ASSESSING MEDICAL HOME READINESS WITHIN HEALTH CENTERS

by
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ABSTRACT

Federally Qualified Health Centers (FQHCs) serve many of the sickest and poorest Americans. This study developed and validated a scale to assess medical home readiness within health centers and identified relationships between medical home readiness, health center and patient characteristics, and community attributes.

Published literature was reviewed to identify the domains and items most crucial to the development of a medical home for inclusion in a readiness scale for health centers. An expert panel was convened to examine the content validity of the scale. Following the development and preliminary validation of the scale, a pilot study was conducted to further test the tool. Finally, the scale was distributed to a national random sample of health centers. Data on health outcomes, organizational characteristics, and community attributes were extracted from additional survey questions, the 2012 Health Resources and Services Administration Uniform Data System, and the 2012-2013 Area Health Resource Files.

A total of 12 domains and 45 items were selected to be included in the medical home readiness scale. There was no expert consensus to remove any of the initial scale domains and items. In the pilot study, 16 health centers reported a mean medical home readiness score of 28.8 out of 45 total points. A total of 202 FQHCs completed the national survey. The mean medical home readiness score from the national survey was 31.68. In addition, we found that having outside medical home accreditation was associated with a higher readiness score. Based on the distribution of responses, we identified 31.5 to be the cut-off point in distinguishing health centers who have achieved medical home transformation versus those who have not.

In considering relationships between medical home readiness, health center and patient characteristics, and community attributes, increased percentages of minority and hypertensive patients as well as cervical cancer screenings were associated with higher medical home readiness scores. High internal collaboration was also found to be associated with significantly higher medical home scores. Additional research is necessary to further explore these relationships in an effort to allocate resources appropriately within health centers and implement the most suitable regulations for medical home transformation.

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PREFACE

My passion for the universal elimination of health care disparities serves as the inspiration behind my work. I give all thanks to God for providing me with the platform to conduct meaningful research and disseminate findings, all in an effort to implement sustainable change. I am most appreciative of the opportunity to have been surrounded by great mentors and scholars during my studies.

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TABLE OF CONTENTS

CHAPTER 1: INTRODUCTION

CHAPTER 2: MEASURING MEDICAL HOME READINESS IN FEDERALLY

QUALIFIED HEALTH CENTERS: DEVELOPMENT AND VALIDATION OF A

NEW AND TAILORED TOOL (MANUSCRIPT I)

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1: INTRODUCTION

Background

A medical home is defined as "a team-based model of care led by a personal physician who provides continuous and coordinated care throughout a patient's lifetime in order to maximize health outcomes."[1] The concept of a medical home originated in 1967, when the American Academy of Pediatrics (AAP) first introduced it with the purpose of becoming the central location for archiving a child's medical records.[2, 3] It was in 1996 that the Institute of Medicine (IOM) reported that the medical home concept should be considered for all individuals, including adults and the elderly.[4] Research suggests that medical homes can improve health care outcomes, reduce disparities in access to care and quality of care, and potentially lower costs over the long run.[5- 9] Given the social and financial benefits associated with medical home implementation as well as the growing national attention and resources being allocated to these activities, it is necessary that medical homes be understood, well-designed, and appropriately implemented.

Following the introduction of the medical home model, numerous organizations have developed tools that aim to assess medical home achievement.[10] These tools vary in their scale, scope, and methodology. Current medical home assessment is uniform across dissimilar practices and populations, leading to varied organizations being assessed for medical home achievement alongside each other. Appropriately addressing medical home readiness is vital, as it allows practices to gauge the level of patient-centered and coordinated care that they are providing to their patients. Medical home accreditation

opens the door for provider and practice incentives, as well as enhanced reimbursement on both the state and national level.

Individuals with expensive and chronic conditions stand to benefit greatly from the medical home model. The coordination and integration of the health care of these populations has the potential to reduce duplication, manage expensive conditions, and improve quality of care. This perspective sheds light on an important group that would benefit from medical home implementation – Federally Qualified Health Centers (FQHCs). Although these centers often serve the sickest and most costly Americans, little attention has been given to the unique needs of these safety net health centers in regards to becoming a medical home. Health centers are located in medically-underserved and resource deprived areas and are charged to provide comprehensive services to all residents, regardless of insurance status or ability to pay.[11] Patients of FQHCs often face significant financial, geographic, language, and cultural barriers to accessing health care.[11]

According to the Health Resources and Services Administration (HRSA), in 2012 1,198 health centers served over 21.1 million patients across the country.[12] HRSA revealed that 62 percent of health center patients were racial/ethnic minorities and 23 percent of all patients were best served in languages other than English.[12] In 2009, one out of every 17 people living in the U.S. reported relying on an FQHC for primary care.[13] In 2012, about 36 percent of those who sought care at health centers were uninsured, while 41 percent were Medicaid recipients.[12] Almost 50 percent of the health center population resided in a rural part of the country in 2010.[11] In addition, 93 percent of health center patients lived below 200 percent of the federal poverty line.[11, 12] These

demographics are quite different from the overall U.S. population, where in 2010, only 35 percent were racial/ethnic minorities, 16 percent were uninsured, 16 percent were Medicaid recipients,16 percent lived in rural communities, and 40 percent lived below 200 percent of the federal poverty line.[11] These numbers show that the characteristics of individuals served by community health centers vary significantly from the characteristics of the general U.S. population, making their health care needs different.

Significance

Health centers serve a unique population with exceptional needs and significant diversity. Providers and health policy researchers have expressed concern in the process by which health centers are evaluated and accredited to become patient-centered medical homes. Most recently, a 2012 Health Affairs publication found that medical home redesign is not sensitive to, or inclusive of, services that may improve care for low-income patients.[14] The authors of this study noted that additional methods are required to measure and improve the capabilities of community health centers to function as medical homes.

Any medical home readiness tool used by health centers should be modified to the experiences of health centers, in order to meet the diverse needs of its patient population and to measure medical home readiness in the context of existing social and organizational factors. There is a need to both determine the measures to be included in a tool that would best define medical home readiness for health centers and to assess medical home readiness within health centers, based on best practices and measures. FQHCs are different from other organizations in the way that health care is financed,

structured, and delivered. FQHCs are also located in unique social and environmental settings, which is important to consider in the context of quality care, care coordination and management, and access to care. Improving care provision for health center patients through medical home implementation that addresses the unique characteristics of FQHCs has the potential to multiply financial and social gains not only for these patients and the communities where they live, but for the nation. This study significantly contributes to the literature by developing a novel measurement model that is specific to health centers and that is generalizable across the country.

First, published literature was reviewed to identify the domains and items most crucial to the development of a medical home for inclusion in a preliminary readiness scale for FQHCs. A Delphi panel, composed of experts from health centers and the health care industry, was convened to examine the content validity of the scale and to refine and further develop the scale. Following the development and preliminary validation of the scale, a pilot study was conducted to test and further validate the tool. The pilot survey was distributed to health centers in Maryland and Washington DC. Finally, the survey was distributed to a random sample of health centers across the country. Lastly, in order to understand the linkages between a health center's unique structure, medical home achievement, and patient outcomes, we examined relationships between 1) medical home readiness, 2) health center and patient characteristics, and 3) community attributes. Identifying these relationships presents a space for future research around direct causation, as well as a platform for social and political action in care delivery reform.

Study Aims and Research Questions

Aim 1: Develop and validate a medical home readiness assessment scale for FQHCs.

Research Question 1: What are the factors that affect medical home readiness?

Research Question 2: Where do voids exist in current medical home assessment tools?

Aim 2: Assess the extent of medical home readiness among a national sample of health centers using the scale developed in Aim 1.

Research Question 1: What is the level of medical home readiness among FQHCs?

Research Question 2: Is external accreditation as a medical home (NCQA, Joint Commission, URAQ, etc.) an effective marker of medical home readiness based upon the tool developed under Aim 1?

Aim 3: Determine whether relationships exist between health center and patient characteristics, community attributes, and medical home readiness.

Research Question 1: Which patient characteristics are associated with higher medical home readiness score?

Research Question 2: Which patient characteristics are associated with higher medical home readiness domain scores?

Research Question 3: Are certain health center or community attributes related to the medical home domains of interest from Research Question 2?

Organization of Dissertation

This dissertation is composed of three manuscripts, each of which address one study aim and is intended for individual submission to a peer-reviewed journal for publication. Each manuscript has been written to stand alone. Thus, background material may be repetitive throughout the dissertation. Chapter 1 of this dissertation introduces medical homes and health centers, along with the overall significance of this research.

The first manuscript (Chapter 2) uses published literature and expert input to develop and validate a scale that assesses the readiness of health centers to function as patient-centered medical homes. The second manuscript (Chapter 3) uses the scale developed in the first manuscript to assess current medical home readiness. First, the scale is tested in a pilot study involving health centers in Maryland and Washington DC. The scale is then distributed to a nationally representative sample of health centers across the country. Center medical directors are targeted in both the pilot and national studies to complete the survey. Finally, the third manuscript (Chapter 4) uses comprehensive data merged together from three sources: the results of the national medical home readiness scale distribution from the second manuscript, 2012 HRSA Uniform Data System (UDS), and 2012-2013 HRSA Area Health Resource Files (AHRF). We used linear regression analyses to assess relationships between health center and patient characteristics, community attributes, and medical home score for a national sample of health centers.

Chapter 5 summarizes the findings and discusses the strengths and limitations of the complete study. In addition, this chapter presents implications for policy and recommendations for future research. Appendices are included at the end of the dissertation.

References

[1] American College of Physicians. What is the Patient-Centered Medical Home? Retrieved February 23, 2012 from http://www.acponline.org/running_practice/pcmh/understanding/what.htm.

[2] American Academy of Pediatrics. Standards of child health care. Evanston, IL. American Academy of Pediatrics. 1967.

[3] American Academy of Family Physicians, American Academy of Pediatrics, American College of Physicians, & American Osteopathic Association. Joint principles of the patient-centered medical home, March 2007. Retrieved February 23, 2012 from http://www.acponline.org/running_practice/pcmh/demonstrations/jointprinc_05_17.pdf.

[4] Institute of Medicine (U.S.) and Donaldson M. Primary care: America's health in a new era. Washington, DC. National Academy Press. 1996.

[5] Blewett, L., Johnson, P., Lee, B., & Scal, P. (2008). When a Usual Source of Care and Usual Provider Matter: Adult Prevention and Screening Services. *Journal of General Internal Medicine, 23*(9), 1354–1360.

[6] Starfield, B. & Shi, L. (2004). The Medical Home, Access to Care, and Insurance: A Review of Evidence. *Pediatrics, 113*(5), 1493–1498.

[7] Franks, P. & Fiscella K. (1998). Primary Care Physicians and Specialists as Personal Physicians: Health Care Expenditures and Mortality Experience. *Journal of Family Practice, 47*(2), 105–109.

[8] Beal, A., Doty, M., Hernandez, S., Shea, K., & Davis, K. "Closing the Divide: How Medical Homes Promote Equity in Health Care: Results from the Commonwealth Fund 2006 Health Care Quality Survey." New York: The Commonwealth Fund, June 2007.

[9] Agency for Healthcare Research and Quality (AHRQ). Early Evidence on the Patient-Centered Medical Home. February 2012.

[10] Urban Institute. Patient-Centered Medical Home Recognition Tools: A Comparison of Ten Surveys' Content and Operational Details. May 2011.

[11] National Association of Community Health Centers. United States Health Center Fact Sheet, 2010. Retrieved April 9, 2012 from http://www.nachc.com/client/US11.pdf.

[12] Health Resources and Services Administration. 2012 Health Center Data. Retrieved July 8, 2014 from http://bphc.hrsa.gov/uds/datacenter.aspx?year=2012.

[13] U.S. Department of Health and Human Services. Community Health Centers and the Affordable Care Act: Increasing Access to Affordable, Cost Effective, High Quality Care. Retrieved July 14, 2012 from http://www.healthcare.gov/news/factsheets/2010/08/increasing-access.html.

[14] Clarke, R., Tseng, C., Brook, R., & Brown A. (2012). Tool used to assess how well community health centers function as medical homes may be flawed. *Health Affairs, 31*(2), 1-9.

CHAPTER 2: MEASURING MEDICAL HOME READINESS IN FEDERALLY QUALIFIED HEALTH CENTERS: DEVELOPMENT AND VALIDATION OF A NEW AND TAILORED TOOL (MANUSCRIPT I)

ABSTRACT

Objective: Federally Qualified Health Centers (FQHCs) serve a unique population and a new tool to measure Patient-Centered Medical Home (PCMH) readiness for these practices is needed. This study aims to develop a scale that assesses the readiness of health centers to function as medical homes.

Data Source and Methods: Published literature was reviewed to identify the domains and items most crucial to the development of a medical home for inclusion in a preliminary readiness scale for FQHCs. A Delphi panel, composed of experts from health centers and the health care industry, was convened to examine the content validity of the scale and to refine and further develop the scale.

Results: Following the review of existing literature and assessment tools, a total of 12 domains and 45 items were selected to be included in the medical home readiness scale. There was no expert consensus to remove any of the initial domains and measures. Rather, experts redefined 2 domains and indicated the need to be more general in defining health care providers.

Conclusions and Policy Implications: A medical home readiness scale, relevant to the unique characteristic of FQHCs, was developed based on existing literature and expert input. This scale is feasible to administer and incorporates important medical home elements left out of existing assessment tools. However, this scale must be further validated with health centers in larger research studies. Developing medical homes for the most vulnerable populations can positively impact individuals, their communities, and the nation.

Background

A medical home is defined as "a team-based model of care led by a personal physician who provides continuous and coordinated care throughout a patient's lifetime in order to maximize health outcomes."[1] The concept of a medical home originated in 1967, when the American Academy of Pediatrics (AAP) first introduced it with the purpose of becoming the central location for archiving a child's medical records.[2, 3] It was in 1996 that the Institute of Medicine (IOM) reported that the medical home concept applied to individuals of all ages.[4] Medical homes are different from other forms of health care delivery in that care is personalized, coordinated and delivered by a team of health care professionals.[5] In addition, patients and their caregivers are at the center of this care team, which includes a doctor, nurse, educator, and other health professionals and specialists who focus on prevention and disease management.[5] This team also coordinates care across settings, and knows and understands the patient's preferences and needs.[5]

Research suggests that medical homes can improve health care outcomes, reduce disparities in access to care and quality of care, and potentially lower costs over the long run.[6-10] Given the social and financial benefits associated with medical home implementation as well as the growing national attention and resources being allocated to these activities, it is necessary that medical homes be well-designed and appropriately implemented. Individuals with expensive and chronic conditions stand to benefit greatly from the medical home model. The coordination and integration of the health care of these populations has the potential to reduce duplication, manage expensive conditions, and improve quality of care.

11

Federally Qualified Health Centers (FQHCs)

FQHCs serve many of the sickest, poorest, and most costly individuals in the country. Given the intention of medical homes to coordinate care for the most unhealthy and expensive populations, this group is particularly important to target for medical home implementation. Health centers are located in medically-underserved and resource deprived areas and are charged to provide comprehensive services to all residents, regardless of insurance status or ability to pay.[11] FQHC patients often face significant financial, geographic, language, and cultural barriers to accessing health care.[11]

In 2012, there were 1,198 FQHCs with over 8,100 delivery sites.[11, 12] More than 21 million patients were served by health centers, 72 percent of whom had incomes less than 100 percent of the federal poverty line and 36 percent of whom were uninsured.[12] Over 62 percent of FQHC patients are racial or ethnic minorities, and 48 percent reside in rural parts of the country.[11, 12] FQHCs serve millions of patients with expensive chronic conditions, including a total of 1.9 million patients with hypertension and 1.2 million with diabetes.[11] Despite these challenges, FQHCs are both efficient and cost-effective, reducing emergency, hospital, and specialty care and saving the health care system $24 billion annually.[11] It is projected that in 2015, FQHCs will generate more than $53.8 billion dollars in economic benefits for local communities.[11] In addition, research has shown that health centers deliver care that is comparable to, or better than, care provided by private doctors and outpatient facilities.[13, 14] With the ongoing implementation of the 2010 Affordable Care Act, the number of individuals who seek care at health centers is expected to double, increasing the need to deliver coordinated, appropriate care to these patients.[15, 16]

FQHC Medical Home Standards

   In an FQHC, medical home development is often inclusive of all patients and services. FQHCs abide by similar standards as other health care providers in medical home development and accreditation. Health policy researchers and medical home stakeholders have expressed concern in the process by which health centers are evaluated and accredited to become patient-centered medical homes. A 2012 study found that medical home redesign is not sensitive to, or inclusive of, services that may improve care for low-income patients.[17] The authors of this study noted that additional methods are required to measure and improve the capabilities of community health centers to function as medical homes. Another researcher noted that the criteria used by NCQA and other accrediting organizations may need to be revised in order to better reflect meaningful practice transformation.[18] In addition, a study focused on chronic disease care in a medical home pilot in Pennsylvania involving practices that achieved NCQA PCMH recognition found limited improvements in quality and no changes in utilization and costs, suggesting that medical home interventions may need further refinement.[19]

   FQHCs are different from other groups in the way that health care is financed, structured, and delivered. FQHCs are also located in unique social and environmental settings, which is important to consider in the context of quality care, care coordination and management, and access to care. Improving care provision for health center patients through medical home implementation that addresses the unique characteristics of FQHCs has the potential to multiply social and financial gains not only for these patients and the communities where they live, but for the entire nation. Medical home assessment and accreditation tools used by health centers should be modified to the experiences of

health centers, in order to better meet the diverse needs of its patient population and to measure medical home readiness in the context of existing social and organizational factors.

