domain was represented by the PCMH's objective to optimize the role of the NP so as to broaden access to health services. Support for the PCMH initiatives was evident by the NPs and health care team's implementation of and participation in the new model of care delivery.

The Strong Model of Advanced Practice domains were also represented in the recently published *Nurse Practitioner Core Competencies* (National Organization of NP Faculties (NONPF), 2012). These competencies include basing NP practice upon scientific underpinnings, leadership, quality care, investigative skills to improve outcomes, policy, technology, health system development, ethics and autonomous practice (NONPF, 2012).

While this study did not directly measure activities of the Strong Model domains of Education, Research, Publication and Scholarship, these domains were implicit in the PCMH NP's role. Health or disease-oriented patient and family education, providing care based upon evidence-based practice, and participation in health care team discussions

were all central to PCMH expectations for NPs. These practice domains provided a platform for additional research into evaluation of the NP role in health outcomes, patient and professional education and research, and NP leadership activities in the PCMH care model.

The conceptual strands of Scholarship, Empowerment and Collaboration are interwoven throughout the PCMH philosophy and strengthened the foundation for this study. NPs in the PCMH functioned in an autonomous and collaborative arrangement with physicians and other health care team members. Knowledge of how the NP was utilized when providing services in the PCMH care delivery model, whether practicing as the sole provider in the CCC or working side-by-side with other providers was crucial to effectively evaluate if what the NP is doing will help the local health system to achieve the desired outcome of enhanced access to care.

Research Questions

This study sought to answer the following research questions with regard to the role of the NP in the PCMH care delivery model. Data was analyzed separately for the two PCMHs: Site A and Site B, Traditional Clinic (TC) and Convenient Care Clinic (CCC).

1. What is the relationship between provider type (NPs versus physicians) and the number of patient visits per FTE?
2. What is the relationship between provider type and the age and gender of patients?
3. What is the relationship between provider type and the predominant ICD-9 codes assigned to patients?

4. What is the relationship between provider type and the level of patient health complexity as measured by the Charlson Co-Morbidity Index score?

Significance of Study

The lack of knowledge about the role of the NP in the PCMH made this study essential to assist the health system, care teams, nursing and medicine in deciding if the NP role was effectively implemented. The results allowed for evaluation of whether current NP utilization patterns demonstrated the optimal level of role integration sought by the health system's PCMH. The findings provided background information for discussion about the direction of future studies to evaluate the role of the NP in care delivery models.

Project Plan

Project Outcomes

Outcomes were identified through meetings with the local health system's stakeholders. These stakeholders included senior health system leadership executives, and the PCMHs' NPs, physicians and practice managers. The outcomes identified for this project were:

1. Short-term outcome: Use information technology to collect data on the NP role in PCMH care delivery model
2. Intermediate outcome: Increase knowledge of patient visits and complexity of care attended by NPs in PCMH
3. Long-term outcome: Disseminate findings to design and implement evidence-based care delivery models to improve patient outcomes and organizational effectiveness

The activities of this project sought to achieve the short-term and intermediate outcomes. Accomplishment of these outcomes allowed for the logical sequence of events to occur to reach the long-term outcome (CDC, 2005) of developing an effective strategy to implement optimal NP role utilization in the PCMH.

Stakeholders

Stakeholder input provided direction for the focus of this exploratory study. The key stakeholders of this study included the local health system's Center for Innovative Care (CIC) team that sponsored the PCMH, executive-level health system leaders including the Executive Medical Director of the CIC, the VP of Finance, VP of Analytics, VP of Health Quality, Senior VP of Nursing, VP of Clinic Strategic Direction, the PCMH NPs, physicians and practice managers, and the research biostatistician. The stakeholders supported this study and were interested in the study findings.

Study Variables and Stakeholder Input

During the planning of this study, stakeholders were interviewed to determine the study variables that would be most beneficial at this stage of PCMH operations. Several separate interview sessions were conducted to accommodate stakeholders' schedules. The stakeholders chose to focus on the role of the NPs in the PCMH as the primary source of inquiry most relevant at this point in time.

The stakeholders narrowed the focus of the inquiry by requesting data from the PCMH be retrieved to evaluate the number of patient visits attended by NPs at the TC versus CCC, type of diagnosis and level of complexity. The stakeholders requested the same data on visits attended by the PCMH physicians.

Challenges to Accessing Data Sources

Archived data retrieved from EPIC, the electronic medical record, was the source of data for this study. Electronic files had not been designed to easily capture data on care provided by the PCMH NPs. Much of the data on NP patient diagnostic codes, number of patient visits, or the site within the PCMH where the NP-patient visit occurred was not accessible within the same database location as it was for physicians.

Several meetings and phone conferences transpired with the VP of analytics, biostatistician, research team and the health system information technology (IT) team to discuss how and where the data on NP care could be retrieved. After hours of discussion and repeated attempts to locate the NP data, disparate files were discovered that housed pieces of requested data. It was decided that for the purposes of this investigation, the research team would take the additional time to retrieve the archived data from these EPIC files. It is the intent of the researcher and the Research IT teams to make recommendations to revise the original EPIC design now that this study is completed so data on all providers is collected, easily retrieved and housed within the same files.

