ABSTRACT

Title of Dissertation:	ADVANCING THE HEALTH OF UNDERSERVED COMMUNITIES ACROSS THE UNITED STATES: *OPPORTUNITIES TO IMPROVE HEALTH CENTER QUALITY OF CARE AND PATIENT EXPERIENCE*
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1 in 13 people in the United States receives care at a community health center. As health center services become an increasing percentage of all primary care services delivered in the United States, their success is vital to national efforts to advance health and manage costs. This dissertation presents three studies, addressing critical gaps in our understanding of health center quality and quality improvement opportunities.

The first study examined the association between ambulatory care accreditation and 14 clinical quality measures in 1,198 health centers. Results demonstrated that accredited centers achieved higher performance on adult weight screening and follow up, tobacco cessation intervention, and use of lipid-lowering therapy. Universal accreditation could lead to an additional 552,087 patients receiving weight screening and follow up, 157,434 receiving tobacco cessation interventions, and 25,289 receiving lipid-lowering therapy. Findings suggest universal accreditation could contribute to quality gains and facilitate health disparity reduction.

The second study used the first nationally representative dataset of health center PEC, to investigate the association between five measures of PEC (access to care,

provider communication, office staff interactions, follow up on results and overall provider rating) and patient and health center characteristics. Results demonstrated that PEC ratings varied significantly by race/ethnicity, health and mental health status, education and income levels, and language. Findings highlight PEC improvement opportunities as well as the importance of patient-mix adjustment of PEC ratings in value-based payment.

The third study evaluated the association between PEC and health center quality of care. Quality of care metrics included receipt of care, health behaviors, patient activation, and clinical outcomes in health center patients. Results showed that PEC ratings were associated with receipt of care, as well as patient adherence and activation. The findings support the importance of measuring PEC as a key determinant of quality, as well improving PEC as a driver for improvement for other aspects of care quality.

All three studies were the first to our knowledge to use nationally representative health center data to examine these dimensions of quality and provide significant contributions towards our understanding of health center quality and related quality improvement and policy implications.

ADVANCING THE HEALTH OF UNDERSERVED COMMUNITIES ACROSS THE
UNITED STATES: *OPPORTUNITIES TO IMPROVE HEALTH CENTER QUALITY OF
CARE AND PATIENT EXPERIENCE*

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DEDICATION

To Rajesh and Arjun Nair who have provided unrelenting support in pursuit of this and many other goals. This journey would not have been possible without you.

To my parents, Somarajan and Shyamala Nair and my dearest Amma, not only have you provided physical and spiritual nurturing, but you have also helped me to understand that our greatest responsibility and privilege is to serve others. Any expression of gratitude would be utterly insufficient.

To the people of the Community Health Center movement – patients, providers, administrators, researchers, champions and colleagues, you are a constant source of inspiration and motivation to find a better way. It is an honor and privilege to serve you.

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LIST OF ABBREVIATIONS

AHRQ	Agency for Healthcare Research and Quality
aOR	Adjusted Odds Ratio
BMI	Body Mass Index
BPHC	Bureau of Primary Health Care
CAD	Coronary Artery Disease
CAHPS	Consumer Assessment of Healthcare Providers and Systems
CDC	Centers for Disease Control and Prevention
CG CAHPS	Clinician and Group Consumer Assessment of Healthcare Providers and Systems
CHARN	Community Health Applied Research Network
CHC	Community Health Center
CMS	Centers for Medicare and Medicaid Services
EHR	Electronic Health Record
FPL	Federal Poverty Level
FQHC	Federally Qualified Health Center
FTEs	Full Time Equivalents
HC	Health Center
HCH	Health Care for the Homeless
HCPS	Health Center Patient Survey
HDL	High Density Lipoprotein
HIT	Health Information Technology
HRSA	Health Resources and Services Administration
IOM	Institute of Medicine
IRB	Institutional Review Board
IVD	Ischemic Vascular Disease
K6	Kessler 6
LDL	Low Density Lipoprotein
MHC	Migrant Health Center
NACHC	National Association of Community Health Centers
OR	Odds Ratio
PCMH	Patient Centered Medical Home
PEC	Patient Experience of Care
PHPC	Public Housing Primary Care
QI	Quality Improvement
RTI	Research Triangle Institute
UDS	Uniform Data System
US	United States