Contribution to the Literature

Despite varied environmental characteristics, organizational design, and populations served, all medical practices are assessed by the same medical home rubric. This is problematic, as practices have to meet different needs and address disparate circumstances, depending on where they are located and who they serve. There has been little research to explore and address the dynamics that influence achievement of PCMH recognition. In addition, existing assessment and accreditation tools vary in their application of the Joint Principles of the Patient-Centered Medical Home, comprehensive measures released in 2007 as a way to fully develop and integrate existing medical home concepts.[3] Current tools vary in their emphasis on team structure, patient and family involvement, and appropriate measures of whole person orientation related to cultural and social elements, which are all significant to medical home development for health centers.

It is necessary to determine the measures that are central to medical home readiness for FQHCs, in order to develop a comprehensive scale for these practices. FQHCs serve a unique population with exceptional needs and significant diversity. Novel demonstrations are considering the development of medical homes within health centers, making our research both timely and important. The aim of this study is to determine the most important domains and items in medical home development for health centers and to develop a scale that appropriately encapsulates them.

Methods

Data for this research study consisted of information related to medical home history and development, collected through an in-depth literature review. In addition, primary data was collected through a Delphi panel approach. The Delphi method helps to identify the most important aspects of a topic by soliciting feedback from qualified experts in the field. The development of this panel was guided by a paper written by Okoli and Pawlowski.[20] We modified the methodology of Okoli's paper to meet the aims of our research study. Contrasting their approach, we did not rank experts within disciplines. We also allowed all interested experts who were contacted to participate.

Development of the Measurement Model

First, a review of the literature was completed. The primary purpose of the review was to assess domains and concepts that are central to the development of medical homes, specifically for FQHCs. Literature was identified through PubMed, Google, and Google Scholar internet searches using the terms 'medical home', 'patient-centered medical home', 'primary care medical home', 'PCMH', 'health home', 'FQHC medical home', and 'health center medical home'. Literature was searched from 1960 to early 2012. Given the on-going work around medical home transformation, published peer-reviewed literature alone did not fully capture the array of information available on the topic. The literature reviewed included comprehensive critiques of existing readiness assessment and accreditation tools. Preliminary domains were also identified and refined based on informal discussions with individuals at health centers.

Figure 2.1: Conceptual Framework

STRUCTURE	PROCESS	OUTCOMES
Environmental and Health Center Attributes	**Patient-Centered Medical Home Domains**	**Health Outcomes**
External Environment - Geographical setting - County-level factors	Personal Physician Assignment	Clinical Outcomes
	Physician-Directed Medical Practice	Health Disparities

Internal Environment
- Patient demographics
   - Payer mix
   - Staffing
   - Technology
   - Ownership
- Leadership culture
- Accountability system
- Internal collaboration
	Whole-Person Orientation	

	Coordinated, Integrated Care	
	Quality and Safety Improvement	
	Enhanced Access	
	Payment Structuring	

Using the information gathered, a conceptual framework of medical home achievement for FQHCs was developed (Figure 2.1). This conceptualization was based on Avedis Donabedian's Structure-Process-Outcomes model.[21, 22] Structure highlights the relatively stable characteristics of the providers of care, the tools and resources they have at their disposal and the physical and organizational settings in which they work.[21, 22] The concept of structure includes the human, physical, and financial resources that are needed to provide medical care.[21, 22] Process refers to the set of activities that go on within and between practitioners and patients.[21,22] Lastly, outcome alludes to a change in a patient's current and future health status that can be attributed to antecedent health care.[21, 22] In using Donabedian's work as a foundation for this research, structural factors align to the internal and external environmental and organizational attributes of health organizations that make them unique from others. Domains from the 2007 Joint Principles of the Patient-Centered Medical Home are considered process factors, in that these domains

encapsulate activities that occur within a health care organization between providers and patients.[3] These process factors occur within a given health center structure and are correlated to patient outcomes. The patient outcomes of interest as a result of medical home processes are comprehensive and include clinical outcomes (incidence and prevalence of chronic disease, morbidity, and adherence) and health disparities. This research focuses on the construction and development of process factors, particularly for FQHCs in the midst of transformation to becoming successful medical homes.

Delphi Panel Inclusion Criteria

Key stakeholders in medical home development, including health center directors and staff at government, academic research, and quality improvement organizations, participated in a Delphi panel to select the central medical home domains and measures for FQHCs. Recruitment for the panel was done by email beginning in February 2013. Individuals identified to participate in the panel were those identified in the literature to play an important role in FQHC medical home development and operation. A total of 15 health center directors were contacted to participate in the study. Of these, 5 directors agreed to participate. Also, 8 of the 12 government, academic, and industry stakeholders solicited agreed to participate in the panel.

Of the health centers that did not participate, a decline was assumed through non-response to the email invitation. Of the stakeholders that declined participation, one declined due to conflict of interest, while another did not specify a reason for declining. Two others failed to respond to the invitation. Overall, a total of 13 experts were included in the final modified Delphi expert panel including five health center representatives from Maryland, Texas, California (2), and Hawaii, four quality improvement organizations

representatives, and one representative from each of the following: health information technology company, government organization, academic institution, and health insurance company.

Delphi Panel Timeline

Members of the expert panel first received the survey in February of 2013. Information collected in the literature review and conceptualization were provided to panel members. They were asked to rank the most important domains of medical home development for FQHCs, based on their professional knowledge and experiences with health centers. Experts were then presented with 45 medical home measures and asked to rate each measure as Very Important, Important, Somewhat Important, or Not Important. Experts were also asked to evaluate the overall content validity of the domains and collated set of measures. The first round of the survey was completed in mid-April 2013.

The second iteration of the survey went out in late April, 2013. The group results from the first round were presented and experts were tasked with confirming the previous average rankings of the group, as well as commenting on the overall importance of domains and measures. In addition, experts categorized new domains and measures that were proposed in the first round of the survey. Lastly, experts were asked to clarify the terms 'clinician' and 'physician', as this was a concern voiced by numerous panelists in the first round of the survey. The second round of the panel was completed in May 2013. The Delphi panel was conducted using Qualtrics Survey Program, a web-based survey service (http://qualtrics.com). Both iterations of the Delphi panel survey can be found in the Appendices. The complete scale is not included in the manuscript, due to copyright concerns.

After exporting the data from Qualtrics, preliminary quantitative analysis of expert panel responses was conducted using StataIC 11. Experts were categorized as either "Health Center" or "Industry" respondents, in order to gauge differences in responses. Means were used to assess differences. Statistical analysis was not possible given the small sample size of the panel (n=13). Qualitatively, text responses and comments were reviewed individually and addressed by the principal researcher. The study protocol was reviewed by the Johns Hopkins Bloomberg School of Public Health Institutional Review Board (IRB) and was determined to be Not Human Subjects Research (NHSR).

Results

Highlights from the Literature

The literature review provided a wealth of information related to medical homes that dated as far as back as the mid-1960s. Key documents that were reviewed include published papers on medical home development as well as relevant reports written by health policy organizations.[23-28] The foundation for medical home standards are the Joint Principles of the Patient Centered Medical Home, established in 2007 as a way to integrate medical home concepts from throughout the literature.[3] There are 7 standards that make up the Joint Principles: 1. Having a personal physician, 2. A physician directed medical practice, 3. Whole person orientation, 4. Coordinated and integrated care, 5. Quality and safety, 6. Enhanced access to care, and 7. Payment for added value.[3] As a result of the release of the Joint Principles, there are now numerous medical home

assessment and recognition tools that incorporate the seven core principles and add additional standards that are construed as important in the health care community.

Seeking to identify key domains and measures in medical home development, we focused our initial review on papers that listed and described core principles of medical homes. In 1992 the American Academy of Pediatrics (AAP) presented a specific set of domains to be considered for a children's medical home, which included accessibility, continuity, comprehensiveness, family centeredness, coordination, and compassion.[29] In 1999, AAP added a seventh principle, culturally effective care.[30] In 2002, AAP noted 37 specific activities that should occur within a medical home.[31, 32] These domains and elements served as the foundation of what would become the 2007 Joint Principles of the Patient-Centered Medical Home.[3]

Following the introduction of the medical home model in 1967 and the development of the Joint Principles in 2007, numerous agencies developed tools to gauge medical home development and achievement. In the literature, 7 recent tools that assess medical home transformation were identified – NCQA PCMH 2011, AAAHC Medical Home, Joint Commission's Primary Care Medical Home, URAC's Patient Centered Health Care Home, TransforMED's Medical Home Implementation Quotient, Center for Medical Home Improvement's Medical Home Index, and Safety Net Medical Home Initiative Change Concepts.[33-43] These tools are described in further detail in Appendix A. Most often, FQHCs use the National Committee for Quality Assurance's (NCQA) Patient-Centered Medical Home (PCMH) Standards, made up of 6 domains and 28 elements.[34-37] One benefit of NCQA's tool is that it is widely used around the country for

PCMH assessment and recognition. Limitations include cost, heavy IT emphasis, and limited must pass elements.[33-37]

These tools vary in the domains addressed and the emphasis placed on each measure within a domain. Most existing tools place little emphasis on payment reform and lack focus on whole person orientation, specifically cultural competency and understanding and addressing the cultural and social determinants of health access and outcomes for patients. Given that there is no gold standard of medical home achievement in the literature, no tests of validity or reliability exist for these tools. Appendix A summarizes each tool in more detail, including the domains as well as pros and cons of each tool.

Following the review of existing literature and tools, a total of 12 domains and 45 items were selected to be included in the preliminary medical home readiness scale for FQHCs. These domains and items are a mix between those refined from existing tools and others not included in existing tools that were found to be important from the literature and informal discussions with experts in the field.

Delphi Panel

Ultimately, there was no expert consensus to remove any of the initial scale domains and items. In addition, there was no consensus that any of the items were of little to no importance in medical home readiness for FQHCs. Rather, several experts suggested that some domains and items be edited to be more inclusive and descriptive of what they should represent. In one instance, during the first round, experts suggested that physicians could be interchanged with physician assistants and/or nurse practitioners in the medical home setting. This finding is supported by recent literature, which finds that

non-physician providers are effective at providing improved access to care, patient outcomes, and reducing health disparities.[44] In the second round, experts were asked to categorize which role in a medical home belonged to a clinician versus a physician. Following round two, physician was replaced with clinician throughout the survey, given the overwhelming response of the panel.

In another instance, experts suggested the addition of two new domains – 'Stable Leadership at the Site and Organizational Level' and 'Translation and Outreach'. In both cases, the suggested additions were presented to experts in the second round of the panel and existing domains were revised to address these topics. The 'Physician care team leadership' domain was revised to be "Care team and organizational leadership" and "Translation and Outreach' was added as a sub-domain of Evidence-based care. Relevant measures were also edited to encapsulate the importance of leadership on all levels within the organization.

Table 2.1: Final Selection of Medical Home Domains

Domain (N=12)	Mean Rank (Health Center Respondents) N=5	Mean Rank (Industry Respondents) N=8
Enhanced access to patient-centered care	4.8	3.7
Personal clinician	6.8	5.6
Continuity of care	2.6	6.3
Care management	5.8	4.7
Whole person orientation	7.4	5.4
Coordinated and integrated care	6.4	5.9
Quality assessment and improvement	4.6	8.4
Incentives and/or payment for value	6.8	7.7
Evidence-based care	5.6	9.4
Care team and organizational leadership	8.2	8.9
Cultural competence	9.2	7.7
Electronic capabilities	10.6	9.4

Experts were asked to rank the domains in order of importance for medical home development within a health center. Health center respondents found continuity of care, quality assessment and improvement, and evidence-based care to rank higher in importance in PCMHs compared to Industry respondents. No other apparent differences existed in the ranking of domains by experts (Table 2.1). Several experts on the panel commented on the difficulty of ranking domains in medical home development, as each of these domains is dependent on others to be successful. One expert noted "PCMH is not a linear or sequential concept. It is rather social change in a complex adaptive system. All of these things are important and should be under consideration."

Discussion

A brief scale was developed to assess FQHC medical home readiness, based on existing literature and expert input. The final scale consists of 12 domains and 45 items, compiled to specifically address medical home development and readiness assessment for FQHCs. Health center staff are able to complete this survey independently, reducing the administrative burden. Unlike existing tools, an emphasis has been placed on the inclusion of measures related to cultural competency and social and cultural determinants of health care – factors important to care provision for health center populations. It is important that medical home tools are adapted to suit the populations that they are tasked to measure. All health care organizations and patients are not the same. This research acknowledges the diversity among patients and providers and addresses it through use of relevant literature and expert contributions in the development of a new medical home readiness scale.

There are a few limitations associated with this study. First, inherent differences may exist between experts that agreed to participate in our study versus those that did not. Given that we randomized the selection of participants, the threat of this limitation is slightly minimized, but not entirely eliminated. Next, in March 2014 NCQA released PCMH 2014, which aims to integrate behavioral health, further address socioeconomic drivers of health, and enhance emphasis on team-based care.[37] Given the timeline of our research, we were unable to consider the new tool in our analyses. Lastly, other medical home tools may exist that are used internally within organizations and/or not recognized on a larger scale. We limited our analyses to those publicly available for use by FQHCs. Nevertheless, the contributions of this research to the literature outweigh its limitations, as this is the first attempt to develop a measurement model of medical home readiness for health centers, which have unique goals and challenges.

This novel study has significant policy implications. The Affordable Care Act of 2010 makes an $11 billion investment in health center infrastructure and operation over a 5 year period.[16] In addition, health centers are expected to serve over 20 million more patients by 2015.[45] FQHCs may be able to use resources in a more cost-effective manner for both new and existing patients through appropriate medical home transformation. A wealth of research points to the impact of medical homes on health care quality, outcomes, and costs.[6-10] Most recently, a 2014 study found significant improvements in cost, utilization, population health, prevention, access to care, and patient satisfaction among medical home practices.[46]

Developing medical homes for the most vulnerable and expensive populations has the potential to positively impact individuals, their communities, as well as society as a

whole. Implementation of the medical home model can enhance care provision for patients of health centers, with the application of transformative activities that are relevant and evidence-based. In-turn, health centers may be able to improve health and reduce costs over the long-run. Comprehensive research is necessary to further validate this scale and examine the impact of health center medical home transformation on outcomes. In addition, once this scale is further refined, national health center accreditation requirements may be revised to be more reflective of domains and items that account for the diversity and needs of health center patients and practices.

References

[1] American College of Physicians. What is the Patient-Centered Medical Home? Retrieved February 23, 2012 from http://www.acponline.org/running_practice/pcmh/understanding/what.htm.

[2] American Academy of Pediatrics. Standards of child health care. Evanston, IL. American Academy of Pediatrics. 1967.

[3] American Academy of Family Physicians, American Academy of Pediatrics, American College of Physicians, & American Osteopathic Association. Joint principles of the patient-centered medical home, March 2007. Retrieved February 23, 2012 from http://www.acponline.org/running_practice/pcmh/demonstrations/jointprinc_05_17.pdf.

[4] Institute of Medicine (U.S.) and Donaldson M. Primary care: America's health in a new era. Washington, DC. National Academy Press. 1996.

[5] National Partnership for Women and Families. Understanding Medical Homes Retrieved April 30, 2012 from http://www.empireblue.com/shared/noapplication/f0/s0/t0/pw_b153348.pdf?refer=ehpfooter.

[6] Blewett, L., Johnson, P., Lee, B., & Scal, P. (2008). When a Usual Source of Care and Usual Provider Matter: Adult Prevention and Screening Services. *Journal of General Internal Medicine, 23*(9), 1354–1360.

[7] Starfield, B. & Shi, L. (2004). The Medical Home, Access to Care, and Insurance: A Review of Evidence. *Pediatrics, 113*(5), 1493–1498.

[8] Franks, P. & Fiscella K. (1998). Primary Care Physicians and Specialists as Personal Physicians: Health Care Expenditures and Mortality Experience. *Journal of Family Practice, 47*(2), 105–109.

[9] Beal, A., Doty, M., Hernandez, S., Shea, K., & Davis, K. "Closing the Divide: How Medical Homes Promote Equity in Health Care: Results from the Commonwealth Fund 2006 Health Care Quality Survey." New York: The Commonwealth Fund, June 2007.

[10] Agency for Healthcare Research and Quality (AHRQ). Early Evidence on the Patient-Centered Medical Home. February 2012.

[11] National Association of Community Health Centers. United States Health Center Fact Sheet, 2010. Retrieved April 9, 2012 from http://www.nachc.com/client/US11.pdf.

[12] Health Resources and Services Administration. 2012 Health Center Data. Retrieved July 8, 2014 from http://bphc.hrsa.gov/uds/datacenter.aspx?year=2012.

[13] Goldman, L. Elizabeth, et al. (2012) "Federally Qualified Health Centers and Private Practice Performance on Ambulatory Care Measures." American Journal of Preventative Medicine 43 (2):142-149.

[14] Shi, L., et al. (2012) Clinical Quality Performance in U.S. Health Centers. Health Services Research. 47(6):2225-2249.

[15] McClanahan, C. Community Health Centers – Providing A Base of Care. Forbes. Retrieved July 16, 2012 from http://www.forbes.com/sites/carolynmcclanahan/2012/07/16/community-health-centers-providing-a-base-of-care/.

[16] National Association of Community Health Centers (NACHC) (2010). Community Health Centers lead the Primary Care Revolution. Retrieved April 17, 2014 from http://www.nachc.com/client/documents/Primary_Care_Revolution_Final_8_16.pdf.

[17] Clarke, R., Tseng, C., Brook, R., & Brown A. (2012). Tool used to assess how well community health centers function as medical homes may be flawed. *Health Affairs, 31*(2), 1-9.