Methodology

This study used an exploratory, cross-sectional design to investigate the role that NPs served as a provider of health care services in the PCMH care delivery model of a local health system. NPs and physicians were compared on selected patient variables in order to determine the degree of similarity and differences in the enactment of their roles.

Ethical Issues and IRB

The archived electronic data was extracted by the local health system research team that has legitimate access to the records of patient visits and diagnosis codes. The

analytic team was composed of this researcher, the biostatistician, and the research analyst. The team completed mandatory HIPPA education and were trained in the collection and retrieval of health data for research. All health system policies regarding data collection and analysis were followed with strict compliance. No patient or provider names, other identifying data, or specific PCMH locations were linked with any of the study variables. All data was collected in the aggregate.

International Review Board (IRB) approval was obtained from the local health system IRB and the UMSL IRB. The local health system leaders, including the Executive Medical Director of the Center for Innovative Care, Vice President (VP) of Health Quality, Senior VP of Nursing, VP of Finance, VP of Nursing Clinical Excellence, VP of Clinic Strategic Direction, and physician leaders of the PCMH supported this study and were interested in the findings as a source of improving care and organizational effectiveness. The stakeholders expressed interest in future follow-up studies on the NP role in care delivery.

Participants and Setting

A local health system established two PCMHs in late 2010. Archived electronic data retrieved from all PCMH patient visits attended by NPs and physicians in the 2011 calendar year served as the evidence for this investigation. The 2011 calendar year was chosen as it provided the most accessible data from a full twelve month time frame of PCMH operations.

The settings where the archived data originated were the two PCMH practice locations: Site A and Site B. Both sites are located in a suburban region of the Midwestern US. Each PCMH is composed of a Traditional Clinic (TC) and an attached,

extended-hour Convenient Care Clinic (CCC). The TC provides patient care by appointment only. The CCC is a walk-in clinic, providing care on a first-come, first-serve basis.

PCMH Site A

PCMH Site A is an internal medical specialty practice that treats adolescents and adults and began operation on January 1, 2011. During 2011, Site A averaged 5.1 full time equivalent (FTE) NPs and 5 FTE physicians. The NPs' staffing in the TC was on an alternating, rotating basis while the physicians staffed the TC regularly. The CCC was primarily staffed by NPs during hours of operation. In the first half of 2011, a physician staffed the CCC along with two NPs. By mid-year, the CCC was staffed solely by the NPs. Physicians were then available only by request for consultation on patient care issues. The clinic was open 63 hours over six days each week.

PCMH Site B

PCMH Site B is a family practice specialty that treats newborns through adult patients. The TC opened on January 1, 2011 while the CCC opened in March, 2011. The Site B PCMH location averaged 3.0 FTE NPs and 3.8 FTE physicians during 2011. The NPs staffed the TC on an alternating, rotational basis while physicians staffed the TC on a consistent basis, as in Site A. The CCC was staffed only by one NP during clinic hours; there was no physician coverage. Physicians were available for consultation at the request of the NP. The Site B location was open 71 hours each week over a seven day period.

Measures and Procedures

After approval from the IRBs, the health system research analyst extracted information from the EPIC-Care Derived Database (EDD). The EDD was queried to

identify all patient visits to the two PCMHs during 2011. At the direction of the VP of Analytics, the research assistant and analyst conducted an extensive search through several different electronic files to locate the data of patient visits to PCMH NPs during the 2011 calendar year.

NPs and physicians were compared on each of the study variables: number of patients per provider FTE, age and gender of patients, health complexity as measured by the Charlson Index and predominant ICD-9 codes assigned to patients. Due to the unique care contexts of the two PCMHs and the two types of clinics within each, separate comparisons were made for Sites A and B and for the associated TC and CCCs.

Charlson Co-Morbidity Index

The Charlson Co-Morbidity Index (Charlson, 1987) is a measure of health complexity. Specifically, it employs a method of classifying co-morbidity and health risk prognosis from 19 potential co-morbid conditions. The CCI is based on a point-scoring system with points accumulated for the number, type and severity of associated health problems. For example, congestive heart failure earns one point, diabetes two points, severe liver disease three points and malignant tumors six points. Age-modified scores also can be calculated with one point added for every decade of age, starting at 40. A higher CCI score indicates a more serious level of co-morbidity and negative prognosis. Scores can range from zero to a maximum of six points for each health condition.

An electronic version of the Charlson Co-morbidity Index calculator was downloaded and installed by the research team into the health system electronic medical record for purposes of this study. The health system research team supported the download as the CCI software has strong interoperability with EPIC.

To calculate a CCI score, the user selected a condition from a predefined list, aligned it with patient age, and the calculator automatically generated a score. No rater judgment was required for calculation of the score (Hall et al, 2004).

Validity of the Charlson Co-Morbidity Index

The Charlson Co-Morbidity Index (Charlson, 1987) has demonstrated good validity and reliability when compared to other co-morbidity indices. Extermann (2000) reported excellent validity and reliability of the Charlson Co-Morbidity Index (CCI) in clinical research. The researcher suggests the CCI possesses strong predictive validity when correlating the CCI with outcomes of postoperative complications, length of hospital admissions or nursing home stays. De Groot, Beckerman, Lankhorst and Bouter (2003), in a comparison of the CCI with other co-morbid indices, reported the CCI showed good predictive validity for the outcomes of mortality, disability, readmission, and length of stay.