CHAPTER 1: INTRODUCTION

Health centers, a subset of all federally qualified health centers, are nonprofit, community-based, primary care centers that receive support from the U.S. Department of Health and Human Services' Health Resources and Services Administration (HRSA) to provide access to comprehensive, culturally competent, quality primary health care services. Nearly 1,400 health centers comprise a critical safety-net primary care network that cares for the Nation's most vulnerable populations and underserved communities. Health centers provided care for over 24 million patients across more than 10,000 service delivery sites. One in thirteen people living in the United States is served by a health center, while one in three individuals living in poverty and one in five uninsured individuals are served at health centers.[1] More than 22,000 primary care providers provide care to a population that was predominantly low-income, racial/ethnic minorities, and serve some of the most disadvantaged populations including the uninsured, individuals experiencing homelessness, agricultural workers and residents of public housing.[2]

Throughout the literature and in practice, HRSA-supported health centers are often referred to using a several different, but related terms. The broadest terminology in a taxonomy would be federally qualified health centers (FQHCs). FQHCs are ambulatory care clinics that are eligible for specific Medicare and Medicaid reimbursement systems and include Indian Health Service clinics and rural health clinics in addition to HRSA-funded health centers. In addition to different payment systems,

FQHCs are eligible for participation in the 340B prescription drug discount and the National Health Service Corps programs.[3] The next category in the taxonomy is related to support from HRSA as a result of meeting key program requirements. There are two categories within this group – funded and non-funded health centers. HRSA supports a small group of non-funded health centers or FQHC look alikes through an FQHC designation process. These health centers do not receive grant funding, but often benefit from training and technical assistance support from HRSA. HRSA provides funding to a growing number of health centers through a competitive grant process. Recipients of this funding, which comes additional benefits such as medical malpractice coverage eligibility, are referred to as Health Center Program grantees or HRSA funded health centers or community health centers. In 2015, HRSA supported 54 look alikes and funded 1,375 health center grantees. The studies in this dissertation were all conducted using data from HRSA-funded health centers.[4]

Health centers have a rich history dating back to 1965 and President Johnson's War on Poverty. The founders of the first health centers in the United States had a vision of creating an entirely new health care paradigm, focused on a holistic understanding and treatment of patients, and a new type of institution to implement this visionary model of care.[5] The goal of these institutions was to provide care that addressed the links between poverty, race and poor health.[6] The original community health center model of care was founded on a core set of guiding principles including addressing the needs of poor, uninsured and disease-burdened populations by removing barriers to accessing care; targeting interventions to both the individual and the community; addressing the social determinants of health; empowering patients and communities; developing data-driven

public health and clinical interventions based on community data; and the use of multidisciplinary teams of clinical and public health professionals to reduce health disparities in underserved communities.[5] While the model has evolved over time as a result of shifting national priorities and healthcare dynamics, adherence to these core principles remains vital to achieving health equity.

Health Centers and Quality Improvement

Health centers are required to meet key program requirements related to the provision of community-driven primary care services, including providing services in a medically underserved area, governance by a patient-majority community board, and providing comprehensive primary health care services and supportive services that are available to all irrespective of their ability to pay. Health centers must also have systems in place that support patient safety and risk management, and improve quality of care and patient health outcomes.[7] Health centers have also demonstrated a long-standing commitment to quality improvement through a variety of initiatives including participation in the HRSA sponsored Health Disparities Collaboratives, electronic health record adoption, ambulatory health care accreditation, and patient centered medical home recognition.[8] As a result, 96% of health centers have adopted electronic health records, 68% of health centers have received patient centered medical home recognition and 25% have received ambulatory care accreditation.[2]

There is a significant and growing body of literature examining both the potential and actual impacts of health information technology and patient centered medical home practice transformation on quality of care and patient outcomes. The emerging evidence points to the positive impact of those quality improvement initiatives.[8] Health center

participation in the Health Disparities Collaboratives has also been studied and found to have a positive impact on quality.[9-11] While health centers have been participating in voluntary ambulatory healthcare accreditation for over 15 years, little information is available on the impact of accreditation on patient safety, quality care or patient health outcomes.