[18] Abrams, M. Medical Homes: An Evolving Model of Primary Care. February 2014. Retrieved May 27, 2014 from http://www.commonwealthfund.org/publications/blog/2014/feb/medical-homes-evolving-primary-care.

[19] Friedberg, M. W., Schneider, E. C., Rosenthal, M. B., Volpp, K. G., and Werner, R. M. (2014). Association between participation in a multipayer medical home intervention and changes in quality, utilization, and costs of care. *JAMA, 311*(8), 815-825.

[20] Okoli, C. & Pawlowski, S. (2004). The Delphi method as a research tool: an example, design considerations and applications. *Information & Management, 42*, 15-29.

[21] Donabedian, A. (1966). Evaluating the quality of medical care. *Milbank Memorial Fund Quarterly, 44*(2), 166-206.

[22] Donabedian, A. (1980). *The definition of quality and approaches to its assessment.* Ann Arbor, Mich.: Health Administration Press.

[23] The Commonwealth Fund. Issue Brief: Providing Underserved Patients with Medical Homes: Assessing the Readiness of Safety-Net Health Centers. May 2010.

[24] Stange, K., Nutting, P., Miller, W., Jaen, C., Crabtree, B., Flocke, S., & Gill, J. (2010). Defining and Measuring the Patient-Centered Medical Home. *Journal of Internal Medicine, 25*(6), 601-612.

[25] The 2009 Commonwealth Fund National Survey of Federally Qualified Health Centers. March 2009-May 2009. Documents retrieved from http://www.commonwealthfund.org/Surveys/2010/May/The-2009-Commonwealth-Fund-National-Survey-of-Federally-Qualified-Health-Centers.aspx.

[26] Wagner, E., Colman, K., Reid, R., Phillips, K., & Sugarman J. Guiding Transformation: How Medical Practices Can Become Patient-Centered Medical Homes. The Commonwealth Fund. February 2012.

[27] Robert Graham Center For Policy Studies in Family Medicine and Primary Care. The Patient Centered Medical Home: History, Seven Core Features, Evidence and Transformational Change. November 2007.

[28] American Academy of Family Physicians (AAFP), American Academy of Pediatrics (AAP), American College of Physicians (ACP), and American Osteopathic Association (AOA). Guidelines for Patient-Centered Medical Home (PCMH) Recognition and Accreditation Programs. February 2011.

[29] American Academy of Pediatrics. The Medical Home: Ad Hoc Task Force on Definition of the Medical Home. *Pediatrics* 1992; 90:774.

[30] American Academy of Pediatrics, Committee on Pediatric Workforce. Culturally effective pediatric care: education and training issues. *Pediatrics*. 1999; 103: 167-170.

[31] American Academy of Pediatrics. Policy Statement: Organizational Principles to Guide and Define the Child Health Care System and/or Improve the Health of All Children. *Pediatrics* 2002; 110: 184-186.

[32] The Patient Centered Medical Home. History, Seven Core Features, Evidence and Transformational Change. Center for Policy Studies in Family Medicine and Primary Care. November 2007. Retrieved May 27, 2014 from http://www.aoa.org/documents/advocacy/Patient-Centered-Medical-Home-History.pdf.

[33] Urban Institute. Patient-Centered Medical Home Recognition Tools: A Comparison of Ten Surveys' Content and Operational Details. May 2011.

[34] National Committee for Quality Assurance (NCQA). Patient-Centered Medical Home (PCMH) 2011. Website: http://www.ncqa.org/tabid/631/Default.aspx.

[35] National Committee for Quality Assurance (NCQA). (2011). NCQA's Patient-Centered Medical Home (PCMH) 2011 Standards. Accessed August 2, 2012 from www.ncqa.com.

[36] National Committee for Quality Assurance (NCQA). (2011). NCQA's PCMH 2011 Summary. Accessed August 2, 2012 from www.ncqa.com.

[37] National Committee for Quality Assurance (NCQA). (2014). Patient-Centered Medical Home Recognition 2014. Accessed April 2, 2014, from http://www.ncqa.org/Home/PatientCenteredMedicalHome.aspx.

[38] Accreditation Association for Ambulatory Health Care, Inc. Primary Care & Medical Home. Website: http://www.aaahc.org/en/accreditation/primary-care-medical-home/.

[39] Joint Commission. Primary Care Medical Home. Website: http://www.jointcommission.org/accreditation/pchi.aspx.

[40] URAC. URAC's Patient Centered Health Care Home Program. Website: https://www.urac.org/healthcare/prog_accred_pchch_toolkit.aspx.

[41] TransforMED. Patient-Centered Model. Website: http://www.transformed.com/transformed.cfm/.

[42] Center for Medical Home Improvement (CMHI). The Medical Home Index. Website: http://www.medicalhomeimprovement.org/pdf/CMHI-MHI-Adult-Primary-Care_Full-Version.pdf.

[43] Safety Net Medical Home Initiative. Change Concepts. Website: http://www.safetynetmedicalhome.org/change-concepts.

[44] National Association of Community Health Centers. Fact Sheet: Expanding Access to Primary Care: The Role of Nurse Practitioners, Physician Assistants and Certified Nurse Midwives in the Health Center Workforce. September 2013. Retrieved May 27, 2014 from http://www.nachc.com/client/documents/Workforce_FS_0913.pdf.

[45] Community Health Centers and the Affordable Care Act: Increasing Access to Affordable, Cost Effective, High Quality Care. Retrieved May 2, 2012 from http://www.healthcare.gov/news/factsheets/2010/08/increasing-access.html.

[46] Nielsen, M. Olayiwola, J.N., Grundy, P., Grumbach, K. (ed.) Shaljian, M. The Patient-Centered Medical Home's Impact on Cost & Quality: An Annual Update of the Evidence, 2012-2013. Patient-Centered Primary Care Collaborative (2014). Retrieved May 23, 2014 from http://www.pcpcc.org/resource/medical-homes-impact-cost-quality#sthash.mthY6NIE.dpuf.

CHAPTER 3: ASSESSING MEDICAL HOME READINESS AMONG A NATIONAL SAMPLE OF FEDERALLY QUALIFIED HEALTH CENTERS (MANUSCRIPT II)

ABSTRACT

Objective: This study aims to assess Federally Qualified Health Center (FQHC) readiness to function as a Patient-Centered Medical Home (PCMH) using a new scale that accounts for the unique characteristics of health centers.

Data Source and Methods: A previously developed medical home readiness assessment scale was distributed electronically to a national random sample of health center medical directors. Using a 1-point per question algorithm, scores were calculated for each center in order to assess medical home readiness efforts nationwide. In addition, the association between medical home readiness score and outside medical home accreditation was explored in order to further validate the scale and define a cut-off point for medical home achievement.

Results: Nationally, health centers showed 70 percent compliance with the medical home readiness scale. Several domains indicated high compliance, including access and quality items, while incentivizing only achieved 32 percent compliance. Health centers with outside PCMH accreditation experienced significantly higher mean compliance (75 percent) compared to those with no accreditation, whose average score was 66 percent

(p<.001). We established an appropriate cut-off point to be 70 percent, given the

distribution of responses in the pilot and national studies.

Conclusions and Policy Implications: The development of a medical home scale for

health centers ensures that factors crucial to care delivery for vulnerable populations are

addressed. Our research establishes that health centers have experienced moderate

medical home achievement, overall. More than half of surveyed health centers achieved

over 70 percent compliance on survey items. Further research is necessary to examine the

relationship between medical home transformation and health outcomes, disparities, and

costs.

Background

A medical home is defined as "a team-based model of care led by a personal physician who provides continuous and coordinated care throughout a patient's lifetime in order to maximize health outcomes."[1] Research has shown that medical homes can improve health care outcomes, reduce disparities in access to care and quality of care, and potentially lower health care costs.[2-6] Individuals with expensive and chronic conditions stand to benefit from the medical home model. The coordination and integration of the health care of these populations has the potential to reduce duplication, manage expensive conditions, and improve quality of care.

Federally Qualified Health Centers (FQHCs) are located in medically-underserved and resource deprived areas and are charged to provide comprehensive services to all residents, regardless of insurance status or ability to pay.[7] Given the intention of medical homes to coordinate care for the most unhealthy and expensive populations, health centers are particularly important to target for medical home implementation. FQHCs serve millions of patients with expensive chronic conditions, including a total of 1.9 million patients with hypertension and 1.2 million with diabetes in 2010.[7] In 2012, there were 1,198 FQHCs with over 8,100 delivery sites.[7, 8] More than 21 million patients were served by health centers, 72 percent of whom had incomes less than 100 percent of the federal poverty line and 36 percent of whom were uninsured.[8] Over 62 percent of FQHC patients are racial or ethnic minorities and 48 percent reside in rural parts of the country.[7, 8] It is projected that by 2015, FQHCs will serve over 40 million patients and generate more than $53.8 billion dollars in economic benefits for local communities.[7, 9]

Medical Home Measurement

The Joint Principles of the Patient Centered Medical Home were established in 2007 as a way to fully develop and integrate medical home concepts.[10] The American Academy of Family Physicians (AAFP), American Academy of Pediatrics (AAP), American College of Physicians (ACP), and American Osteopathic Association (AOA), who together represent over 333,000 physicians, joined forces to develop and emphasize these principles.[10] According to the Joint Principles, medical homes are best defined as a model that encompasses seven core functions and attributes:

➢ Personal physician – each patient has an ongoing relationship with a personal physician trained to provide first contact, continuous and comprehensive care.

➢ Physician-directed medical practice – the personal physician leads a team of individuals at the practice level who collectively take responsibility for the ongoing care of patients.

➢ Whole person orientation – the personal physician is responsible for providing all the patient's health care needs or taking responsibility for appropriately arranging care with other qualified professionals at all stages of life; acute care; chronic care; preventive services; and end of life care.

➢ Care coordination – care is coordinated and/or integrated across all elements of the complex health care system (e.g., subspecialty care, hospitals, home health agencies, nursing homes) and the patient's community (e.g., family, public and private community-based services). Care is facilitated by registries, information technology, health information exchange and other means to assure that patients

get the indicated care when and where they need and want it, in a culturally and linguistically appropriate manner.

➢ Quality and safety – use of evidence-based medicine and clinical decision-support tools guide decision making, in addition to practices engaging patients and their families, advocating for their patients, and accepting accountability for continuous quality improvement.

➢ Enhanced access – care is available through systems such as open scheduling, expanded hours and new options for communication between patients, their personal physician, and practice staff.

➢ Payment for value – payment structure appropriately recognizes the added value provided to patients who have a patient-centered medical home.

There are several medical home recognition tools being used around the country, with the most popular being the National Committee for Quality Assurance's (NCQA) 2011 Patient Centered Medical Home tool.[11, 12] These tools all measure how well a practice is doing as a medical home, but vary in their scale, scope, and methodology. Scholars have noted significant limitations within existing medical home assessment tools for practices that serve vulnerable populations. For example, Robin Clarke and his colleagues found that the assessment tool developed by NCQA and most endorsed by the federal government may not be sensitive to, or inclusive of, services that improve care for low-income patients.[13] Another researcher noted that the criteria used by NCQA and other accrediting organizations may need to better reflect meaningful practice transformation.[14] In addition, a 2014 study focused on chronic disease care in a medical home pilot in Pennsylvania involving practices that achieved NCQA PCMH recognition

found limited improvements in quality and no changes in utilization and costs, suggesting that medical home interventions may need further refinement.[15] Appropriately addressing medical home readiness is vital, as it allows practices to gauge the level of patient-centered and coordinated care that they are providing to their patients. Accreditation opens the door for provider and practice incentives, as well as enhanced reimbursement on both the state and national level.

Current medical home assessment is uniform across dissimilar practices and populations, leading to varied organizations being assessed for medical home achievement alongside each other. FQHCs are different from other groups in the way that health care is financed, structured, and delivered. FQHCs are also located in unique social and environmental settings, which is important to consider in the context of quality care, care coordination and management, and access to care. This study will measure medical home readiness among a nationally representative sample of FQHCs using a new medical home tool designed specifically for health centers.[16] In addition, this study will further validate this new tool by exploring the relationship between medical home readiness score and outside medical home accreditation or certification.

Contribution to the Literature

Despite varied environmental characteristics, organizational design, and populations served, practices are assessed by the same medical home rubric. There has been little research in the dynamics that influence achievement of PCMH recognition. The testing of a new scale for health centers incorporates the input of FQHC experts and professionals from across the country, making the study both comprehensive and timely. In addition, we measure the status of medical home readiness for FQHCs, providing

researchers and policy makers with important insight on where health centers stand with the use of a novel scale that appropriately encapsulates the most crucial domains and measures of medical home readiness.

Methods

Data for this research study consisted of comprehensive primary data collection methods. Development of the medical home readiness scale was completed based on information collected through an in-depth literature review and Delphi panel.[16] This process was also essential to establishing face and content validity. Following the development and preliminary validation of the scale, a pilot study was conducted to test and further validate the tool. The pilot survey was distributed to health centers in Maryland and Washington DC. Finally, the survey was distributed to a random sample of health centers across the country.

We used 2012 Uniform Data System (UDS) data reported to the Health Resources and Services Administration (HRSA) (http://bphc.hrsa.gov/healthcenterdatastatistics/), as well as 2012-2013 Area Health Resource Files (AHRF) data (http://ahrf.hrsa.gov/) to determine characteristics of the national health center population to compare to our sample. UDS is a core set of data for reviewing the operation and performance of health centers, as defined by Section 330 of the Public Health Services Act. These centers include community health centers, migrant health centers, health care for the homeless programs, public housing primary care programs, and other health delivery organizations that receive federal funding under Section 330. UDS tracks information on health center patient demographics, services provided, staffing, clinical indicators, utilization rates,

costs, and revenues. Data are reported annually by health centers in the first quarter of every year.[17]

Area Health Resource Files (AHRF) provided information related to a community's health care facilities, health professionals, and population characteristics. AHRF is maintained by Quality Resource Systems, Inc. (QRS), under contract to HRSA. AHRF provide current and historic data on over 6,000 variables for every county in the US. Geographic codes and descriptors make files easily linkable to other data. Data are assembled annually, and used to help inform health resources planning, analyses and decision making.[18, 19]

In our analyses, the dependent variable of interest was medical home score, measured as a continuous variable. Independent variables of interest were: 1) organization-level health center patient characteristics, extracted from 2012 UDS data: % female, % minority, % uninsured, % public insurance, % diabetic, % hypertensive, % overweight or obese, % asthmatic on appropriate treatment plan (asthmatic patients, ages 5-40), % eligible who received cervical cancer screening (females, ages 24-64), and % eligible who received colorectal screening (adults, ages 51-74); 2) health center organizational characteristics, extracted from medical home readiness data: external PCMH accreditation or certification, inclusion in a larger medical network/organization, health center affiliations or partnerships, and level of internal collaboration (little/some versus high); and 2012 UDS data: electronic health record (EHR) use, and location in an urban (MSA) area; and 3) community-level attributes, extracted from 2012-2013 AHRF files: % poverty (2009 measure), % Hispanic (2010 measure), # physicians (2009-2011 measure), and # hospital beds (2010 measure).

Scale Development

In developing the FQHC medical home readiness scale, information was first collected through an in-depth literature review in order to identify the most important domains and items.[16] Literature was identified through PubMed, Google, and Google Scholar internet searches using the terms 'medical home', 'Patient-Centered Medical Home', 'Primary Care Medical Home', 'PCMH', 'health home', 'FQHC medical home', and 'health center medical home'. Literature was searched from 1960 to early 2012. Next, a Delphi expert panel was assembled and used to select the central medical home domains and measures, employing the information collected from the literature review and conceptualization.[16] Members of the panel included five health center representatives from Maryland, Texas, California (2), and Hawaii, four quality improvement organizations representatives, and one representative from each of the following: health information technology company, government organization, academic institution, and health insurance company. Delphi panel recruitment and survey distribution took place between February and May of 2013. Qualtrics, a web-based survey system, was used for the study (http://qualtrics.com).

Following the two rounds of the Delphi panel, the final scale, composed of 45 items, was distributed to medical directors of health centers in Maryland and Washington DC for further testing. In the event that the medical director of a health center could not be reached, the executive director was contacted. In addition to the scale, the survey provided to health centers included questions related to PCMH accreditation or certification, organizational affiliation and partnerships, organizational culture, and internal collaboration. Qualtrics was used to distribute the survey to these centers

Pilot Study and Scoring Methodology

Table 3.1: FQHC Medical Home Readiness Scale Domains and Count of Items

Domains (N=12)	# of Items (N=45)
Enhanced Access to Patient-Centered Care	3
Coordinated and Integrated Care	4
Care Management	4
Cultural Competency	6
Continuity of Care	5
Care Team and Organizational Leadership	6
Quality Assessment and Improvement	5
Whole Person Orientation	4
Personal Clinician	1
Incentives and/or Payment for Added Value	2
Evidence-Based Care	2
Electronic Capabilities	3

from September 2013 to October 2013. Of the 22 health centers that received the survey, 16 (73 percent) agreed to participate in the study and completed the full survey and medical home scale. Based on the literature review, expert panel, and pilot study, items were categorized into one of 12 domains (Table 3.1). Given the small sample size of the pilot survey (n=16), correlation and exploratory factor analyses were not possible for the categorization of the 45 items.

Each scale item contributed 0, .25, .5, .75 or 1 point, depending on the level of agreement with the question. Health centers that reported an activity 0 percent of the time, or never, received no points for that item. Centers that reported an activity 25 percent of the time received .25 points. Those that reported an activity 50 percent of the time received .50 points; 75 percent of the time received .75 points; and 100 percent compliance received 1 full point. Few missing values were represented (<3% across all items) and were coded as never (0 percent of the time) in the event of this occurrence.