In a more recent study, Khan, Perera, Harper and Rose (2011) demonstrated validity of the Charlson Co-Morbidity Index score in primary care patient databases. CCI scores of less than one were associated with low risk of death while comparatively higher CCI scores above five revealed a strong association of mortality. Huntley, Johnson, Purdy, Valderas, and Salisbury (2012) conducted a systematic review to identify measures of co-morbidity suitable for research in primary care. The Charlson Index was identified as one of the most widely used measures possessing the greatest evidence of validity.

Data Analysis

A team composed of this researcher, the biostatistician, and an experienced EPIC research analyst assumed the primary responsibility for extraction of the data. The health system biostatistician served as consultant and director for data retrieval and analysis. Accuracy of data extraction from EPIC and entry into the database for this study was assessed by the research analyst through double-entry verification. The Statistical Analytic System (SAS) software version 9.2 was used for analysis of the data.

Means, standard deviations, and confidence intervals were calculated for the total 2011 patient visits per provider FTE, patient age, and Charlson Co-Morbidity Index scores for patients seen by NPs versus physicians in the CCC and TC of the Site A and Site B PCMHs. Mean differences between the NPs and physician on the continuous variables were compared using the t-test. Significance levels of t-tests were set at $p < .0001$. Confidence intervals were calculated at the 95% level. Frequency and percentages for patient gender and prevalent ICD-9 codes assigned by NPs compared to physicians were calculated. Chi square analyses were conducted to compare the differences in proportion of female versus male patients attended by NPs relative to physicians. Significance levels were set at $p < .0001$

Potential Risks and Benefits of the Study

This study involved the analysis of de-identified archived data so risks were minimal. There was no direct contact with patients or providers. The only foreseeable risk was the possible loss of confidentiality regarding patient data or identification of the treating providers. This possibility was minimized by removal of all identifying information prior to completion of the analytic file. The only personal health information

retrieved from the records was the date of visit, diagnostic codes, patient age, and gender and whether the visit occurred at the PCMH Site A or B, TC or CCC. As this was a retrospective study that collects secondary data, there were no changes in clinic workflow or loss of personal time of the PCMH NPs, physicians or co-workers. While patients or their providers did not receive any direct benefits from this study, the analysis of the practice information may contribute to improved patient care in the PCMH and add to nursing knowledge regarding optimal utilization of the NP role.

Project Outcomes

The study findings are presented according to the stated research questions for the Traditional Clinic (TC) and Convenient Care Clinic (CCC) of the Site A and Site B PCMHs. Of the 2011 PCMH visits, data was retrieved from the 34,640 patient visits at Site A and 15,831 visits at Site B. Comparisons between NPs and physicians were made on each of the study variables for PCMHs Site A and Site B according to clinic type. Since PCMH Site B CCC was staffed only by NPs, no comparisons could be made with physicians.

Patient Visits per FTE

PCMH Site A

For PCMH Site A, NPs at the TC treated a mean of 9.47 (SD=4.40) per FTE compared to 16.01 (SD = 5.43) per FTE for physicians. NPs treated an average of 6.65 fewer patients than physicians (95% CI: 6.04 -7.02, $t = 26.33$, $df = 517$, $p < .0001$).

NPs at the CCC treated a mean of 10.93 patients (SD = 5.36) while physicians treated a mean number of 3.80 (SD = 3.93). NPs treated an average of 6.97 more patients per FTE in the CCC than physicians (95% CI: 6.55 – 7.71, $t = 24.18$, $df = 546$,

$p < .0001$).

PCMH Site B

For the PCMH Site B, NPs at the TC treated a mean number of 6.50 patients per FTE (SD = 3.88) while physicians treated a mean of 14.68 patients (SD = 5.47) per FTE (95% CI: 7.39-8.95). NPs treated an average of 8.15 less patients than physicians ($t = 20.58$. $df = 416$, $p <. 0001$).

NPs at the Site B CCC treated a mean of 12.36 (SD = 7.25) of patients per FTE. Since no physicians treated patients at the CCC, comparisons were not possible.

Patient Age

PCMH Site A

For the Site A TC**,** NPs treated patients with a mean age of 54.2 years (SD = 17.9) compared to 57.1 years for physicians (SD=17.6). Patients treated by NPs were 2.9 years younger (95% CI: 2.44 - 3.47) than patients treated by physicians ($t = 11.2$, $df = 23357$, $p < .0001$).

At the Site A CCC, NPs' patients had a mean age of 51.4 years (SD = 17.2) while those of physicians were 49.3 years (SD = 17.2). NPs' patients were 2.1 years older (95% CI: 1.05-2.98) than patients treated by physicians ($t= 4.12$, $df = 11279$, $p < .0001$).

PCMH Site B

For the PCMH Site B TC, the NPs treated patients with a mean age of 38.3 years (SD = 16.9) compared to 44.3 years (SD = 18.3) for physicians. NPs treated patients who averaged 6 years younger (95% CI: 5.02 -7.15) than patients treated by physicians ($t = 11.2$, $df = 12277$, $p < .0001$).