In addition to these quality infrastructure improvements, health centers have focused on improving the clinical quality metrics collected in the Uniform Data System (UDS), an annual reporting requirement for all health centers. The UDS includes organizational level data on patient demographics, services provided, staffing, clinical indicators, costs and revenues.[2] In 2015, the UDS included data on 16 measures of health center quality of care and patient health outcomes reflecting the range of primary care services (including behavioral and oral health) and populations cared for by health centers. Health centers are required to set baselines as well as annual performance goals and implement quality improvement initiatives to achieve them. This focus on quality improvement has resulted in clinical quality successes such as most health centers meeting or exceeding targets on at least one Healthy People 2020 goal. A body of literature has also demonstrated that the quality of health center services is equal to or better than care received in other primary care settings.[12-14] Studies have also shown that health centers have been successful in their efforts to promote health equity by eliminating disparities in access to care and preventive health services among racial and ethnic minority patients. These achievements are even more notable considering the complex social, economic and health challenges that disproportionately burden health

center patients.[14] There is also a growing body of literature on the cost-effectiveness of health centers.[13,15-20]

Health centers experienced tremendous growth since the inception of the program over 40 years ago, with some of the largest increases in program capacity and impact documented in the last five years.[2] Health centers currently serve one in 13 people living in the United States, and with the projected growth, resulting from Affordable Care Act funding patients served could exceed 40 million in the next few years.[21] As health center services become an increasing percentage of all primary care services delivered in the United States, it is vital to national efforts to advance the National Quality Strategy's three aims of achieving better individual health, and improving population health, and increasing the affordability of care.[22] It is important to understand the interventions that contributed to quality outcomes to strengthen and spread initiatives that will result in continued improvement in quality of care and patient outcomes. This dissertation is composed of a series of papers examining aspects of health center quality of care and quality improvement opportunities.

New Opportunities to Study Quality Improvement in Health Centers

HRSA routinely fields a Health Center Patient Survey to gather patient-level data about health center patients and the services they obtained; compare patient reports to care received by the general US population; and gather information that will assist HRSA and policymakers assessment of how well health centers are meeting health care needs.[23] The 2014 Health Center Patient Survey (HCPS) built upon the success of previous patient surveys to reflect emerging healthcare and health center priorities, including ensuring representation of populations historically underrepresented in health surveys as well as

adding new questions to provide a detailed understanding of patient experiences of care. Interview questions were based on surveys from the National Health Interview Survey, National Ambulatory Medical Care Survey, Medical Expenditure Panel Survey, Clinician and Group Consumer Assessment of Healthcare Providers and Systems, and National Health and Nutrition Examination Survey. Survey questions included information on sociodemographic characteristics, health conditions, health behaviors, access to health care, and utilization of services.[23]

The 2014 Health Center Patient Survey was fielded between September 2014 and April 2015. Data was collected from the patients of Health Centers funded through four BPHC grant types: the Community Health Center (CHC) Program, the Migrant Health Center (MHC) Program, and the Health Care for the Homeless (HCH) Program, and the Public Housing Primary Care (PHPC) Program. Surveys were completed for 7,002 patients using computer-assisted personal interviews with health center patients.[23] This data became available at the end of 2015 and provided a robust nationally representative data set from which to evaluate health center quality of care.