Points were summed to form domain scores as well as an overall medical home score.

The maximum number of possible points was 45, indicating 100 percent compliance with

the medical home items and domains. A score of 33.75 indicated 75 percent compliance,

while a score of 22.5 indicated 50 percent compliance. In addition, experts noted the need

to weigh items equally, as they are interdependent and all play a vital role in medical

home operation.[16] The domains with the heaviest weight (by item) are cultural

competency and care team and organizational leadership (6 items, each). The domain

with the lowest weight is having a personal clinician (1 item).

National Survey Distribution

The survey was randomly distributed to 604 of the 1,198 health centers across the

United States in 2012 (50 percent of the total health center population). The full listing of

active health centers was obtained from the Health Resources and Services

Administration (HRSA) health center listing.[20] Maryland and Washington DC health

centers were excluded from the final survey, given their inclusion in the pilot study. An

online random number generator, Stat Trek, was used for center selection.[21] 46 centers

were eliminated from the sample due to bounced emails (n=13), participation in the

expert panel and/or pilot survey (n=9), lack of appropriate alignment with 2012 UDS data

(n=18), or no longer being an active FQHC (n=6). 558 FQHCs were included in the final

distribution, with 202 completing the survey in its entirety (36 percent response rate).

This sample is adequate with a 95 percent confidence level and 6.5 percent precision.[22]

A three-month data collection period (October 2013 – December 2013) was

selected to ensure that all organizations were made aware of the survey request in a

timely manner. The survey was designed to be as brief as possible, with items intended to

be clear and concise in an effort to reduce respondent burden. A personalized e-mail invitation was sent to each FQHC medical director. In cases where contact information for the medical director was not available, the invitation was sent to the FQHC director. The survey deadline was posted in each electronic distribution of the survey. The Johns Hopkins Bloomberg School of Public Health logo was clear and visible to respondents. Qualtrics web-based surveying system was also used to distribute the final survey. Individuals were contacted about the survey three times; in an initial introduction and survey email, a follow-up reminder email, and a final reminder email. The survey system remained open until January 2014, in the event that individuals responded later than the deadline.

This study protocol was reviewed by the Johns Hopkins Bloomberg School of Public Health Institutional Review Board (IRB) and was determined to be Not Human Subjects Research (NHSR), given the focus on organization characteristics. No patient-level identifiers, data, or information are included in any aspect of the research study.

Results

Pilot Study

Table 3.2: Pilot Study Findings with FQHCs in Maryland and Washington DC (N=16)

Items	Mean Score (%)	SD	Min	# at Min (%)	Max	# at Max (%)	Scale Max
Access	2.19 (73)	0.86	.5	1 (6.3)	3	5 (31.3)	3
Coordination/ Integration	2.41 (60.3)	.72	1	1 (6.3)	3.75	1 (6.3)	4
Care Management	2.55 (63.8)	0.71	1.5	1 (6.3)	3.5	4 (25.0)	4
Cultural Competency	3.66 (61)	1.46	0	1 (6.3)	5.5	1 (6.3)	6
Continuity	3.08 (61.6)	1.22	.75	2 (12.5)	4.75	2 (12.5)	5
Leadership	4.23 (70.5)	0.78	2.25	1 (6.3)	5.25	1 (6.3)	6
Quality	3.52 (70.4)	.97	1.5	1 (6.3)	4.75	2 (12.5)	5
Whole Person	2.34 (58.5)	.80	1	1 (6.3)	3.75	1 (6.3)	4
Personal Clinician	.77 (77)	.21	.5	5 (31.3)	1	6 (37.5)	1
Incentives	.45 (22.5)	.59	0	8 (50.0)	2	1 (6.3)	2
Evidence-based Care	1.5 (.75)	.34	1	3 (18.8)	2	2 (12.5)	2
Electronic Capabilities	2.14 (71.3)	.76	.75	1 (6.3)	3	6 (37.5)	3
Scale Totals	28.83 (64.1)	5.91	20.5	1 (6.3)	37.5	1 (6.3)	45

In the pilot study, health centers reported a mean score of 28.8 (64 percent compliance), with a minimum score of 20.5 and a maximum score of 37.5. This reveals that most health centers in the pilot study experienced greater than 50 percent compliance, but none achieved 100 percent compliance. 83 percent compliance is the highest level reported from the pilot study (37.5 out of 45 points). A bivariate

(unadjusted) relationship between score and outside PCMH accreditation was not

statistically significant in analyses, likely due to the small sample size. Additional

findings from the pilot survey can be found in Table 3.2.

National Survey

Table 3.3: Survey Respondents Compared to FQHC Population (2012)

Patient Demographics (%)	Survey Respondents (n=202)	All Other Health Centers (n=996)	p-value
Female	57.1	57.5	.48
Race/Ethnicity:			
White, Non-Hispanic	45.8	42.9	.23
Black, Non-Hispanic	16.6	20.4	.05
Asian, Non-Hispanic	2.4	2.4	.96
Hispanic patients	26.3	25.3	.65
Best served in another other language	17.8	18.2	.82
Income below 150% FPL	61.1	62.4	.48
Insurance:			
Uninsured	37.9	38.9	.51
Medicaid or CHIP	34.7	34.4	.83
Medicare	8.8	8.9	.82
Health Conditions and Screenings:			
Diabetic	8.7	8.8	.77
Hypertensive	17.5	17.8	.68
Asthma treatment plan	75.8	74.6	.50
Cervical cancer screening	52.2	51.4	.60
Colorectal cancer screening	27.4	27.3	.93

A total of 202 FQHCs completed the national survey. Health centers were

represented from all but 1 state (Nevada), as well as several territories. With the

exception of the percentage of black patients, the characteristics of survey respondents

closely mirrored that of the greater population of health centers from 2012 HRSA UDS

data (Table 3.3). The average percentage of black patients in our sample of health centers

was significantly lower than in the entire universe of health centers (p=.05). These

relationships were similar when considering responding health centers versus those contacted that did not participate in the study (see Appendix D).

Table 3.4: National Survey Study Findings (n=202)

Items	Mean Score (%)	SD	Min	# at Min (%)	Max	# at Max (%)	Scale Max
Access	2.35 (78.3)	.66	0	2 (1.0)	3	60 (29.7)	3
Coordination/ Integration	2.64 (66.0)	.81	.25	1 (.5)	4	10 (5.0)	4
Care Management	2.96 (74.0)	.81	.25	1 (.5)	4	19 (9.4)	4
Cultural Competency	3.87 (64.5)	1.40	0	1 (.5)	6	12 (5.9)	6
Continuity	3.63 (72.6)	.89	.25	1 (.5)	5	15 (7.4)	5
Leadership	4.4 (73.3)	1.14	0	1 (.5)	6	15 (7.4)	6
Quality	3.85 (77.0)	1.00	0	1 (.5)	5	31 (15.4)	5
Whole Person	2.45 (61.3)	.89	.5	6 (3.0)	4	11 (5.5)	4
Personal Clinician	.79 (79.0)	.20	0	3 (1.5)	1	76 (37.6)	1
Incentives	.64 (32.0)	.70	0	89 (44.1)	1	30 (14.9)	2
Evidence-based Care	1.58 (79.0)	.38	.25	1 (.5)	2	49 (24.3)	2
Electronic Capabilities	2.52 (84.0)	.58	.5	1 (.5)	3	88 (43.6)	3
Scale Totals	31.68 (70.4)	6.74	11.25	1 (.5)	44.5	1 (.5)	45

The mean medical home readiness score from the survey was 31.68, or 70.4 percent compliance, 6 percentage points higher than the pilot study average. The minimum score reported was 11.25 (25 percent compliance), while the highest score reported was 44.5 (98.9 percent compliance). Domains with the highest compliance were electronic capabilities (84 percent), having a personal clinician (79 percent), evidence-

based care (79 percent), and access (78.3 percent). Incentives for added value (32

percent), whole-person orientation (61.3 percent), and cultural competency (64.5 percent)

had the lowest compliance levels. Additional findings from the final survey can be found

in Table 3.4.

Table 3.5: Adjusted Multivariate Analysis of Factors Associated with Medical Home
Readiness Score

Variable	Coefficient	SE	P-Value
Health Center Patients (%):			
Female	.001	.084	.99
Minority	.06	.02	.01
Uninsured	.01	.05	.77
Publicly Insured	.08	.06	.14
Diabetic	-.53	.24	.03
Hypertensive	.26	.09	.01
Overweight/Obese	-.02	.08	.84
Asthmatic, On Treatment Plan	-.01	.02	.53
Cervical Cancer Screening	.06	.03	.07
Colorectal Cancer Screening	-.06	.03	.05
Health Center Organizational Characteristics:			
External PCMH Accreditation or Certification	3.51	.998	.001
Participation in a Larger Network	-.55	1.07	.61
Partnership with other Health Centers	.66	1.57	.68
Use of EHR	.58	2.06	.78
Location in MSA	-1.38	1.00	.17
High Internal Collaboration	3.90	.995	<.001
Community (county) Attributes:			
Persons below poverty line (%)	.10	.07	.16
Hispanic (%)	-.03	.03	.22
# Physicians per 1,000 residents	-.59	.53	.26
# Hospital Beds per 1,000 residents	.60	.56	.29

Based on the distribution of responses, we identified 31.5, or 70 percent

compliance, to be the cut-off point in distinguishing health centers who have achieved

medical home transformation versus those who have not. With the exception of the

incentives domain, which presented a mean significantly lower than the other domains, we established that health centers must achieve at least 70 percent compliance overall, as well as on each domain, in order to achieve full medical home transformation. In the national sample, only 23 health centers met this requirement, or 11 percent of the centers sampled.

Scoring Compared to Other Tools

Health centers that completed the survey were asked to report whether they had obtained medical home accreditation from other agencies or organizations. 97 of responding centers (48 percent) reported having medical home accreditation: 82 from NCQA's PCMH Program (7 NCQA Level 1, 28 NCQA Level 2, and 47 NCQA Level 3), 5 from AAAHC's Medical Home Program, 23 from the Joint Commission Medical Home Program, 4 from the Safety Net Medical Home Initiative, and 4 from a state agency. No health centers reported having URAC accreditation. In an unadjusted bivariate analysis, health centers who reported having outside accreditation had a 4.2 point increase in medical home score based on our tool compared to those with no accreditation (p<.001). Health centers with outside accreditation achieved an average of 75 percent compliance, compared to only 66 percent compliance in the sample with no reported accreditation. Even after controlling for patient demographics, organizational and community attributes, including MSA, community ethnicity and poverty, this relationship persisted (p<.001) (Table 3.5). In addition, 70 percent of centers with scores of over 70 percent on the medical home scale reported having outside medical home accreditation.

When looking specifically at unadjusted bivariate relationships between NCQA level (1, 2, or 3) and medical home scores, Level 3 NCQA medical homes experienced a score 4.69 points higher than other health centers (p<.001). Even after controlling for other attributes, Level 3 NCQA medical homes scored 4.09 points higher than others (p<.001). The relationship between Level 1 and Level 2 NCQA medical homes and medical home readiness score were not found to be statistically significant.

Health centers that reported outside accreditation had a greater mean across all 12 medical home domains, compared to health centers with no outside accreditation. Nevertheless, 25 percent of health centers who reported outside accreditation scored below 70 percent on this medical home tool, some as low as 33 percent. This indicates that these centers scored poorly on medical home items selected by experts in the field to be most important to health centers. While correlated, having outside medical home certification alone is not an effective marker of achievement using this new tool.

Discussion

This scale reveals moderate medical home achievement among health centers in the country. An average of 70 percent compliance was achieved across medical home items by the 202 centers that participated in the study. When considering medical home achievement to be greater than 70 percent compliance across all domains, only 11 percent of health centers surveyed met this requirement. About 8 percent of centers reported overall compliance of 90 percent or more on this tool. Additional emphasis should be placed on several elements of medical home development in order to perform strongly on

this tool, particularly on incentivizing activities, social and cultural considerations in providing care, and inclusion of the patient and family in the medical home.

It was determined that there is a positive correlation between medical home achievement on other scales and this tool, designed specifically for FQHCs. Even after controlling for organizational, community, and patient characteristics, having outside accreditation was associated with a 3.5 point increase in medical home readiness on this tool. However, a significant number of health centers who reported outside accreditation still performed poorly on this tool. This reveals that while there is some positive correlation between this and existing tools, the new tool may measure domains not fully captured in others.

The only significant difference identified between sampled versus non-sampled health centers as well as responding versus non-responding centers was the lower average number of black patients in our sample. When considering the greater universe of providers, our data is consistent with previous research which has shown that health centers serve greater proportions of minority, uninsured, and publicly insured patients than both physicians' offices and hospital outpatient departments.[23, 24] Our data also supports current research that shows that health center patients receive equal or better care than patients at other facilities. For example, patients in our sample experience greater cervical cancer screening rates than patients that use hospital outpatient departments.[25, 26] Asthmatic patients at health centers also have better asthma management than other patients.[27] Nevertheless, rates of colorectal cancer screening appear lower in health center patients than among others.[28, 29] These findings all merit additional investigation.

In addition, an association between medical home readiness score and percentage of minority, diabetic and hypertensive patients, percentage of colorectal cancer screenings, as well as level of internal collaboration in a health center all show marginal significance in our multivariate analysis. More research is necessary to establish whether a true association exists between medical home readiness score and these attributes.

This study is unique in that the most crucial measures of medical home development for health center populations were captured through expert communication for the creation of a new, brief scale specifically for FQHCs. Health centers across the country were randomly selected to participate, and respondents were able to provide additional feedback related to their PCMH experiences. However, there are a few limitations to this study. First, the moderate response rate of our study (36%) represents only a subset of the universe of health centers. Given the lack of statistically significant differences in comparing participating centers with all health centers on key center characteristics, random selection appears to have helped to limit selection bias. Second, the electronic mode of distribution of the survey may have limited select health centers from accessing and completing the survey. Technical assistance was provided to any health center staff who encountered difficulties with this mode of distribution. While mailing surveys may have minimized this limitation, the cost associated with this method was outside of the scope of the project budget.

Overall, the contributions of this research to the literature outweigh these limitations, as this is the first attempt to use a novel measurement model of medical home readiness for health centers, which have unique goals and challenges. This tool has extensive value, given its ability to measure medical home readiness between health

centers and set a valid and reliable national benchmark. In addition, this tool assesses internal quality improvement activities in health centers across several relevant domains. All in all, this research tests a new tool that has the potential to enhance care provision for patients at health centers, and in-turn, improve health and reduce costs associated with duplication, morbidity, and mortality over the long-run.

Recent research revealed that NCQA medical home accreditation may, in fact, not be correlated with improved outcomes or costs.[13, 14] This is inconsistent with previous research, which revealed the positive potential of medical homes to improve quality, outcomes, and costs.[2-6] Particularly for health centers, this may indicate the need to take existing tools a step further and reassess measures that aim to capture the needs of the vulnerable populations traditionally served by health centers. The Affordable Care Act of 2010 provides over $11 billion dollars in funding for the strengthening of health center operations.[30] Given the potential of medical homes to be cost-effective while improving care, it is important that these limited resources are used efficiently and with the utmost consideration of the characteristics and needs of the populations served. This new scale supports this effort, as expert input and evidence-based activities for vulnerable populations serve as the foundation of the domains and items included in this scale.

The positive impact of intervening in Donabedian's process, structure, outcomes health care model through medical home implementation can only be fully assessed through the measurement of the correct process factors.[31] This research was able to test the most important measures in access, coordination, and quality for health center patients through the use of refined items based on literature and input of professionals in the field.[16] This study helped to establish construct validity for this tool, given the

significant correlation to existing medical home tools. We were also able to determine

that health centers are performing well in medical home readiness, overall, but there is

still work to be done across several domains. Further, it is not yet clear what the impact

of this performance means when it comes to improving quality of care. Additional

research is necessary to measure the impact of medical home achievement on key

outcomes of interest, including cost, quality, and health outcomes. This requires looking

at which aspects of medical home development are correlated to better health outcomes

and reduced health care disparities. It is only through additional research that we will be

able to determine whether medical homes are, in fact, an effective method to achieve the

triple aim – improved experience of care, improved population health, and reduced costs

- in the provision of care of vulnerable populations who rely on health centers.[32]

References

[1] American College of Physicians. What is the Patient-Centered Medical Home? Retrieved February 23, 2012 from http://www.acponline.org/running_practice/pcmh/understanding/what.htm.

[2] Blewett L., Johnson P., Lee B., & Scal P. (2008). When a Usual Source of Care and Usual Provider Matter: Adult Prevention and Screening Services. *Journal of General Internal Medicine, 23*(9), 1354–1360.

[3] Starfield B. & Shi L. (2004). The Medical Home, Access to Care, and Insurance: A Review of Evidence. *Pediatrics, 113*(5), 1493–1498.

[4] Franks P. & Fiscella K. (1998). Primary Care Physicians and Specialists as Personal Physicians: Health Care Expenditures and Mortality Experience. *Journal of Family Practice*, *47*(2), 105–109.

[5] Beal A., Doty M., Hernandez S., Shea K., & Davis K. "Closing the Divide: How Medical Homes Promote Equity in Health Care: Results from the Commonwealth Fund 2006 Health Care Quality Survey." New York: The Commonwealth Fund, June 2007.

[6] Agency for Healthcare Research and Quality (AHRQ). Early Evidence on the Patient-Centered Medical Home. February 2012.

[7] National Association of Community Health Centers. United States Health Center Fact Sheet, 2010. Retrieved April 9, 2012 from http://www.nachc.com/client/US11.pdf.