At the Site B CCC, NPs' patients had a mean age of 33.9 years (SD=18.9). No Site B physicians treated patients at the CCC.

Patient Gender

PCMH Site A

For the PCMH Site A TC, NPs' patients were 57.34% female compared to 50.4% of those treated by physicians (Chi Square = 90.3, df = 1, $p < .0001$). At the Site A CCC, NPs' patients were 57.9% female compared to 55.1% for physicians (Chi Square = 3.8, df = 1, $p < .0499$, not significant).

PCMH Site B

For the Site B TC, NPs' patients were 81.6% female compare to 55.1% female patients treated by physicians (Chi Square = 261.1, df = 1, $p < .0001$). At the Site B CCC, 65.3% of the patients treated by NPs were female. No physicians treated patients at the Site B CCC, so comparison was not possible.

Predominant ICD-9 Codes

PCMH Site A

The most frequent NP assigned ICD-9 diagnostic codes at the Site A TC were routine general medical exam (9.2%), essential hypertension (2.4%), acute sinusitis (2.2%,) and acute upper respiratory infection (2.0%) (Table 2). Physicians most frequently assigned the diagnostic codes of routine general medical exam (18.5%), unspecified hyperlipidemia (6.1%), benign hypertension (4.4%) and influenza vaccination (3.8%).

NPs at the CCC most frequently assigned ICD-9 diagnostic codes were acute sinusitis (13.8%), acute pharyngitis (7.0%), acute upper respiratory infection (6.5%) and

cough (4.2%). Physicians' most frequently assigned ICD-9 codes were for acute sinusitis (11.3%), upper respiratory infection (8.0%), acute pharyngitis (6.1%) and acute bronchitis (4.2%).

PCMH Site B

The most frequent NP assigned ICD-9 diagnostic codes at the Site B TC were for routine gynecologic exam (6.3%), routine general medical exam (4.4%), acute pharyngitis (4.2%) and DTP vaccination (4.0%). Physicians' most frequently assigned ICD-9 diagnostic codes were for routine general medical exam (5.3%), unspecified hypertension (5.6%), influenza vaccination (3.0%) and for acute sinusitis (3.0%).

NPs at the Site B CCC most frequently assigned ICD-9 diagnostic codes were for acute pharyngitis (15.4%), acute upper respiratory infection (9.0%), and acute sinusitis (6.4%) and for routine infant or child checkup (3.6%). No physicians treated patients at the Site B CCC, so comparisons could not be conducted.

Charlson Co-Morbidity Index Score

PCMH Site A

NPs' patient at Site A TC scored a mean Charlson Co-Morbidity Index of 0.83 (SD = 1.51) compared to a score of 1.06 (SD = 1.68) for patients treated by physicians. Patients of NPs scored an average of 0.23 points less (95% CI: 0.17 - 0.27) than patients of physicians ($t = 9.2$, $df = 23213$, $p < .0001$).

At the CCC, NPs' patients scored an average Charlson Co-Morbidity Index of 0.75 (SD = 1.38) compared to a score of 0.67 (SD = 1.26) for patients treated by physicians. Patient of NPs scored an average of 0.08 points higher (95% CI: 0.003-0.15) than patients of physicians ($t = 2.06$, $df = 11231$, $p < .0393$, not significant).

PCMH Site B

NPs' patients at the Site B TC scored a mean Charlson Co-Morbidity Index of 0.28 (SD = 0.76) compared to a score of 0.47 (SD = 1.13) for patients treated by physicians. Patients of NPs scored an average of 0.19 less points (95% CI: 0.11 - 0.24) than physicians ($t = 5.50$, $df = 12228$, $p < .0001$).

At the Site B CCC, NPs treated patients with a mean Charlson Co-Morbidity Index score of 0.23 (SD = 0.73). Since only NPs staffed the CCC, no comparisons were possible.

Discussion

The purpose of this study was to describe the NP role in two PCMHs of a local health system and how it compared to that of physicians. This study identified differences in the number of patient visits, patient demographics, types of diagnoses, and patient health complexity between the two providers. These differences appear to be the result of variations in how the roles of NPs and physicians were implemented in the PCMHs. Therefore, the data must be interpreted within the context of PCMH organizational and management policies.

Patient Visits per Provider FTE

Review of the data within the context of the PCMH operational policies suggest that differences in patient visits per provider FTE may be an artifact of different scheduling practices for NPs versus physicians. In the PCMH TCs, NPs' patients were scheduled every 20 minutes whereas physicians' patients were scheduled on a 15 minute rotation. The longer period for NP visits was allotted in recognition of their request for additional time to talk with patients and families in the interest of relationship-building,

education, and preventative interventions. This scheduling variance explains the six to eight less patients treated per NP FTE compared to physicians. In addition, the physicians' schedules were typically filled first, frequently days to weeks in advance. In contrast, the NPs' schedules were commonly left open to accommodate patient overflow after the physicians' schedules were full. In addition, more NPs were staffed to the CCCs in which patient visits were unpredictable due to their walk-in nature.