In health services research, and most other endeavors, it is important first to look back before moving forward. In this spirit, I began my efforts to identify new opportunities for quality improvement in health centers by conducting a comprehensive literature review of health center quality improvement studies to develop an understanding of the progress made across health centers since the last review in 2005. In Chapter 1, I present a comprehensive literature that summarizes the content and findings of health center quality improvement (QI) studies since 2006. I identified 55 QI studies between 2006 and 2015, demonstrating the growth in peer-reviewed quality improvement

studies across the Health Center Program. The review highlighted the increasing diversity

and range of focus areas in quality improvement literature, as well as an increase in the

number and type of interventions utilized. While significant progress has been made in

documenting and disseminating quality improvement studies, critical gaps in the

literature including interventions focused on patient satisfaction and experience of care

persist.

Based upon the gaps identified in this literature review, my understanding of the

changes in the health care environment and value-based payment policies that would

impact health centers, and available datasets, I formulated the following questions to

serve as the basis for my dissertation.

1. Despite an almost 20 year HRSA investment in ambulatory care accreditation,
   there is literature examining accreditation's relationship with health center
   quality. My first study will aim to answer the following question - is
   ambulatory care accreditation associated with better quality of care and patient
   outcomes? I hypothesize that there will be a positive association between
   accreditation and health center quality of care given accreditation's focus on
   key quality assurance and improvement systems and processes.

2. While interest in patient satisfaction with care is decreasing in favor of more
   objective assessments of patient care experiences, there is very limited
   information on health center patients' care experiences. My second study will
   seek to understand the national health center patient experience and whether
   care experiences vary by patient or health center characteristics. Given health
   centers use of patient-centered, culturally and linguistically competent care

delivery methods I hypothesize health center patients report positive patient experience of care ratings and there would not be significant disparities in patient experience ratings.

3. Patient experience of care ratings are increasingly being included in value-based payment programs in concert with traditional resource utilization and quality metrics. Is there a relationship between patient experience of care ratings and quality of care measured by clinical processes, patient behaviors and clinical outcomes? I hypothesize a positive association between PEC ratings and appropriate care, patient and clinical outcomes in health center patients.

Conceptual Model for Quality Improvement in Health Centers

Donabedian proposed three levels of measurement of the quality of care: structure, process and outcome. Structure relates to the attributes of care delivery settings, including the attributes of material resources (building, equipment, available drugs, services examinations, and money), human resources (number and qualification personnel) and organizational structure (staff organization, peer review practices and reimbursement methods). Process denotes whether what is known to be good medical practice has been applied or not: clinical history, physical exam, diagnostic tests, justification of diagnosis and therapy, technical competence, evidence of preventive management, coordination of care and continuity of care, and acceptability of care to the recipient. Outcome measures reflect the impact of care on the health status and include recovery, restoration of function, survival and patient satisfaction.[24,25]

Figure 2.1 depicts my conceptual model delineating the relationship contextual

factors and health center quality of care. Health center quality of care is further

categorized according to Donabedian's structure-process-outcome framework for

evaluating quality of care. This model is adapted from conceptual frameworks describing

the assessment of quality of care by Donabedian and Coyle and Battles, as well as Price

and colleagues' conceptual model describing how patient care experiences are associated

with health care quality.[25-29] I used the model to illustrate the influence of individual and

environmental factors on quality of care and the relationships between the various

domains of health care quality.

This conceptual model informed all three of the studies included in this

dissertation. For the first study, I hypothesized that the structural changes or health care

delivery improvements that result from going through the ambulatory care accreditation

process would positively impact health center quality of care. In this study I controlled

for the other health center and patient factors that could also influence quality of care

outcomes. In the second study, I hypothesized that patient ratings of their PEC with

health centers, health center providers and staff would be influenced by both patient and

environmental/health center factors. In the final study, I hypothesized that ideal PEC

ratings would be positively associated with clinical processes (e.g. receipt of appropriate

care), patient outcomes (e.g. adherence to treatment plans, behavioral changes and patient

activation) and clinical outcomes (e.g. blood glucose level, blood pressure, BMI). The

model also illustrates that contextual factors (both environmental and individual)

influence quality of care, which are controlled for in my studies.