[8] Health Resources and Services Administration. 2012 Health Center Data. Retrieved July 8, 2014 from http://bphc.hrsa.gov/uds/datacenter.aspx?year=2012.

[9] National Association of Community Health Centers. Community Health Centers lead the Primary Care Revolution. August 2010. Retrieved April 17, 2014 from http://www.nachc.com/client/documents/Primary_Care_Revolution_Final_8_16.pdf.

[10] Patient-Centered Primary Care Collaborative. Joint Principles of the Patient-Centered Medical Home. Retrieved March 8, 2012 from http://www.pcpcc.net/content/joint-principles-patient-centered-medical-home.

[11] Urban Institute. Patient-Centered Medical Home Recognition Tools: A Comparison of Ten Surveys' Content and Operational Details. May 2011.

[12] National Committee for Quality Assurance. Patient-Centered Medical Home. Retrieved April 9, 2012 from http://www.ncqa.org/tabid/631/default.aspx.

[13] Clarke R., Tseng C., Brook R., & Brown A. (2012). Tool used to assess how well community health centers function as medical homes may be flawed. *Health Affairs, 31*(2), 1-9.

[14] Abrams, M. Medical Homes: An Evolving Model of Primary Care. February 2014. Retrieved May 27, 2014 from http://www.commonwealthfund.org/publications/blog/2014/feb/medical-homes-evolving-primary-care.

[15] Friedberg, M. W., Schneider, E. C., Rosenthal, M. B., Volpp, K. G., and Werner, R. M. (2014). Association between participation in a multipayer medical home intervention and changes in quality, utilization, and costs of care. *JAMA, 311*(8), 815-825.

[16] Pierre G., LaVeist T. A., and Shi L. (2014). Measuring Medical Home Readiness in Federally Qualified Health Centers: Development and Validation of a New and Tailored Tool. *Manuscript in preparation.*

[17] Bureau of Primary Health Care (BPHC), Health Resources and Services Administration (HRSA). Health Center Data. Accessed April 21, 2014 at http://bphc.hrsa.gov/healthcenterdatastatistics/#whatisuds.

[18] Health Resources and Services Administration (HRSA). Area Health Resource Files (AHRF). Data Categories. Accessed April 21, 2014 at http://arf.hrsa.gov/categories.htm.

[19] Health Resources and Services Administration (HRSA). Area Health Resource Files (AHRF). Contact Us. Accessed April 24, 2014 at http://arf.hrsa.gov/contactUs.htm.

[20] U.S. Department of Health and Human Services. Health Resources and Services Administration (HRSA). Find a Health Center. http://findahealthcenter.hrsa.gov/Search_HCC.aspx.

[21] Stat Trek. http://stattrek.com/statistics/random-number-generator.aspx.

[22] PennState. How to Determine a Sample Size. Retrieved August 22, 2013 from http://extension.psu.edu/evaluation/pdf/TS60.pdf.

[23] Shi, L., Lebrun, L. A., Hung, L. M., Zhu, J., & Tsai, J. (2012). US primary care delivery after the Health Center Growth Initiative: comparison of health centers, hospital outpatient departments, and physicians' offices. *The Journal of ambulatory care management, 35*(1), 60-74.

[24] Hing, E., Hooker, R. S., & Ashman, J. J. (2011). Primary health care in community health centers and comparison with office-based practice. *Journal of Community Health, 36*(3), 406-413.

[25] Shi, L. (2014). Cancer screening across primary care settings. *Manuscript in preparation.*

[26] Centers for Disease Control and Prevention (CDC). Ambulatory Health Care Data. http://www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm.

[27] Moorman, J. E., Akinbami, L. J., Bailey, C. M., et al. National Surveillance of Asthma: United States, 2001–2010. National Center for Health Statistics. Vital Health Stat 3(35). 2012.

[28] Messina, C. R., Lane, D. S., & Colson, R. C. (2009). Colorectal cancer screening among users of county health centers and users of private physician practices. *Public health reports*, *124*(4), 568.

[29] Centers for Disease Control and Prevention (CDC). Colorectal cancer screening rates remain low. Retrieved June 23, 2014 from http://www.cdc.gov/media/releases/2013/p1105-colorectal-cancer-screening.html.

[30] Community Health Centers and the Affordable Care Act: Increasing Access to Affordable, Cost Effective, High Quality Care. Retrieved May 2, 2012 from http://www.healthcare.gov/news/factsheets/2010/08/increasing-access.html.

[31] Donabedian, A. (1980). *The definition of quality and approaches to its assessment.* Ann Arbor, Mich.: Health Administration Press.

[32] Berwick, D., Nolan, T., & Whittington, J. (2008). The triple aim: care, health, and cost. *Health Affairs, 27*(3), 759-769.

CHAPTER 4: RELATIONSHIPS BETWEEN MEDICAL HOME READINESS AND FEDERALLY QUALIFIED HEALTH CENTER ATTRIBUTES (MANUSCRIPT III)

ABSTRACT

Objective: The objective of this study is to determine whether relationships exist between health center and patient characteristics, community attributes, and medical home readiness.

Data Sources and Methods: Data for this research study consisted of comprehensive data merged together from three sources: a recent national medical home readiness survey, 2012 Health Resources and Services Administration (HRSA) Uniform Data System (UDS), and 2012-2013 HRSA Area Health Resource Files (AHRF). We used linear regression analyses to assess relationships between health center and patient characteristics, community attributes, and medical home readiness score for a sample of 202 Federally Qualified Health Centers (FQHCs).

Results: Increased percentages of minority (p<.01) and hypertensive health center patients (p<.05), as well as women screened for cervical cancer (p<.05) were associated with higher medical home scores. Contrarily, increased percentages of diabetic patients were associated with lower medical home scores (p<.05). Reporting high internal

collaboration was also found to be associated with significantly higher medical home scores (p<.001). Additional significant relationships are apparent when considering individual medical home domain scores as the dependent variables of interest.

Conclusion and Policy Implications: Our analyses revealed that several associations exist between medical home readiness scores, health center patient and organizational characteristics, and community attributes. Additional research is necessary to further explore these relationships in an effort to allocate resources appropriately in FQHCs and implement the most appropriate regulations for medical home transformation.

Background

     A medical home is defined as "a team-based model of care led by a personal

physician who provides continuous and coordinated care throughout a patient's lifetime

in order to maximize health outcomes."[1] Medical homes are different from other forms of

health care delivery in that care is personalized, coordinated and delivered by a team of

health care professionals.[2] In addition, patients and their caregivers are at the center of

this care team, which includes a doctor, nurse, educator, and other health professionals

and specialists who focus on prevention and disease management.[2] This team also

coordinates care across settings and knows and understands the patient's preferences and

needs.[2] Research has shown that medical homes can improve health care outcomes,

reduce disparities in access to care and quality of care, and potentially lower health care

costs.[3-7] Nevertheless, weak evidence on the overall impact of the medical home on

outcomes and costs as well as limited research on this topic require more investigation to

be conducted.[8, 9] Given the intention of medical homes to coordinate care for the most

unhealthy and expensive populations, Federally Qualified Health Centers (FQHCs) are

particularly important to target for medical home implementation and further research.

     FQHCs are located in medically-underserved and resource deprived areas and are

charged to provide comprehensive services to all patients, regardless of insurance status

or ability to pay.[10] In 2012, there were 1,198 FQHCs with over 8,100 delivery sites.[10, 11]

More than 21 million patients were served by health centers, 72 percent of whom had

incomes less than 100 percent of the federal poverty line and 36 of whom were

uninsured.[10, 11] Over 62 percent of FQHC patients are racial or ethnic minorities, and 48

percent reside in rural parts of the country.[10, 11] FQHCs serve millions of patients with

expensive chronic conditions, including a total of 1.9 million patients with hypertension and 1.2 million with diabetes.[10] It is projected that by 2015, FQHCs will serve over 40 million patients and generate more than $53.8 billion dollars in economic benefits for local communities.[10, 12]

FQHCs are different from other organizations in the way that health care is financed, structured, and delivered. FQHCs are also located in unique social and environmental settings, which is important to consider in the context of quality care, care coordination and management, and access to care. Organizational characteristics have been found to be highly associated with the delivery of high-quality health care across multiple settings, while environment can directly affect individual and population health outcomes.[13-19] Staffing and technology have the potential to impact the preparedness of an organization to serve patients, as well as directly improve care quality and safety.[16, 17] Additional studies have found that organization ownership, leadership culture, accountability, and internal collaboration all potentially influence quality of care and performance in health care organizations.[13-15] For example, Keroack and colleagues found that in the highest performing academic medical centers, collaboration was key in service delivery, improvement, and problem solving.[13] Externally, geographical setting can directly impact access to care, as setting may impair convenience and ease of use.[18] Significant evidence shows that county-level factors, such as provider to patient ratio and the racial distribution of the population, adversely affect individual health outcomes and are important to control for in this model.[19]

There has been little research into the dynamics that influence PCMH achievement, particularly for health centers. A recent study used expert input and

consensus to determine the domains and measures central to medical home transformation readiness for FQHCs and developed a comprehensive assessment scale.[20] In a follow-up study, this scale was tested and further validated among a national sample of health centers.[21] In order to understand and impact the linkages between a health center's unique structure, medical home readiness, and outcomes, it is necessary to determine whether relationships exist between 1) attributes inherent to health centers and their environments, 2) patient characteristics, and 3) medical home readiness.

Contribution to the Literature

In a previous study, we developed a medical home readiness scale and measured the current level of readiness among FQHCs around the nation.[20, 21] It is not yet clear how medical home readiness may be related to key outcomes. Without explicit evidence that patients in a medical home setting experience better quality care and services, it becomes difficult to promote the idea of widespread medical home implementation. It is necessary to explore the social, organizational, and environmental factors that are associated with higher medical home readiness scores. Identifying these relationships presents a space for future research around direct causation, as well as a platform for social and political action in care delivery reform.

Methods

Data Sources

Data for this research study consisted of comprehensive data from three sources. First, data from a previously developed medical home readiness scale was used.

Development of the scale was completed based on data collected through an in-depth literature review and refined by a Delphi expert panel.[20] 12 specific medical home domains were defined – enhanced access to patient-centered, coordinated and integrated care, care management, cultural competency, continuity of care, care team and organizational leadership, quality assessment and improvement, whole person orientation, having a personal clinician, incentives for added value, evidence-based care, and electronic capabilities.[20] Following scale development, the survey was distributed to medical directors at health centers in Maryland and Washington DC for pilot testing.[21] Finally, the survey was distributed to a national random sample of health center medical directors in order to gauge medical home readiness and test scale construct validity.[21] In addition to the medical home readiness domains and measures, the survey asked questions related to organizational network, partnerships, and collaboration. The results of these previous studies have been discussed in further detail elsewhere.[20, 21]

Second, we used 2012 Uniform Data System (UDS) data reported to the Health Resources and Services Administration (HRSA) (http://bphc.hrsa.gov/healthcenterdatastatistics/).[22] UDS is a core set of data for reviewing the operation and performance of health centers, as defined by Section 330 of the Public Health Services Act.[22] These centers include community health centers, migrant health centers, health care for the homeless programs, public housing primary care programs, and other health delivery organizations that receive federal funding under Section 330.[22] UDS tracks information on health center patient demographics, services provided, staffing, clinical indicators, utilization rates, costs, and revenues.[22] Data are reported annually by health centers in the first quarter of every year.[22]

Lastly, 2012-2013 Area Health Resource Files (AHRF) provided information related to a community's health care facilities, health professionals, and population characteristics (http://arf.hrsa.gov).[23, 24] AHRF is maintained by Quality Resource Systems, Inc. (QRS), under contract to HRSA.[25] AHRF provide current and historic data on over 6,000 variables for every county in the US.[23] Geographic codes and descriptors make files easily linkable to other data.[23] Data are assembled annually, and used to help inform health resources planning, analyses and decision making.[23]

Study Sample

The study sample was restricted to the 202 health centers that participated in the medical home readiness scale national study.[21] Medical home readiness, 2012 UDS, and 2012-2013 AHRF data specific to these health centers were merged. The dependent variables of interest in the analyses were medical home readiness score, overall, as well as for each of the 12 individual domains. Independent variables of interest were: 1) organization-level health center patient characteristics, extracted from 2012 UDS data: % female, % minority, % uninsured, % public insurance, % diabetic, % hypertensive, % overweight or obese, % asthmatic on appropriate treatment plan (asthmatic patients, ages 5-40), % eligible who received cervical cancer screening (females, ages 24-64), and % eligible who received colorectal screening (adults, ages 51-74); 2) health center organizational characteristics, extracted from medical home readiness data: inclusion in a larger medical network/organization, health center affiliations or partnerships, and level of internal collaboration (little/some versus high); and 2012 UDS data: electronic health record (EHR) use, and location in an urban (MSA) area; and 3) community-level

attributes, extracted from 2012-2013 AHRF files: % poverty (2009 measure), % Hispanic (2010 measure), # physicians (2009-2011 measure), and # hospital beds (2010 measure).

Medical home scores were determined based on previous research.[21] The maximum score possible was 45, indicating 100 percent compliance on the medical home measures and domains. The point range for each of the 12 domain scores can be found in Table 4.1. While a previous study established 70 percent compliance overall and on each domain as the cut-off score for medical home achievement, the small number of health centers in the sample that met this requirement limited our ability to conduct extensive statistical analyses (n=23).[21] For this reason, we considered medical home score to be a continuous variable in our research study.

Table 4.1: FQHC Medical Home Readiness Scale Domains and Point Ranges

Scale Domains (N=12)	Point Range *(in increments of .25)*
Enhanced Access to Patient-Centered Care	0 – 3
Coordinated and Integrated Care	0 – 4
Care Management	0 – 4
Cultural Competency	0 – 6
Continuity of Care	0 – 5
Care Team and Organizational Leadership	0 – 6
Quality Assessment and Improvement	0 – 5
Whole Person Orientation	0 – 4
Personal Clinician	0 – 1
Incentives and/or Payment for Added Value	0 – 2
Evidence-Based Care	0 – 2
Electronic Capabilities	0 – 3
	45 points

Statistical Analyses

All data analyses were completed using Stata/IC 11.0 (www.stata.com). Summary descriptive statistics were determined using univar and summary commands in Stata. Appropriate bivariate and multivariate regression using ordinary least square (OLS) were run to examine relationships between the dependent and independent variables of interest. The Brueusch-Pagan/Cook-Weisberg test was used to test each model for heteroskedasticity. In the event that heteroskedasticity appeared to be an issue of concern, the model was adjusted with robust standard errors. Model 1 (unadjusted) examined the bivariate relationships between all health center characteristics, community attributes, and medical home readiness score. Model 2 analyzed adjusted multivariate relationships between patient characteristics and medical home readiness score. Model 3 represented adjusted multivariate models between patient characteristics, health center characteristics, and medical home readiness score, and model 4 added community attributes to the adjusted analysis. In considering each of the 12 medical home domains, only model 4 was conducted with each of the domains as the dependent variable of interest. Each domain was measured as continuous variable.

This study protocol was reviewed by the Johns Hopkins Bloomberg School of Public Health Institutional Review Board (IRB) and was determined to be Not Human Subjects Research (NHSR), given its focus on organization characteristics. No patient-level identifiers, data, or information is included in any aspect of the research study.

Results

Table 4.2: Mean Characteristics of Health Center Respondents

	Survey Respondents (n=202)	
	Mean (%)	SD
Health Center Patient Characteristics (%):		
Female	57.1	7.2
Minority	48.3	30.6
Uninsured	37.9	19.6
Publicly Insured	45.4	16.6
Diabetic	8.7	3.9
Hypertensive	17.5	8.6
Overweight/Obese	7.6	6.5
Asthmatic, On Treatment Plan	75.8	21.7
Cervical Cancer Screening	52.2	18.5
Colorectal Cancer Screening	27.4	19.5
Health Center Organizational Characteristics:		
Participation in a Larger Network	28.5	45.3
Partnership with other Health Centers	10.6	30.9
Use of EHR	93.6	24.6
Location in MSA	49.0	50.1
Internal Collaboration:		
Some	33.6	47.4
High	66.3	47.4
Community (county) Attributes:		
Persons below poverty line (%)	16.1	6.5
Hispanic (%)	15.5	18.9
# Physicians per 1,000 residents	3.6	10.7
# Hospital Beds per 1,000 residents	3.2	9.9

Preliminary descriptive analysis painted a picture of the characteristics of the

health center sample. In 2012, health centers in the sample were predominately female

and half of patients were from minority racial/ethnic groups. About 38 percent of health

center patients were uninsured, with another 45.4 percent reporting enrollment in CHIP,

Medicare, Medicaid, or another public insurance source. 8.7 percent of patients were

diabetic, while 17.5 percent were hypertensive and 7.6 percent were overweight or obese.

An average 75.8 percent of health center patients were on an appropriate asthma treatment plan. 52.2 percent of female patients aged 24-64 received pap tests, while only 27.4 percent of adults aged 51-74 received colorectal screening exams.

Of the health centers surveyed, 28.5 percent reported being a part of a larger network or organization. Almost 11 percent reported an affiliation or partnership with another health center. An overwhelming majority of health centers (93.6 percent) reported EHR system use, and 49 percent were located in urban areas. About a third of health centers reported high internal collaboration, compared to a third who reported only little to some internal collaboration. County-level data revealed that on average, 16.1 percent of health center communities lived below the poverty line. In addition, on average, health center counties were 15.5 percent Hispanic and there were 3.6 physicians and 3.2 hospital beds per 1,000 residents. Additional information on the mean characteristics of the health center sample can be found in Table 4.2.