The specific type of service provided may also mask productivity. For example, when comparing the type of health conditions treated by NPs versus physicians, one of the top four health issues addressed by physicians at both TCs was for influenza vaccine. Patients who presented solely for seasonal, prophylactic inoculations were not actually seen by the physician but rather received the immunization by an office medical assistant. Yet, the physician received credit for these visits which inflated the patients-to-physician FTE ratio. For NPs to be treating only six to eight less patients per FTE daily under these circumstances implies that NPs may be able to treat an equal and possibly greater volume of patients if scheduling policy was applied consistently across providers.

In comparison to the TCs, more NPs worked in the CCCs where patients were treated on a walk-in basis. Practice managers reported marked seasonal variations in patient visits to the CCC, with higher volumes during the winter flu season. Thus, NPs' were staffed in the CCC even though there was no guarantee that patients would be presenting for treatment. In contrast, physicians were rarely present in the CCC when it was empty. This explains why at the Site A CCC, NPs treated approximately seven patients more per FTE than Site A physicians.

Recommendations for Staffing

Review of current staffing patterns in relationship to peak patient volumes may allow health system leaders to assess whether adjustment of clinic scheduling and NP FTE hours may be appropriate. Presumably, the purpose for the current policy of filling physicians' schedules ahead of NPs is to maximize the productivity of physicians, whose labor costs are significantly higher. Further investigation is needed to determine whether more balanced patient scheduling may improve access for patients seeking services from the TC without jeopardizing reimbursement. Additional inquiry would allow for a more accurate productivity evaluation between providers and produce more credible data for organizational improvement. It may also contribute to more efficient resource utilization of both the NP and physician workforce.

The PCMHs' policies permit patient visits to NPs at longer intervals in recognition that NPs approach patient care from a different philosophy than physicians. NPs ostensibly request longer visit times to provide care that includes development of a positive nurse-patient relationship, education, and prevention. Yet, knowledge about what is actually happening in the NPs' process of care compared to that of physicians is scant. Assessing specific care processes and associated outcomes from an NP perspective will bring greater insight into the talents that NPs bring to the PCMH team and how they can maximally contribute in this new care delivery model.

Relationship between Patient Gender, Age and Provider Type

NPs treated a higher percentage of female patients compared to physicians at both PCMH sites. However, the reason for this finding is not clear. The tendency for NPs to treat female patients may be related to the increased availability of same day

services offered by NPs in the TCs, a higher percentage of women may seek service without advance appointment, or patients may request to receive care from providers of the same gender (as all the NPs were female and all of the physicians were male).

The possibility that patients with certain type of health conditions may choose female or male providers was also considered. For example, at the Site B TC, the most frequent ICD-9 code assigned by NPs was for gynecologic exams. This could explain why Site B NPs treated a significantly higher percentage of female patients. Gynecologic exams may also be performed more frequently at PCMH Site B because of the family practice specialty there compared to the internal medicine specialty at Site A. This tendency may also be explained by a younger patient population at Site B compared to Site A.

Investigation of patient age revealed that NPs at the TCs of both PCMH sites treated patients that were younger than patients treated by physicians. These findings are consistent with national studies (Fletcher, 2011) but are not immediately explainable in the context of the PCMHs. These findings may also be related to the PCMH scheduling practices. Patients with chronic health conditions are more likely to be older and have routine appointments scheduled in advance. In contrast, patients seeking service on a more immediate basis are more likely to be assigned to a NP and may be younger with minor and acute health issues.

Site B providers, both NPs and physicians, treated younger patients than NPs and physicians at Site A. This finding is consistent with the practice contexts of the PCMHs. Site A is an internal medicine practice treating patients age 12 and older while the family practice at Site B treats patients from newborn to the very elderly.

Recommendations Regarding Patient Demographics

The findings reveal that in general, NPs treated a younger population of patients who were female. The data does not clearly indicate whether this pattern is related to practice scheduling policies, patient age, preference for provider type, acute versus chronic health conditions, or other factors. Greater understanding of the demographics of the population that the clinics serve and the patients' preferences for provider type would facilitate better health system planning for assignment of providers. Knowledge of why a patient may prefer one provider type over another will provide the opportunity for enhanced patient education on the role and competence of the care team members.

Relationship between Predominant ICD-9 Code and Provider Type

NPs at both PCMH TC sites treated a smaller percentage of chronic health conditions than physicians at the same location. However, both NPs and physicians at the Site A TC treated a greater proportion of chronic health conditions than those at the Site B TC. This may be related to the location of the PCMH clinic. Site A is located in an older, established community while the Site B PCMH location is situated in a newer, younger and affluent neighborhood. The age of the patient population at Site A is also older than at Site B and thus may be associated with a higher percentage of chronic diseases. Despite an older patient population, the most frequent ICD-9 codes assigned by NPs and physicians at either PCMH TCs were for routine medical or gynecologic exams. For both PCMH CCCs, the ICD-9 codes assigned by NPs or physicians represented minor, acute health problems or routine health exams.

Recommendations for ICD-9 Codes Assigned by Provider Type

Analysis of the data indicates that the majority of health conditions treated at both

PCMH locations were minor, acute issues or single, well-controlled chronic health conditions (e.g., hypertension) reflected by the low Charlson Co-Morbidity Index Scores. It also indicates that NPs tended to treat patients with lower acuity health problems compared to physicians, although the differences in health complexity of ICD-9 codes between NPs and physicians are small. Yet, these findings are also reflective of the PCMH practice policies of filling physician schedules in advance and triaging patients with minor, acute health complaints to the NPs. This differential assignment appears to occur without regard to whether it makes the most efficient and effective use of provider time and skills. Further exploration as to why the NP assigned ICD-9 codes reflect a less serious health condition is recommended to promote a greater understanding of the PCMH workflow and informed planning for efficient care delivery. In addition, discussion with the NP and physician providers as to the patterns of ICD-9 code assignment and whether the codes represent an accurate reflection of their practice is advised.