In Chapter 2 of this dissertation, I examine the association between ambulatory care accreditation and health center quality of care. Health centers have a long history of participating in ambulatory care accreditation; however, there is a dearth of information on the relationship between accreditation and quality of care. I conducted a cross-sectional study of 1,198 health centers, using multivariate regression to estimate the association between accreditation and 14 clinical quality measures, controlling for patient and organizational characteristics. I also predicted national estimates of accreditation related improvement in quality.

Chapter 3 addresses the significant gaps in our knowledge on patient experience of care (PEC) in health center patients by using a nationally representative dataset (2014 Health Center Patient Survey) to examine PEC for 5,299 adults. I employed multivariate regression models to examine the association between five measures of PEC (access to care, provider communication, office staff interactions, follow up on results and overall provider rating) and patient and health center characteristics. I also examined the subcomponent metrics in each PEC domain to identify quality improvement opportunities.

In Chapter 4, I continue to explore patient experience of care in health centers, focusing on the association between PEC and health center quality of care. The growing emphasis on PEC metrics in quality payment programs has increased interest in improving PEC; however, little is known about the relationship between PEC and quality of care in health centers. Using the 2014 Health Center Patient Survey and 2014 Uniform Data System data, I examined the relationship between the five domains of PEC and quality of care for 5,299 adults. I employed multivariate regression models to examine

the association between five measures of PEC (access to care, provider communication, office staff interactions, follow up on results and overall provider rating) and quality of care metrics such as receipt of appropriate care, health behaviors, patient activation, and health outcomes.

The dissertation concludes with a discussion of the quality improvement implications for health centers and the Health Center Program, as well as broader health policy implications.

Figure 1.1. Conceptual Model for Improving Quality of Care in Health Centers
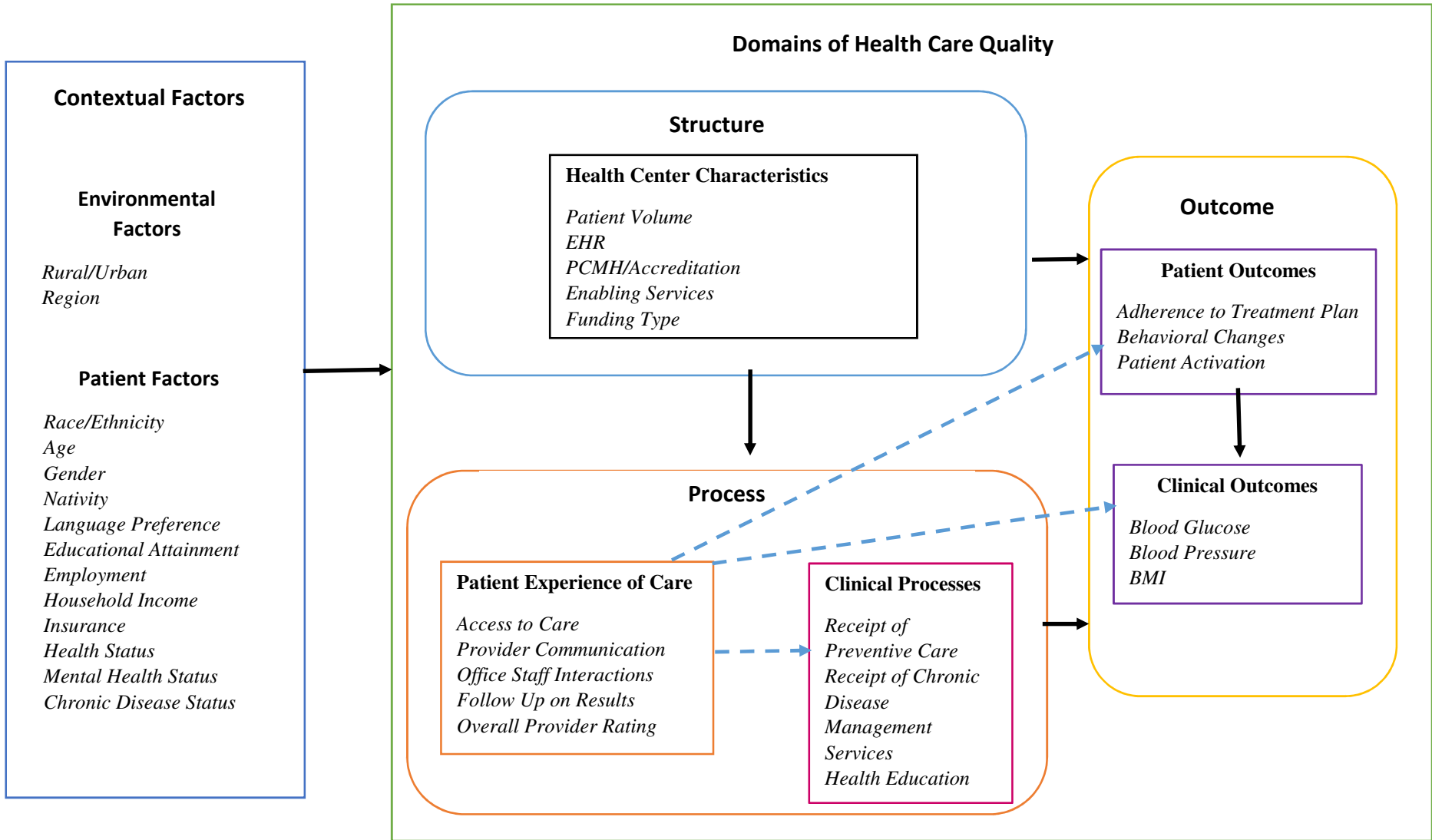
Source: Adapted from Donabedian, Coyle & Battles, and Price et al.