With the exception of the percentage of black patients, the characteristics of survey respondents closely mirrored that of the greater population of health centers from 2012 HRSA UDS data. The average percentage of black patients in our sample of health centers was significantly lower than in the entire universe of health centers (p=.05). These relationships were similar when considering responding health centers versus those contacted that did not participate in the study (see Appendix D).

Table 4.3: Unadjusted Bivariate and Adjusted Multivariate Analyses of Patient and Organizational Characteristics on Medical Home Readiness Score

	Model 1 (unadjusted)	Model 2 (adjusted)	Model 3 (adjusted)	Model 4 (adjusted)
Health Center Patient Characteristics: (%)				
Female	.043 (.066)	.038 (.086)	.023 (.087)	- .021 (.090)
Minority	**.037 (.015)*****	**.046 (.018)*****	**.048 (.020)*****	**.057 (.023)****
Uninsured	- .025 (.025)	- .024 (.051)	- .003 (.053)	- .004 (.055)
Publicly Insured	**.056 (.029)*****	.038 (.057)	- .063 (.058)	.062 (.061)
Diabetic	- .033 (.012)	**- .707 (.218)****	**- .623 (.228)****	**- .516 (.242)*****
Hypertensive	.054 (.056)	**.372 (.104)***	**.321 (.101)****	**.248 (.101)*****
Overweight/Obese	.051 (.074)	- .009 (.086)	- .016 (.081)	- .015 (.083)
Asthma Treatment Plan	- .001 (.022)	.002 (.020)	- .009 (.019)	- .009 (.019)
Cervical Cancer Screening	**.052 (.026)*****	**.083 (.033)*****	**.068 (.032)*****	**.068 (.033)*****
Colorectal Cancer Screening	- .015 (.025)	**- .068 (.029)*****	**- .059 (.030)*****	- .048 (.030)
Health Center Org. Characteristics:				
Participation in a Larger Network	- .005 (.011)	---	-1.033 (1.099)	- .890 (1.091)
Partnership with other Health Centers	.0418 (.016)	---	1.284 (1.700)	1.151 (1.621)
Use of HER	.031 (.019)	---	1.415 (1.856)	1.239 (1.951)
Location in MSA	.012 (.001)	---	- .838 (.992)	- .427 (1.013)
High Internal Collaboration	**4.280 (.967)***	---	**4.271 (.992)***	**4.331 (.976)***
Community (county) Attributes:				
Poverty	**.179 (.073)*****	---	---	.101 (.078)
Hispanic	- .001 (.025)	---	---	- .031 (.026)
# Physicians per 1,000 residents	.018 (.045)	---	---	- .932 (.592)
# Hospital Beds per 1,000 residents	.027 (.048)	---	---	.981 (.632)

* p<.001   **p<.01   ***p<.05

71

Medical Home Readiness Score

Table 4.3 presents the results of unadjusted bivariate and adjusted multivariate analyses of patient and organizational characteristics on total medical home readiness score. The unadjusted regression model (model 1) presents bivariate relationships between patient and organizational characteristics and medical home readiness score. Several significant relationships are apparent. A one point increase in percentage of minority patients at a health center was found to be associated with a .037 point increase in medical home score (p<.05). A one point increase in the percentage of publicly insured patients was associated with a .056 point increase in medical home score (p<.05). A one point increase in the percentage of women screened for cervical cancer was associated a .052 point increase in medical home score (p<.05). Having high internal collaboration was associated with a 4.28 point increase in medical home score (p<.001). A one point increase in the percentage of persons living below poverty was associated with a .179 point increase in medical home score (p<.05). Other variables were not significantly associated with medical home readiness score in unadjusted analyses.

Model 2 analyzed adjusted multivariate relationships between patient characteristics and medical home score. The relationship between public insurance and medical home score is eliminated once other factors are controlled for in the analysis. Holding all else constant, a one point increase in the percentage of minority patients was associated with a .046 point increase in medical home readiness score (p<.05). A one point increase in the percentage of diabetic patients was associated with a .707 point decrease in medical home score (p<.01). Conversely, a one point increase in the percentage of hypertensive patients was associated with a .372 point increase in medical

home score (p<.001). A one point increase in the percentage of women screened for cervical cancer was associated with a .083 point increase in medical home score (p<.05). A one point increase in the percentage of adults screened for colorectal cancer was associated with a .068 point decrease in medical home score (p<.05).

Next, we ran an adjusted multivariate model among patient characteristics, health center characteristics, and medical home readiness score (model 3). Significant relationships are similar between this model, which controls for health center characteristics, and model 2. Holding all other variables constant, a one point increase in the percentage of minority patients was found to be associated with a .048 point increase in medical home score (p<.05). A one point increase in the percentage of diabetic patients was associated with a .623 point decrease in medical home score (p<.01), while a one point increase in the percentage of hypertensive patients was associated with a .321 point increase in medical home score (p<.01). A one point increase in the percent of women screened for cervical cancer was associated with a .068 point increase in medical home score (p<.05). A one point increase in the percent of adults screed for colorectal cancer was associated with a .059 point decrease in medical home score (p<.05). High internal collaboration was associated with a 4.27 point increase in medical home score (p<.001).

Lastly, model 4 adds community attributes to the adjusted multivariate analysis run in model 3. The negative relationship between colorectal cancer screening and medical home score after controlling for patient and health center characteristics is eliminated once community attributes are added to the model. In addition, the relationship between the percentage of the community below the poverty line and medical home score loses statistical significance once the model is adjusted.

Holding all else constant, a one point increase in the percentage of minority health center patients was associated with a .057 point increase in medical home score ($p<.01$). A one point increase in the percentage of diabetic patients was associated with a .516 point decrease in medical home score ($p<.05$). A one point increase in the percentage of hypertensive patients was associated with a .248 point increase in medical home score ($p<.05$). A one point increase in the percentage of women screened for cervical cancer was associated with a .068 point increase in medical home score ($p<.05$). Lastly, reporting high internal collaboration was found to be associated with a 4.3 point increase in medical home score, as compared to reporting low or some collaboration ($p<.001$).

Table 4.4: Adjusted Multivariate Analyses of Patient, Organizational, and Community Characteristics on Medical Home Domain Score

	Access	Coordination/ Integration	Care Management	Cultural Competency
Health Center Patient Characteristics: (%)				
Female	- .008 (.008)	**-.021 (.010)*****	-.010 (.010)	-.006 (.017)
Minority	.0002 (.002)	**.006 (.002)*****	**.006 (.003)*****	**.020 (.004)***
Uninsured	- .0001 (.005)	-.009 (.006)	.002 (.007)	.004 (.011)
Publicly Insured	.005 (.006)	.001 (.007)	.005 (.008)	.012 (.013)
Diabetic	- .015 (.025)	-.026 (.029)	-.037 (.025)	**-.102 (.050)*****
Hypertensive	.011 (.011)	.008 (.013)	.019 (.011)	**.047 (.022)*****
Overweight/Obese	.003 (.008)	-.007 (.010)	-.003 (.009)	.010 (.014)
Asthma Treatment Plan	.001 (.002)	.002 (.003)	.0002 (.002)	-.002 (.004)
Cervical Cancer Screening	-.0002 (.003)	.005 (.004)	**.012 (.004)****	**.014 (.006)*****
Colorectal Cancer Screening	.001 (.003)	-.003 (.004)	-.005 (.004)	**-.012 (.006)*****
Health Center Org. Characteristics:				
Participation in a Larger Network	-.198 (.117)	-.125 (.137)	.103 (.130)	-.263 (.215)
Partnership with other Health Centers	.055 (.168)	.139 (.197)	-.202 (.179)	.342 (.302)
Use of EHR	.325 (.213)	-.086 (.249)	.191 (.214)	-.548 (.284)
Location in MSA	.070 (.125)	.015 (.146)	.022 (.123)	-.151 (.224)
High Internal Collaboration	.184 (.103)	**.428 (.121)****	**.437 (.119)***	**.499 (.189)****
Community (county) Attributes:				
Poverty	-.001 (.008)	.010 (.009)	.005 (.009)	.020 (.015)
Hispanic	-.004 (.003)	-.003 (.004)	-.004 (.003)	-.007 (.005)
# Physicians per 1,000 residents	-.055 (.061)	-.082 (.072)	**-.159 (.079)*****	-.107 (.121)
# Hospital Beds per 1,000 residents	.06 (.066)	.087 (.078)	**.168 (.084)*****	.114 (.129)

* p<.001 **p<.01 ***p<.05

Table 4.4: Adjusted Multivariate Analyses of Patient, Organizational, and Community Characteristics on Medical Home Domain Score (continued)

	Continuity	Care Team Leadership	Quality	Whole Person Orientation
Health Center Patient Characteristics: (%)				
Female	.010 (.012)	.009 (.014)	-.011 (.011)	.009 (.012)
Minority	.002 (.003)	.005 (.004)	.004 (.004)	.005 (.003)
Uninsured	-.009 (.007)	.002 (.008)	.015 (.008)	.002 (.007)
Publicly Insured	-.006 (.008)	.009 (.009)	**.025 (.008)****	.004 (.008)
Diabetic	**-.078 (.030)****	**-.085 (.039)*****	-.047 (.034)	**-.074 (.034)*****
Hypertensive	**.032 (.015)*****	**.048 (.018)****	.021 (.014)	**.031 (.014)*****
Overweight/Obese	-.0003 (.010)	-.021 (.018)	.013 (.011)	.00004 (.011)
Asthma Treatment Plan	-.001 (.003)	-.003 (.003)	-.001 (.003)	-.001 (.002)
Cervical Cancer Screening	.007 (.005)	.008 (.005)	.007 (.004)	.005 (.004)
Colorectal Cancer Screening	-.007 (.004)	-.007 (.006)	-.005 (.005)	-.003 (.004)
Health Center Org. Characteristics:				
Participation in a Larger Network	.069 (.148)	.176 (.167)	-.108 (.168)	-.059 (.161)
Partnership with other Health Centers	.224 (.217)	.307 (.218)	-.066 (.269)	-.026 (.227)
Use of EHR	-.028 (.204)	.216 (.371)	**.501 (.259)*****	.070 (.297)
Location in MSA	-.065 (.142)	.191 (.180)	**-.324 (.162)*****	.001 (.145)
High Internal Collaboration	**.489 (.131)***	**.621(.163)***	**.387 (.150)*****	**.498 (.131)***
Community (county) Attributes:				
Poverty	.017 (.010)	.003 (.012)	.018 (.011)	.003 (.010)
Hispanic	.004 (.004)	.002 (.004)	**-.010 (.004)*****	-.002 (.004)
# Physicians per 1,000 residents	-.119 (.082)	**-.204 (.095)*****	.0003 (.094)	-.140 (.081)
# Hospital Beds per 1,000 residents	.122 (.087)	**.215 (.101)*****	.001 (.101)	.137 (.086)

*p<.001 **p<.01 ***p<.05

Table 4.4: Adjusted Multivariate Analyses of Patient, Organizational, and Community Characteristics on Medical Home Domain Score (continued)

	Personal Clinician	Incentives	Evidence-Based Care	Electronic Capabilities
Health Center Patient Characteristics: (%)				
Female	.004 (.003)	.0003 (.008)	-.006 (.005)	.007 (.007)
Minority	.001 (.001)	.004 (.002)	.001 (.001)	.003 (.002)
Uninsured	-.001 (.001)	**-.015 (.005)****	.001 (.003)	.003 (.004)
Publicly Insured	.001 (.002)	-.006 (.006)	.004 (.003)	.008 (.005)
Diabetic	-.008 (.008)	-.025 (.025)	-.0001 (.014)	-.017 (.020)
Hypertensive	**.007 (.003)*****	.011 (.011)	-.001 (.006)	.014 (.009)
Overweight/Obese	-.004 (.002)	.002 (.008)	.004 (.005)	-.013 (.008)
Asthma Treatment Plan	-.0004 (.001)	-.001 (.002)	-.0001 (.001)	-.002 (.002)
Cervical Cancer Screening	**.002 (.001)****	.006 (.003)	.002 (.002)	.001 (.003)
Colorectal Cancer Screening	-.001 (.001)	-.003 (.003)	.00005 (.002)	-.002 (.002)
Health Center Org. Characteristics:				
Participation in a Larger Network	.054 (.035)	.034 (.118)	.076 (.063)	-.145 (.101)
Partnership with other Health Centers	.041 (.051)	.157 (.169)	.069 (.091)	.110 (.118)
Use of EHR	.093 (.054)	-.297 (.214)	**.319 (.143)*****	**.483 (.228)*****
Location in MSA	-.025 (.030)	.003 (.125)	-.045 (.059)	-.120 (.093)
High Internal Collaboration	**.093 (.032)****	.144 (.014)	**.219 (.059)***	**.332 (.090)***
Community (county) Attributes:				
Poverty	-.0003 (.002)	.015 (.008)	.005 (.004)	.006 (.007)
Hispanic	.0002 (.001)	-.004 (.003)	-.002 (.002)	.0002 (.002)
# Physicians per 1,000 residents	-.017 (.020)	-.021 (.062)	-.018 (.041)	-.010 (.047)
# Hospital Beds per 1,000 residents	.020 (.022)	.022 (.067)	.020 (.044)	.015 (.050)

*p<.001 **p<.01 ***p<.05

Medical Home Domain Scores

Table 4 presents the results of adjusted multivariate analyses of patient, organizational, and community characteristics on each of the 12 medical home domain scores. No statistically significant relationships were found among the access domain and other characteristics in the model. Analyses revealed that several associations existed between medical home domain scores and patient, organization, and community characteristics. Increased percentages of minority patients were associated with higher coordination/integration (.006, p<.05), care management (.006, p<.05), and cultural competency (.020, p<.001) domain scores. This finding is inconsistent with previous quality research, which shows that greater numbers of minority patients are associated with lower quality of care.[26] Contrarily, it confirms recently published literature that shows that minority patients report higher care coordination than white patients, as well as recent medical home research, where medical home implementation eliminates racial and ethnic disparities in quality of care.[27, 28]

Increased percentages of diabetic patients were found to be associated with lower cultural competency (-.102, p<.05), continuity (-.078, p<.01), care team and organizational leadership (-.085, p<.05), and whole person orientation (-.074, p<.05) domain scores. This finding is consistent with current literature, which shows that diabetic patients receive poor quality of care.[29] Contrary to this finding, increased percentages of hypertensive patients were found to be associated with higher scores in cultural competency (.047, p<.05), continuity (.032, p<.05), care team leadership (.048, p<.05), whole person orientation (.031, p<.05), and personal clinician (.007, p<.05) domains. Previous research has showed an association between blood pressure control

78

and higher quality of care.[30] In addition, controlling hypertension is essential for chronic disease management. Our research may be reflective of better clinical management of hypertensive patients compared to diabetes patients in our sample of centers, although previous literature has suggested the opposite in some populations.[30]

Increased medical home domain scores were associated with higher percentage of women receiving cervical cancer screening. This association existed for overall medical home score (.068, p<.05), as well as care management (.012, p<.01), cultural competency (.014, p<.05), and personal clinician domains (.002, p<.01). This relationship was expected, as pap tests are often used as a quality of care indicator in health care.[31, 32] Higher numbers of pap tests have been found to be associated with higher performance in health centers.[33] Unlike this finding, higher percentages of colorectal cancer screening were found to be associated with lower cultural competency scores (-.012, p<.05). This finding is inconsistent with previous literature, which has shown that increased patient-provider communication is associated with higher screening rates.[34]

High internal collaboration was consistently associated with higher medical home scores across the board. Collaboration was also associated with increased coordination/integration (.428, p<.01), care management (.437, p<.001), cultural competency (.499, p<.01), continuity (.489, p<.001), care team and organizational leadership (.621, p<.001), quality (.387, p<.05), whole person orientation (.498, p<.001), person clinician (.093, p<.01), evidence-based care (.219, p<.001), and electronic capabilities (.332, p<.001). These findings are consistent with previous research, which show that care team collaboration improves quality of care and care outcomes.[12, 35, 36]

Other factors were significant across some domains. A higher percentage of female patients was associated with lower coordination/integration scores (-.021, p<.05). This is inconsistent with previous research which shows that women receive better quality of care than men.[37] Nevertheless, women's primary health care has been described as "fragmented" and researchers have noted that coordination and integration are both a challenge.[38] Next, a greater number of physicians per 1,000 residents was associated with decreased care management (-.159, p<.05) and care team leadership (-.204, p<.05), while a greater number of hospital beds per 1,000 residents was associated with increased care management (.168, p<.05) and care team leadership (.215, p<.05). These findings are somewhat contrary to previous research, which have associated a greater number of physicians with higher health care quality, and greater hospital capacity with increased use, but not better outcomes.[39, 40] It is possible that more available physicians make care management and leadership decisions more difficult to manage in a medical home setting. In addition, more hospital beds may mean more use, and thus, urgent cases to manage more efficiently.

A higher percentage of publicly insured patients was associated with increased quality of care (.025, p<.01). This is consistent with previous research, which shows that having insurance is associated with improved first-contact care and patient satisfaction.[41] Use of EHR was associated with increased quality (.501, p<.05), evidence-based care (.319, p<.05), and electronic capabilities (.483, p<.05). This finding builds upon existing research, which has found little to no association between EHR use and quality.[42] Location in an urban area and a higher percentage of Hispanics in the community were associated with lower quality scores (-.324, p<.05; -.010, p<.05, respectively). Literature

on quality between urban and rural providers is mixed, but this finding is consistent with some literature that notes lower quality scores in urban areas.[43-45] These findings are also consistent with research that has shown that greater numbers of minority patients are associated with lower quality of care.[26] Finally, a higher percentage of uninsured patients was associated with a lower score on the incentives domain (-.015, p<.01). This makes sense, as provider incentives are often provided through payors (i.e. Medicaid, Medicare), so incentives are limited for patients with no payor source.