Relationship between Charlson Co-Morbidity Index Score and Provider Type

The Charlson Co-Morbidity Index was used to determine the overall level of health complexity as reflected in the ICD-9 diagnoses assigned to patients. NPs and physicians treated patients with higher complexity at the TC compared to the CCC. In general, NPs treated patients with lower complexity scores than those of physicians at the same site. This is consistent with findings on the primary ICD-9 codes assigned by provider type and reflective of the current PCMH policies of assigning patients with less complex health issues to NPs. The NPs at Site A, however, treated patients with higher

Charlson Co-Morbidity Index scores than NPs or physicians at Site B due to the older patient population at Site A.

A Charlson Co-Morbidity Index score of one represents a patient with one co-morbid health condition and a low risk of morbidity. In contrast, a score of five or greater is associated with a higher health complexity level and high risk of morbidity. On average, the scores of patients treated by either NPs or physicians at either PCMH location were one or less. If the NP and physician providers are precise and complete in ICD-9 code assignment, the findings demonstrate that the NPs and physicians of the PCMHs are primarily treating healthy patients and suggest that neither the NPs nor physicians are practicing to the full scope of education and training.

Recommendations on Provider Type and Patient Health Complexity

These findings demonstrate that in general, NPs are assigned patients of a lower health complexity than physicians without regard to their knowledge or competency. NPs can and are caring for patients with a higher health care complexity than some physicians in the PCMHs. Expanding the NP patient panel to include chronic disease management and directing physicians to those more severe health conditions that particularly require their involvement will enhance access to health services, promote wiser and less costly workforce utilization and improve clinical health outcomes.

Conclusion

Research has consistently demonstrated that NPs are capable of providing safe, high quality and competent care for chronic health problems such as those treated at the PCMHs (Spitzer et al, 1974; OTA, 1986; Brown & Grimes, 1995; Lenz et al, 2004; Seale, 2006; Laurent et al, 2009, Fletcher, 2011; Newhouse et al, 2011). Forecast

projections repeatedly warn of the dwindling primary care physician supply and the growing demand for providers to treat an aging population with increasingly complex health needs. The local health system leaders acknowledge the need to rely on NPs to help bridge the gap of the dwindling physician workforce for future care delivery. The findings from this study provide health system leaders with new benchmark data on the role of the NP in the PCMH and suggest that optimal NP role utilization has not been fully achieved. Maintaining obsolete health system policies that use NP providers to stem overflow in physician schedules or offer NPs' services secondary to those of physicians' fail to meet the goals of the health system's New Model of Care. This model emphasizes the strategic and deliberate use of NPs to redesign the way health care is delivered through lower costs and improved access to health services through the PCMHs.

It is beyond the scope of this study to conclude whether applying different scheduling policies for NPs and physicians is the most cost-effective method to improve access to health services. Further investigation is needed. However, if NPs can competently treat a broader range of health conditions at the PCMH at a lower cost, health system leaders may want to consider reorganizing current care delivery patterns, including more NPs on staff. This could be accomplished by assigning patients with more stable chronic disease conditions to NPs and redirecting physician attention to the more complexly ill patients. The Charlson Co-Morbidity Index Scores of the patients from the two PCMHs represent generally healthy patients or those with manageable chronic conditions which NPs are capable and competent to treat. Directing most PCMH primary care health conditions to NPs may result a lower cost of care with equivalent or potentially higher outcomes.

Further detailed inquiry into the processes of care that NPs employ during the delivery of health services will produce valuable information about the specific assets they bring to the care team. Trying to squeeze the NP role into a traditional medical model approach to care and then evaluate it with medically based outcomes is an example of not asking appropriate questions about NP care. Further study into the NP role from a nursing practice framework such as the Strong Model (Ackerman et al., 1996) will allow for accurate identification and recognition of the unique contributions that NPs bring to the care team. Measuring NP sensitive variables not currently found within medical diagnostic coding parameters such as functional status, quality of life, concordance with health care recommendations, or preventing re-hospitalization will promote clearer delineation of the NPs' role in care delivery.

Redesign of the health system's EMR to collect data on NP care will allow for informed decisions as to what circumstances that NPs are the appropriate providers to meet the needs of the health system and population. Accessible data will also allow for effective evaluation of the outcomes of care provided by NPs. Additional investigation will contribute to the advancement of nursing science. It will also provide the care team and the local health system with the knowledge to strategically redesign and implement the New Care Model.

Limitations of Study

A primary limitation of this study is the potential lack of generalizability of the findings to other care delivery models. This investigation concerned two PCMHs of a single Midwestern health system in 2011 and may not adequately represent what is

occurring in other health systems at the present time. The two PCMHs were located in suburban areas and addressed the needs of distinctively healthy populations.