Discussion

Our analyses uncovered significant relationships between medical home readiness, health center and patient characteristics, and community attributes. Greater representation of minority and hypertensive patients, cervical cancer screening, and internal collaboration were consistently associated with higher medical home readiness scores, while a higher percentage of diabetic patients was associated with lower medical home readiness scores. These relationships persisted across medical home domains. Many of these findings are aligned with existing literature, which suggests that patient, organizational, and community attributes are correlated to quality of care.

There are several limitations to this study. First, our response rate is small (36 percent) relative to the universe of health centers. This makes it difficult to generalize these findings. A previous research study showed that the characteristics between this sample and the population of health centers are similar, minimizing this concern.[21] Second, while the medical home scale used to collect data for this study has gone through preliminary content and construct validation, important measures related to medical home

achievement may be outside of the scope of this tool.[20, 21] By incorporating decades of literature and expert opinion, we tried to alleviate this concern in previous studies.[20, 21] Lastly, as this is a cross-sectional study, we are unable to attribute causation and only have evidence to support associations. Additional multi-year research is necessary to further explore relationships between patients, organizations, communities, and medical home readiness in order to assess whether there are direct causal relationships between these factors.

Through the Affordable Care Act of 2010, over $11 billion dollars will be allocated to health centers for expansion and operational improvements by the end of 2015.[46] The implementation of medical homes within health centers has tremendous implications for the future of health care provision for vulnerable populations. More collaborative and coordinated care has the potential to fill gaps in health care faced by disadvantaged populations. Medical home transformation has been shown to improve quality of care for patients, while potentially reducing costs over the long-term.[3-7]

Previous research developed and validated a scale for FQHCs to gauge medical home readiness within practices.[20, 21] This study presents significant evidence regarding factors that are associated with improved medical home readiness. Most notably, by encouraging internal collaboration and some cancer screenings within health centers, medical homes may be able to significantly improve operations and care provision. Nevertheless, additional, multi-year research studies with larger and more diverse samples are necessary to explore our findings further.

References

[1] American College of Physicians. What is the Patient-Centered Medical Home? Retrieved February 23, 2012 from http://www.acponline.org/running_practice/pcmh/understanding/what.htm.

[2] National Partnership for Women and Families. Retrieved April 30, 2012 from http://www.empireblue.com/shared/noapplication/f0/s0/t0/pw_b153348.pdf?refer=ehpfooter.

[3] American Academy of Pediatrics. Standards of child health care. Evanston, IL. American Academy of Pediatrics. 1967.

[4] American Academy of Family Physicians, American Academy of Pediatrics, American College of Physicians, & American Osteopathic Association. Joint principles of the patient-centered medical home, March 2007. Retrieved February 23, 2012 from http://www.acponline.org/running_practice/pcmh/demonstrations/jointprinc_05_17.pdf.

[5] Institute of Medicine (U.S.) and Donaldson M. Primary care: America's health in a new era. Washington, DC. National Academy Press. 1996.

[6] Blewett, L., Johnson, P., Lee, B., & Scal, P. (2008). When a Usual Source of Care and Usual Provider Matter: Adult Prevention and Screening Services. *Journal of General Internal Medicine, 23*(9), 1354–1360.

[7] Starfield, B. & Shi, L. (2004). The Medical Home, Access to Care, and Insurance: A Review of Evidence. *Pediatrics, 113*(5), 1493–1498.

[8] Agency for Healthcare Research and Quality (AHRQ). Early Evidence on the Patient-Centered Medical Home. February 2012.

[9] Bernstein, J., Chollet, D., Peikes, D., & Peterson G. Medical Homes: Will they improve primary care? Mathematica Policy Research, Inc., June 2010.

[10] National Association of Community Health Centers. United States Health Center Fact Sheet, 2010. Retrieved April 9, 2012 from http://www.nachc.com/client/US11.pdf.

[11] Health Resources and Services Administration. 2012 Health Center Data. Retrieved July 8, 2014 from http://bphc.hrsa.gov/uds/datacenter.aspx?year=2012.

[12] National Association of Community Health Centers (NACHC) (2010). Community Health Centers lead the Primary Care Revolution. Retrieved April 17, 2014 from http://www.nachc.com/client/documents/Primary_Care_Revolution_Final_8_16.pdf.

[13] Keroack, M., Youngberg, B., Cerese, J., Krsek, C., Prellwitz, L., & Trevelyan, E. (2007). Organizational Factors Associated with High Performance in Quality and Safety in Academic Medical Centers. *Academic Medicine, 82*(12), 1178-1186.

[14] Fottler, M. (1987). Health Care Organizational Performance: Present and Future Research. *Journal of Management, 13*(2), 367-391

[15] Flood, A. (1994). The Impact of Organizational and Managerial Factors on the Quality of Care in Health Care Organizations. *Medical Care Research and Review, 51*(4), 381-428.

[16] Aiken, L.H., Clarke, S.P., Sloane, D.M., Sochalski, J., & Silber, J.H. (2002). Hospital nurse staffing and patient mortality, nurse burnout, and job dissatisfaction. *Journal American Medical Association, 288*, 1987–1993.

[17] Bates, D. & Gawande, A. (2003). Improving Safety with Information Technology. *New England Journal of Medicine, 348*, 2526-2534.

[18] Guagliardo, M. (2004). Spatial accessibility of primary care: concepts, methods and challenges. *International Journal of Health Geographics*, 3, 3.

[19] Pickett, K. & Pearl, M. (2000). Multilevel analyses of neighborhood socioeconomic context and health outcomes: a critical review. *Journal of Epidemiology and Community Health, 55*, 111-122.

[20] Pierre, G., LaVeist, T., & Shi, L. (2014). Measuring Medical Home Readiness in Federally Qualified Health Centers: Development and Validation of a New and Tailored Tool. *Manuscript in preparation.*

[21] Pierre, G. (2014). Assessing Medical Home Readiness among a National Sample of Federally Qualified Health Centers (FQHCs). *Manuscript in preparation.*

[22] Bureau of Primary Health Care (BPHC), Health Resources and Services Administration (HRSA). Health Center Data. Retrieved April 21, 2014 from http://bphc.hrsa.gov/healthcenterdatastatistics/#whatisuds.

[23] Health Resources and Services Administration (HRSA). Area Health Resource Files (AHRF). Data Categories. Retrieved April 21, 2014 from http://arf.hrsa.gov/categories.htm.

[24] Health Resources and Services Administration (HRSA). Area Health Resource Files (AHRF). 2012-2013 AHRF Access Data. Retrieved April 14, 2014 from http://arf.hrsa.gov/download.htm.

[25] Health Resources and Services Administration (HRSA). Area Health Resource Files (AHRF). Contact Us. Retrieved April 24, 2014 from http://arf.hrsa.gov/contactUs.htm.

[26] Reschovsky, J. D., & O'Malley, A. S. (2008). Do primary care physicians treating minority patients report problems delivering high-quality care?. *Health Affairs*, *27*(3), w222-w231.

[27] *Closing the Divide: How Medical Homes Promotes Equity in Health Care*. Commonwealth Fund, 2007.

[28] Strickland, B., McPherson, M., Weissman, G., Van Dyck, P., Huang, Z. J., & Newacheck, P. (2004). Access to the medical home: results of the National Survey of Children with Special Health Care Needs. *Pediatrics*, *113*(Supplement 4), 1485-1492.

[29] Saaddine, J. B., Engelgau, M. M., Beckles, G. L., Gregg, E. W., Thompson, T. J., & Narayan, K. V. (2002). A diabetes report card for the United States: quality of care in the 1990s. *Annals of internal medicine*, *136*(8), 565-574.

[30] Egan, B. M., Zhao, Y., & Axon, R. N. (2010). US trends in prevalence, awareness, treatment, and control of hypertension, 1988-2008. *Jama*, *303*(20), 2043-2050.

[31] Schuster, M. A., McGlynn, E. A., & Brook, R. H. (2005). How good is the quality of health care in the United States?. *Milbank Quarterly*, *83*(4), 843-895.

[32] Health Resources and Services Administration (HRSA). Uniform Data System (UDS). Table 6B: Quality of Care Indicators. Retrieved April 23, 2014 from http://www.bphcdata.net/docs/table_6b.pdf.

[33] Paradise, J., Shin, P., Sharac, J., & Rosenbaum, S. J. (2013). Quality of Care in Community Health Centers and Factors Associated with Performance.

[34] Carcaise-Edinboro, P., & Bradley, C. J. (2008). Influence of patient-provider communication on colorectal cancer screening. *Medical care*, *46*(7), 738-745.

[35] Zwarenstein, M., Goldman, J., & Reeves, S. (2009). Interprofessional collaboration: effects of practice-based interventions on professional practice and healthcare outcomes. *Cochrane Database Syst Rev*, *3*(CD000072).

[36] Baggs, J. G., Schmitt, M. H., Mushlin, A. I., Mitchell, P. H., Eldredge, D. H., Oakes, D., & Hutson, A. D. (1999). Association between nurse-physician collaboration and patient outcomes in three intensive care units. *Critical care medicine*, *27*(9), 1991-1998.

[37] Asch, S. M., Kerr, E. A., Keesey, J., Adams, J. L., Setodji, C. M., Malik, S., & McGlynn, E. A. (2006). Who is at greatest risk for receiving poor-quality health care?. *New England Journal of Medicine*, *354*(11), 1147-1156.

[38] Henderson, J. T., Weisman, C. S., & Grason, H. (2002). Are two doctors better than one? Women's physician use and appropriate care. *Women's Health Issues*, *12*(3), 138-149.

[39] Cooper, R. A. (2009). States with more physicians have better-quality health care. *Health Affairs*, *28*(1), w91-w102.

[40] Fisher, E. S., Wennberg, J. E., Stukel, T. A., Skinner, J. S., Sharp, S. M., Freeman, J. L., & Gittelsohn, A. M. (2000). Associations among hospital capacity, utilization, and

mortality of US Medicare beneficiaries, controlling for sociodemographic factors. *Health Services Research*, *34*(6), 1351.

[41] Shi, L. (2000). Type of health insurance and the quality of primary care experience. *American Journal of Public Health*, *90*(12), 1848.

[42] Zhou, L., Soran, C. S., Jenter, C. A., Volk, L. A., Orav, E., Bates, D. W., & Simon, S. R. (2009). The relationship between electronic health record use and quality of care over time. *Journal of the American Medical Informatics Association*, *16*(4), 457-464.

[43] Baldwin, L. M., MacLehose, R. F., Hart, L. G., Beaver, S. K., Every, N., & Chan, L. (2004). Quality of care for acute myocardial infarction in rural and urban US hospitals. *The Journal of Rural health*, *20*(2), 99-108.

[44] Lutfiyya, M. N., Bhat, D. K., Gandhi, S. R., Nguyen, C., Weidenbacher-Hoper, V. L., & Lipsky, M. S. (2007). A comparison of quality of care indicators in urban acute care hospitals and rural critical access hospitals in the United States. *International Journal for Quality in Health Care*, *19*(3), 141-149.

[45] Reschovsky, J. D., & Staiti, A. B. (2005). Access and quality: does rural America lag behind?. *Health Affairs*, *24*(4), 1128-1139.

[46] Community Health Centers and the Affordable Care Act: Increasing Access to Affordable, Cost Effective, High Quality Care. Retrieved May 2, 2012 from http://www.healthcare.gov/news/factsheets/2010/08/increasing-access.html.

CHAPTER 5: DISCUSSION

Summary of Findings

This study developed and validated a scale to assess medical home readiness within health centers and identified relationships between medical home readiness, health center and patient characteristics, and community attributes.

Following a comprehensive review of existing literature and tools, a total of 12 domains and 45 items were selected to be included in the FQHC medical home readiness scale (Study Aim 1, Research Questions 1 and 2). While there was no expert consensus to remove any of the initial scale domains and items, experts suggested that some domains and items be revised. In the pilot study, 16 health centers reported a mean medical home readiness score of 28.8 out of 45 total points, with a minimum score of 20.5 and a maximum score of 37.5. A total of 202 FQHCs completed the national survey. The mean medical home readiness score from this survey was 31.68 or 70.4 percent compliance – 6 percentage points higher than the pilot study average (Study Aim 2, Research Question 1). The minimum score reported was 11.25 (25 percent compliance), while the highest score reported was 44.5 (98.9 percent compliance). More than half of surveyed health centers achieved over 70 percent compliance on survey items, showing moderate medical home readiness across FQHCs. In addition, we found that having outside medical home accreditation was associated with a higher readiness score (Study Aim 2, Research Question 2). Based on the distribution of responses we identified 31.5, or 70 percent compliance, to be the cut-off point in distinguishing health centers who have achieved medical home transformation versus those who have not.

In considering relationships between medical home readiness, health center and patient characteristics, and community attributes, increased percentages of minority and hypertensive health center patients as well as women screened for cervical cancer were associated with higher medical home readiness scores. Reporting high internal collaboration was also found to be associated with significantly higher medical home scores. Contrarily, increased percentages of diabetic patients were consistently associated with lower medical home scores (Study Aim 3, Research Question 1).

When considering individual medical home domains, increased percentages of diabetics were associated with lower cultural competency, continuity, care team leadership, and whole person orientation scores. Higher percentages of hypertensive patients were associated with higher cultural competency, care team leadership, whole person orientation, and personal clinician scores. Increased cervical cancer screening in a health center was associated with higher care management, cultural competency, and personal clinician scores, while higher percentages of colorectal cancer screening were associated with lower cultural competency scores (Study Aim 3, Research Question 2).

Use of EHR was associated with higher quality, evidence-based care, and electronic capabilities scores, while location in an MSA was associated with lower quality scores. High internal collaboration was positively associated with all medical home domain scores except enhanced access and incentives. The percentage of Hispanics in a community was associated with lower quality scores, while the number of hospital beds per 1,000 residents was associated with higher care management scores. Lastly, the number of physicians per 1,000 residents was associated with lower care management and care team leadership scores (Study Aim 3, Research Question 3).

90

Strengths and Limitations

This is the first attempt to develop and test a novel measurement model of medical home readiness for health centers, which have unique goals and challenges. This research acknowledges the diversity among patients and providers across health care organizations, and addresses it through the use of relevant literature and expert contributions in the development of a new, brief medical home readiness scale. This tool has extensive value, given its ability to measure medical home readiness between health centers and set a valid and reliable national benchmark. In addition, this tool assesses internal quality improvement activities in health centers across several relevant domains.

There are limitations associated with our study. First, inherent differences may exist between experts that agreed to participate on our Delphi panel versus those that did not. Given that we randomized selection of participants, the threat of this limitation was slightly minimized, but not entirely eliminated. Second, in March 2014 NCQA released PCMH 2014, which aims to integrate behavioral health, further address socioeconomic drivers of health, and enhance emphasis on team-based care. Given the timeline of our research, we were unable to consider the new tool in our analyses. Third, other medical home measures and tools may exist that were outside the scope of our research. We aimed to compensate for this limitation by incorporating decades of literature and expert opinion, and limiting our analyses to tools publicly available for use by FQHCs. Next, the moderate response rate of our study (36%) represents only a subset of the universe of health centers. Given the lack of statistically significant differences in comparing participating centers with the entire universe of health centers on key center characteristics, simple random selection appears to have helped to limit selection bias.

Also, the electronic mode of distribution of the survey may have limited select health centers from accessing and completing the survey. Technical assistance was provided to any health center staff who encountered difficulties with this mode of distribution. While mailing surveys may have minimized this limitation, the cost associated with this method was outside of the scope of the project budget. Lastly, we use a cross-sectional approach to analyze the relationships between medical home readiness score, health center and patient characteristics, and community attributes. We are unable to attribute causation and only have evidence to support associations between factors of interest.

Policy Implications and Recommendations for Future Research

This study has significant policy implications. Public and private demonstrations involving the implementation and evaluation of medical homes are occurring nationwide.[1] These programs often place those with high care coordination needs within a medical home that provides integrated, high-quality care. Appropriately addressing medical home achievement is important, as it opens the door for incentives as well as enhanced reimbursement on both the state and national levels. While research has shown the positive potential of medical home development on health care quality and cost, scholars have noted significant limitations within existing medical home assessment tools for practices that serve vulnerable populations.[2, 3] One study found that the assessment tool developed by NCQA and most endorsed by the federal government may not be sensitive to, or inclusive of, services that improve care for low-income patients.[4] Additional research revealed that NCQA medical home accreditation may not be correlated with improved outcomes or costs.[5] This indicates the need to take medical

home tools a step further and reassess measures that fully capture the needs of the vulnerable populations traditionally served by health centers. Medical home assessment allows practices to gauge the level of patient-centered and coordinated care that they are providing to their patients. Accreditation opens the door for additional resources for providers and health centers.

With the implementation of The Affordable Care Act of 2010 (ACA), many Americans will become eligible for Medicaid under state expansion efforts. Private insurance will also become more affordable through the allocation of subsidies to low-income individuals.[6] However, it is estimated that 26 to 31 million people will remain uninsured in 2016, leaving a large, vulnerable group that will begin to, or continue to, seek care at health centers.[7, 8] ACA makes an $11 billion investment in health center operation and infrastructure over a 5 year period (2010-2014).[9] Appropriate medical home transformation can help health centers to use this funding in a more cost-effective manner for both new and existing patients. Our novel medical home readiness scale supports this effort, as expert input and evidence-based activities for vulnerable populations serve as the foundation of the domains and items included in this tool. We were able to determine that health centers are performing well in medical home preparation, overall, but there is still work to be done across several domains. In addition, significant associations between medical home readiness scores, health center and patient characteristics, and community attributes suggest that while the composition of health center patients may be related to some quality measures, there are proactive actions that can be taken to improve performance on medical home domains. In particular,

encouraging internal collaboration and cervical cancer screenings may be methods by which to improve quality.

This study opens the door for future investigation. More specifically, examining medical home readiness within other types of practices can highlight variation in medical home need and implementation, as well as reveal the role that organizational and environmental attributes play. While most of our findings are supported by existing research, some results were uncovered that are inconsistent with current literature. The FQHC medical home readiness scale should be further tested in a multi-year research study with a larger, more diverse health center sample. This will help to support our results, make findings generalizable to all health centers, as well as strengthen the robustness of the study. Additional research is also necessary to explore relationships between patients, organizations, communities, and medical home readiness in order to examine direct causal relationships between these factors. Once causal relationships are established, it will become feasible to better model medical homes to achieve the most optimal outcomes.

References

[1] National Center for Medical Home Implementation. National Demonstration Projects & State Initiatives. Retrieved August 1, 2014 from http://www.medicalhomeinfo.org/national/projects_and_initiatives.aspx.

[2] Blewett, L., Johnson, P., Lee, B., & Scal, P. (2008). When a Usual Source of Care and Usual Provider Matter: Adult Prevention and Screening Services. *Journal of General Internal Medicine, 23*(9), 1354–1360.

[3] Starfield, B. & Shi, L. (2004). The Medical Home, Access to Care, and Insurance: A Review of Evidence. *Pediatrics, 113*(5), 1493–1498.

[4] Clarke R., Tseng C., Brook R., & Brown A. (2012). Tool used to assess how well community health centers function as medical homes may be flawed. *Health Affairs, 31*(2), 1-9.

[5] Friedberg, M. W., Schneider, E. C., Rosenthal, M. B., Volpp, K. G., and Werner, R. M. (2014). Association between participation in a multipayer medical home intervention and changes in quality, utilization, and costs of care. *JAMA, 311*(8), 815-825.

[6] The Henry J. Kaiser Family Foundation. (2013). Key Facts about the Uninsured Population. Retrieved April 30, 2014 from http://kff.org/uninsured/fact-sheet/key-facts-about-the-uninsured-population/.

[7] Congressional Budget Office. (2012). Updated Estimates for the Insurance Coverage Provisions of the Affordable Care Act. Retrieved April 30, 2014 from

http://www.cbo.gov/sites/default/files/cbofiles/attachments/03-13-Coverage%20Estimates.pdf.

[8] Nardin, R., Zallman, L., McCormick, D., Woolhandler, S., & Himmelstein, D. (2013). The uninsured after implementation of the Affordable Care Act: A demographic and geographic analysis. *Health Affairs Blog.* Retrieved April 30, 2014 from http://healthaffairs.org/blog/2013/06/06/the-uninsured-after-implementation-of-the-affordable- care-act-a-demographic-and-geographic-analysis/.

[9] Community Health Centers and the Affordable Care Act: Increasing Access to Affordable, Cost Effective, High Quality Care. Retrieved May 2, 2012 from http://www.healthcare.gov/news/factsheets/2010/08/increasing-access.html.

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APPENDICES

Appendix A: Analysis of Existing Tools for PCMH Assessment and Certification

Tool	Pros	Cons
NCQA PCMH 2011 (6 Domains, 28 Elements, 100 Points) 1. Enhance Access and Continuity 2. Identify and Manage Patient Populations 3. Plan and Manage Care 4. Provide Self-Care Support and Community Resources 5. Track and Coordinate Care 6. Measure and Improve Performance	Widespread use across the county; Currently most used accreditation tool by FQHCs.	Expensive; High administrative burden; Heavy IT emphasis; Yes/No survey responses; No emphasis on structure of physician-directed medical practice or payment reform; Only 6 must-pass elements for recognition; Focus on cultural competency and provision of care to vulnerable populations is low.
AAAHC Medical Home (2009) (7 Domains, 238 Items) 1. Medical Home Patient Rights/Responsibilities and Relationship 2. Medical Home Governance and Administration 3. Medical Home Clinical Records and Health Information 4. Medical Home Continuity of Care 5. Medical Home Comprehensiveness 6. Medical Home Accessibility 7. Medical Home Quality	Member of accreditation initiative by HRSA BPHC for FQHCs.	Over 200 items; Moderate administrative burden; Mandatory site visit; Little health IT focus; Three-point scale makes scoring difficult to gauge (substantial compliance, partial compliance, non-compliance); Little focus on medical team structure. Few elements related to cultural sensitivity, social, cultural needs of the population.

Joint Commission's Primary Care Medical Home Designation (2011) (5 Domains, 26 Elements) 1. Patient-Centered Care 2. Comprehensive Care 3. Coordinated Care 4. Superb Access to Care 5. Systems-Based Approach to Quality and Safety	Member of accreditation initiative by HRSA BPHC for FQHCs. Heavy emphasis on patient engagement in PCMH activities and culturally competent communications; Based on AHRQ model of medical home.	2-3 day site visit required; Moderate administrative burden; Expensive for large practices with multiple sites; Must be in compliance with 100% of items. Few items related to integration of community resources.
URAC's Patient Centered Health Care Home Program Toolkit (2010) (7 Domains, 28 Elements, 527 Points) 1. Core Quality Care Management 2. Patient-Centered Operations Management 3. Access and Communications 4. Testing and Referrals 5. Care Management and Coordination 6. Advanced Electronic Capabilities 7. Quality Performance Reporting and Improvement	Currently used by FQHCs. One of 10 guiding principles is elimination of health disparities. Inclusion of organization characteristics.	Heavy IT emphasis; Moderate administrative burden; mandatory site visit. 7 must pass items (out of 28 total items); few access to care, continuity of care elements; no items related to social, cultural determinants of health. Yes/No answer format. Only 65% success rate necessary for achievement.

TransforMED's Medical Home Implementation Quotient (IQ), version 2.0 (2009) (9 Domains) 1. Access to Care and Information 2. Practice-Based Services 3. Care Management 4. Care Coordination 5. Practice-Based Care Team 6. Quality and Safety 7. Health Information Technology 8. Practice Management 9. Mindful clinician patient communication	Available online for free; automatically scored upon completion; Varied answer formatting (Yes/No and multiple choice); Light administrative burden.	Measures progress only against NCQA standards; Moderate health IT burden; Little emphasis on cultural sensitivity, social, cultural needs of the population.
Center for Medical Home Improvement's Medical Home Index (2008) (6 Domains, 25 Elements) 1. Organizational Capacity 2. Chronic Condition Management 3. Care Coordination 4. Community Outreach 5. Data Management 6. Quality Improvement	Available for free, light administrative burden; Includes community assessment of needs.	Little focus on medical team structure, approach; Complex scoring technique (either partial or complete across four different levels); Only one question related to cultural competency in care provision. Little emphasis on inclusion of/coordination with community resources.

Safety Net Medical Home Initiative Change Concepts (8 Domains, 33 Elements, 12 Points) 1. Engaged Leadership 2. Quality Improvement (QI) Strategy 3. Empanelment 4. Continuous and Team Based Healing Relationships 5. Patient-Centered Interactions 6. Organized, evidence-based care 7. Enhanced access 8. Care Coordination	Specific to safety net providers; Free self-assessment. Light administrative burden. Strong emphasis on engaged leadership.	Complex scoring method (score of 1, 2, or 3 across four levels). No elements related to cultural competency, consideration of cultural or social determinants of health.

Appendix B: Delphi Panel - Round 1

Thank you for agreeing to serve on the expert committee for my dissertation, Assessing Medical Home Achievement Within Health Centers. Please contact me directly with any questions or concerns at gpierre@jhsph.edu. (Round 1 – February 2013)

1. From your experiences with Federally Qualified Health Centers (FQHCs), please rank the following medical home domains from most important (1) to least important (13) for FQHCs:

Whole person orientation
Personal physician
Physician care team leadership
Enhanced access to care
Coordinated and integrated care
Incentives and/or payment for added value
Quality improvement
Cultural competence
Continuity of care
Care management
Evidence-based care
Advanced electronic capabilities
Other (please specify)

1a. Do you have any additional thoughts and/or comments about question #1?

2. From your experiences with Federally Qualified Health Centers (FQHCs), please score each measure by level of importance for an FQHC in becoming a medical home:

	Not Important	Somewhat Important	Important	Very Important
Each of the 45 measures listed for review by the expert committee				

2a. Do you have any additional thoughts and/or comments about question #2?

Appendix C: Delphi Panel - Round 2

Thank you for agreeing to serve on the expert committee for my dissertation, Assessing Medical Home Achievement Within Health Centers. This is the final round of the expert survey. I have incorporated the thoughtful feedback received from the first survey into this round. Please contact me directly with any questions or concerns at gpierre@jhsph.edu. (Round 2 – April 2013).

1. Based on Expert Panel Survey – Round 1, the following medical home domains are ranked from most important (1) to least important (12) in care provision:

(1) Enhanced access to patient-centered care
(2) Personal clinician
(3) Continuity of care
(4) Care management
(5) Whole person orientation (physical, social, economic)
(6) Coordinated and integrated care
(7) Quality assessment and improvement
(8) Incentives and/or payment for added value
(9) Evidence-based care
(10) Care team and organizational leadership
(11) Cultural competence
(12) Electronic capabilities

(Please answer questions from your professional perspective)

1a. Are there domains from Q1 that are equally as important? If so, which domains? (multiple choice)

Enhanced access to patient-centered care
Personal clinician
Continuity of care
Care management
Whole person orientation (physical, social, economic)
Coordinated and integrated care
Quality assessment and improvement
Incentives and/or payment for added value
Evidence-based care
Care team and organizational leadership
Cultural competence
Electronic capabilities

1b. Are there domains from Q1 that are unimportant or unnecessary in this context? If so, which domains?

Enhanced access to patient-centered care
Personal clinician
Continuity of care
Care management
Whole person orientation (physical, social, economic)
Coordinated and integrated care
Quality assessment and improvement
Incentives and/or payment for added value
Evidence-based care
Care team and organizational leadership
Cultural competence
Electronic capabilities

1c. Is the order in Q1 accurate? If not, where would you suggest changes?

1d. In the medical home, where should "Translation and Research" be categorized?

Enhanced access to patient-centered care
Personal clinician
Continuity of care
Care management
Whole person orientation (physical, social, economic)
Coordinated and integrated care
Quality assessment and improvement
Incentives and/or payment for added value
Evidence-based care
Care team and organizational leadership
Cultural competence
Electronic capabilities
New, stand-alone domain

1e. Do you have any additional thoughts and/or comments about questions 1, 1a, 1b, 1c, or 1d?

2. Based on Expert Panel Survey – Round 1, the following measures are important for an FQHC in becoming a medical home:

Each of the 45 measures listed here.

2a. Considering Q2; which measure(s) would you categorize as "Helpful, but not required" for health centers in medical home development?

Each of the 45 measures listed here.

2b. Considering Q2, please designate the following roles to either a clinician or a physician.

	Clinician (Physician, Nurse Practitioner, or Physician Assistant)	Physician
Patient has designated personal clinician/physician		
Clinician/physician is a part of a larger medical team		
Clinician/physician is responsible for the medical team		

2c. Do you have any additional thoughts and/or comments about questions 2, 2a, or 2b?

Appendix D: Survey Respondents compared to Non-Respondents (2012)

Patient Demographics (%)	Survey Respondents (n=202)	Non-Respondents (n=356)	p-value
Female	57.1	57.6	.53
Race/Ethnicity:			
White, Non-Hispanic	45.8	45.1	.80
Black, Non-Hispanic	16.6	21.1	.04
Asian, Non-Hispanic	2.4	2.5	.97
Hispanic patients	26.3	22.7	.13
Best served in another other language	17.8	17.3	.80
Income below 150% FPL	61.1	60.5	.78
Insurance:			
Uninsured	37.9	38.5	.73
Medicaid or CHIP	34.7	33.5	.45
Medicare	8.8	9.4	.37
Health Conditions and Screenings:			
Diabetic	8.7	9.0	.41
Hypertensive	17.5	18.5	.24
Asthma treatment plan	75.8	74.3	.47
Cervical cancer screening	52.2	50.9	.45
Colorectal cancer screening	27.4	27.0	.83

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EDUCATION

Johns Hopkins University, Bloomberg School of Public Health
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PhD Candidate, Department of Health Policy and Management - Health Services Research
 ▪ Dissertation: "Assessing Medical Home Readiness among Health Centers"
 ▪ Agency for Healthcare Research and Quality (AHRQ) Pre-doctoral Training Program, 2010-2012
 ▪ Gates Millennium Scholarship – Doctoral Fellow

University of North Carolina, Gillings School of Global Public Health
Spring 2010
Masters of Science in Public Health, Department of Health Policy and Management
 ▪ Concentration in health disparities and health services research
 ▪ Thesis: "Racial Disparities in Psychotropic Drug Use and Expenditures among Older Americans"
 ▪ UNC Graduate School Merit Assistantship Recipient, 2008-2009

University of Virginia
Spring 2008
Bachelors of Science, Economics and African-American and African Studies
 ▪ Studied abroad in Accra, Ghana during Winter 2008 term
 ▪ Global Public Health certificate

RESEARCH INTERESTS

Health disparities and underserved populations; social determinants of health; health policy; innovation in primary care delivery; quality improvement; and community health centers.

WORK AND RESEARCH EXPERIENCE

Parkland Center for Clinical Innovation
March 2014 – Present
Health Services Researcher, Private Contractor
- Develop appropriate qualitative and quantitative research methodologies for proposed studies.
- Draft and revise grant applications to national funding agencies on topics related to health information exchange and shared savings programs involving Medicaid and uninsured patients.
- Provide public health expertise in research project development, implementation, and evaluation.

The Reinvestment Fund
February 2013 – July 2013
Policy Fellow, Policy Solutions Division
- Conducted a series of presentations on vulnerable populations, health care reform, health center program history and operation, and patient-centered medical home development.
- Developed a blueprint outlining appropriate methods for measuring the outcomes and impacts of health center practices.
- Provided expertise regarding quality improvement for vulnerable populations as needed by the Policy Solutions and Community Facilities Finance divisions.

CareFirst BlueCross BlueShield
May 2011 – December 2012
Intern, Public Policy and Community Affairs
- Designed and managed CareFirst BlueCross BlueShield Health Insurance Exchange (HIE) information sharing webpage.
- Regularly attended regional (Maryland and Washington D.C.) HIE planning and implementation meetings, reporting back to public policy team with updates.
- Co-managed $8.5 million Safety Net Health Center Initiative, including program operation and preliminary evaluations.
- Drafted an internal report on the transformation of safety-net practices into medical homes.
- Developed and refined an organization-wide grant evaluation rubric to be used in allocation of awards to community health organizations.

Johns Hopkins Bloomberg School of Public Health
June 2010 – Present
Research Assistant, Department of Health Policy and Management
- Support Health Policy and Management professors on significant health disparities research, analysis, and writing projects.
- Conduct quantitative research analyses related to public health and disparities using nationally representative, complex data sets such as MEPS, NHANES, NHIS, and NAMCS/NHAMCS.

- Perform in-depth literature and research reviews on topics related to quality improvement and health reform implementation for vulnerable population subgroups.
- Develop feasible social and policy solutions to health issues facing Medicare, Medicaid, and CHIP enrollees.
- Draft, revise, and submit manuscripts to top peer-reviewed health care journals.

Duke University – Black Caregiving Project
May 2009 – May 2010
Research Assistant, Duke Behavioral Medicine Research Center
- Served as the research project team lead, supervising graduate students' work products.
- Conducted extensive qualitative data analyses on diverse care giving experiences to patients with cognitive decline, using Atlas.ti qualitative software.
- Managed data coding and transcription progress, regularly reporting to principal investigators.

University of North Carolina – Chapel Hill – Institute on Aging
August 2008 – May 2010
Research Assistant, Center for Aging and Diversity
- Conducted meaningful qualitative and quantitative research related to the impact of race, ethnicity, and culture in aging and care giving.
- Managed large data sets and assessed preliminary findings from ongoing research projects.
- Evaluated the impact of community education meetings on the experiences of diverse family caregivers across North Carolina through survey data.

North Carolina Department of Health and Human Services
Summer 2009
Intern, Drug Control Unit - Controlled Substance Reporting System (CSRS)
- Evaluated controlled substance usage and prescribing practices among North Carolina residents.
- Drafted a concept paper related to trends in controlled substance use in elderly populations.
- Explored mapping techniques to help pinpoint regions within state with highest prescribing for specific controlled drugs.

Institute of Human Virology – Abuja, Nigeria
Summer 2006
Intern, Community Health and Outreach Division
- Co-led HIV/AIDS research and education seminars in local communities.
- Served as guest editor for *ACTION News* monthly newsletter.
- Attended International NeuroAIDS Research Conference as department representative.
- Conducted economic evaluation of HIV/AIDS education programs in communities across Nigeria.

Institute of Human Virology – Baltimore
Summer 2005
Intern, Epidemiology/Preventive HIV Vaccine Department
- Led educational seminars on HIV prevention and testing in Baltimore, MD.
- Conducted informational sessions on HIV preventive vaccines being tested worldwide.
- Developed first Project B.R.A.V.E. (Baltimore Regional Alliance for the Vaccine Effort) organizational newsletter.

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- Health Policy Analysis and Synthesis (Spring 2013)
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Pierre, G., Thorpe, R.J., Dinwiddie, G.Y., and Gaskin, D.J. (2014). Racial Disparities in Psychotropic Drug Use and Expenditures in a Nationally Representative Sample of Men in the United States: Evidence from the Medical Expenditure Panel Survey (MEPS). *American Journal of Men's Health*, 8(1), 1-19.

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