The ICD-9 codes retrieved were dependent upon provider accuracy to enter the appropriate and complete total list of patient health conditions and thus may be incomplete or inaccurate. With reference to the Strong Model of Advanced Practice and Benner's Novice to Expert Stages (Ackerman et al, 1996), there was no inquiry into the expertise level of the NPs. The NPs' stage of clinical and professional role development stage may have influenced the PCMH scheduling practices and the number and type of patient health conditions that were treated. There was also no measure of the physicians' perceptions regarding the NPs' competency to treat certain health conditions which may have influenced scheduling patterns and other patient assignment practices.

Plans for Dissemination of Knowledge

Results from this investigation will be shared through formal presentations with the Executive VP of Organizational Effectiveness, Chief Operating Officers, Executive Medical Director, Senior VP of Ambulatory Clinics, VP of Clinic Strategic Initiatives, Senior VP of Nursing, VPs of Quality, Analytics and Finance, PCMH NPs, physicians and practice managers and other local health system leaders who had expressed interest in this study. The data will also be shared via internal electronic communication to other acute and ambulatory NPs, physicians, and managers across the local health system. The findings will allow for re-evaluation and future planning of improved electronic data collection regarding NPs' services and redesign of efficient and effective health care teams. Submission of results for publication to an appropriate NP, clinical practice, and health policy or health organization journals will be completed. Power Point

presentations about the findings and implications will be presented to the local NP association.

Application of the Doctor of Nursing Practice Essentials to Practice

The Doctor of Nursing Practice (DNP) education prepares nurses for the highest level of leadership in practice. The DNP is a practice-focused, terminal degree that places emphasis on clinical scholarship and advanced nursing practice that is innovative and evidenced-based. The DNP graduate is expected to have an expanded knowledge base in eight Essentials as defined by the American Association of Colleges of Nursing (AACN, 2006). The DNP Essentials encompass advanced education in the areas of science, organizational systems, scholarship, informatics, health care policy, interprofessional collaboration to improve population health, clinical prevention, and advanced nursing practice (AACN, 2006).

Accomplishment of the DNP Essentials was evidenced by successful completion of the DNP coursework, comprehensive examination, and the ongoing process of defining, implementing, and reporting of the clinical scholarship project. Table 1 shows the articulation of the DNP Essentials with supporting activities that occurred during the process of completing this project.

Translation of current research findings such as the epidemiologic impact of the physician shortage on health care access, the growing NP workforce, and the paucity of studies defining the NP role in new care delivery models provided the foundation and investigative structure for this exploratory study. The use of effective communication and collaborative skills resulted in support from the local health system senior leaders and other stakeholders for this investigation.

Furthermore, the ability to use analytical reasoning in the design of new strategies to retrieve electronic data on the NP role in the PCMH allowed for accurate evaluation and quality improvement of the practice environment. Analyzing previously inaccessible data generated new knowledge on how the NP functions in the PCMH. The application and integration of nursing science demonstrated personal proficiency in the ability to serve as a change agent to influence and lead health system redesign for more favorable NP role utilization. The DNP Essentials provided the foundation to lead future scholarship initiatives in health policy, health system organizational improvement and ultimately optimal population health outcomes.

However, successful completion of the DNP curriculum and project are just the start of the evidence of accomplishment of doctoral educational goals. Advanced knowledge of clinical practice, health policy and leadership skills come alive when applied to real-world settings of health care delivery and population health. The DNP program has equipped this writer with the tools to lead the local health system's newly formed Collaboration in Practice Advisory Panel to help guide more efficient utilization of NPs and health policy decisions that support the full scope of advanced practice nursing. Discussion with health system leaders has also led to the inclusion of NPs as providers for future telehealth care team delivery initiatives. It is the application of advanced nursing knowledge to organizational initiatives that truly demonstrates clinical scholarship and successful completion of the DNP program.

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Figure 1. The Strong Model of Advanced Practice

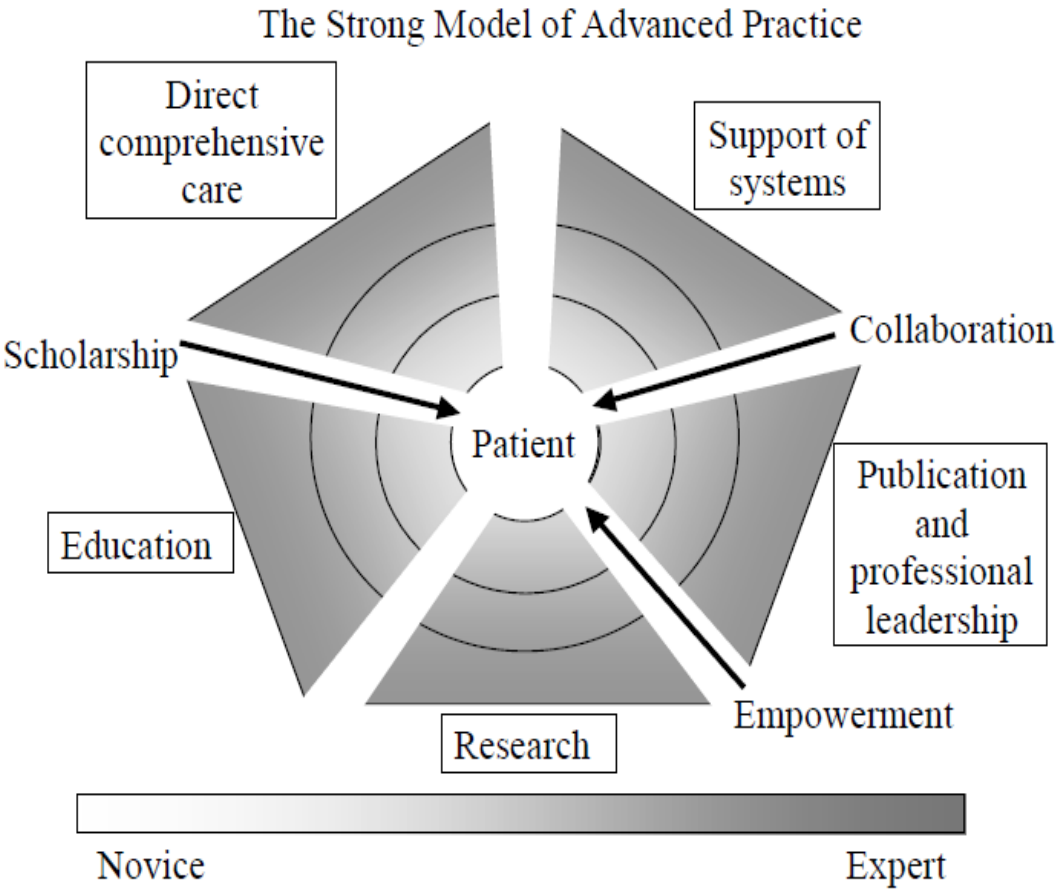

Table 1.

Accomplishment of the Doctor of Nursing Practice (DNP) Essentials

Doctor of Nursing Practice Essentials	Evidence of Accomplishment
Scientific Underpinnings for Practice	Integrated nursing science and Strong Model of Advanced Practice to support DNP project to investigate the NP role in the PCMH health care delivery model.
Organizational Systems Leadership for Quality Improvement and Systems Thinking	Conducted health system leaders and PCMH provider meetings to determine interest and input for PCMH investigation. Promoted NP role in telehealth initiatives.
Clinical Scholarships of Analytical Methods for Evidence-Based Practice	Evaluated extant literature to design, direct and evaluate best-practice NP role utilization that supports patient and health system goals.
Information Systems/Technology and Patient Care Technology for Improvement and Transformation of Health Care	Developed clinical information system (EPIC) redesign to access NP practice data and improve knowledge of NP utilization patterns
Health Care Policy for Advocacy in Health Care	Led executive leadership regarding health system culture and policies on advanced nursing practice to develop formal position statement. Co-author: *State of Missouri Public Health Policy White Paper:Barrier Free Care for Missouri Citizens.*
Interprofessional Collaboration for Improving Patient and Population Health Outcomes	Facilitated communication and led interprofessional teams in discussions of NP role in PCHM care delivery and health systems policies governing team-based care. Leader of SOP Advisory Panel.
Clinical Prevention and Population Health for Improving the Nation's Health	Collected/evaluated current national epidemiologic data trends that impact population health wellbeing. Developed recommendations for strategies to promote enhanced access to health services through optimal utilization of NP role on care team.
Advanced Nursing Practice	Incorporated advanced levels of clinical judgment and systems level thinking to design, implement and evaluate of the NP role in the PCMH. Led NP Council.

Table 2.

Predominant ICD-9 Diagnoses According to Patient Centered Medical Home Site and Clinic

PCMH Site Provider and Clinic Type	ICD-9 Diagnosis	Percent
Site A Traditional Clinic		
Nurse Practitioner	Routine General Medical Examination	9.2
	Essential Hypertension	2.4
	Acute Sinusitis	2.2
	Acute Upper Respiratory Infection	2.0
Physician	Routine General Medical Examination	18.5
	Unspecified Hyperlipidemia	6.1
	Benign Hypertension	4.5
	Influenza Vaccination	3.8
Site A Convenient Care		
Nurse Practitioner	Acute Sinusitis	13.8
	Acute Pharyngitis	7.0
	Acute Upper Respiratory Infection	6.5
	Cough	4.2
Physician	Acute Sinusitis	11.3
	Acute Upper Respiratory Infection	8.0
	Acute Pharyngitis	6.1
	Acute Bronchitis	4.2
Site B Traditional Clinic		
Nurse Practitioner	Routine Gynecologic Examination	6.3
	Routine General Medical Examination	4.4
	Acute Pharyngitis	4.2
	DTP Vaccination	4.0
Physician	Routine General Medical Examination	5.3
	Unspecified Hypertension	5.6
	Influenza Vaccination	3.0
	Acute Sinusitis	3.0

Table 3

Predominant ICD-9 Diagnoses According to Patient Centered Medical Home Site and Clinic

PCMH Site Provider and Clinic Type	ICD-9 Diagnosis	Percent
Site B Convenient Care		
Nurse Practitioner	Acute Pharyngitis	15.4
	Acute Upper Respiratory Infection	9.0
	Acute Sinusitis	6.4
	Routine Infant or Child Checkup	3.6
Physician	No physicians practiced at this clinic.	