CHAPTER 2: QUALITY IMPROVEMENT IN FEDERALLY QUALIFIED HEALTH CENTERS: *A REVIEW OF THE LITERATURE*

Literature Review Purpose

The purpose of this literature review is to summarize the content and findings of health center quality improvement studies published since the last literature review by Chien and colleagues in 2007.[30] Since the previous literature review, there has been significant growth and expansion in the Health Center Program. There have been two growth initiatives that contributed to the significant expansion of the health care program. Under the second Bush administration several hundred new health center sites were added. This growth continued during the Obama administration, with a 34% growth in the number of healthcare delivery sites, a 20% growth in the number of patients and a 30% growth in the number of providers between 2008 and 2013.[2]

In addition to increasing access to care, the Health Center Program also aimed to improve quality of care and patient health outcomes. Since the last literature review, the health care delivery landscape has shifted to focus on achieving the triple aim of improved care, better health and affordable cost and several national program and policy initiatives have been promulgated to advance these three aims. The previous review was conducted during the early phases of HRSA's Health Disparities Collaboratives, which marked a national focus on quality improvement. The Health Disparities Collaboratives which included only a subset of health centers, gave way to national quality improvement infrastructure development through initiatives such as the adoption of electronic health records, the implementation of patient-centered care delivery models and a focus on population health management. This review will examine the current state of quality

improvement in health centers nationwide, and will allow for comparison with the previous literature review, describing shifts in focus, new intervention types, and other interesting trends. The literature review will also identify gaps in quality improvement efforts and provide insights into potential areas for health and quality improvement initiatives in the future.

Framework for Evaluating Quality and Quality Improvement

In 2004, the Agency for Healthcare Research and Quality (AHRQ) developed a series titled *Closing The Gap* to critically analyze existing literature on quality improvement strategies for key diseases and practice priorities identified in the Institute of Medicine's (IOM) 2003 report – *Priority Areas for National Action: Transforming Health Care Quality.*[31] The first volume in the series provides key definitions and a taxonomy of quality improvement interventions/strategies that are useful framework for studying quality improvement in health centers. The report describes quality of health care as the degree to which health services increase the likelihood of desired health outcomes and are consistent with current professional knowledge.

Health Care Quality

Donabedian proposed three levels of measurement of the quality of care: structure, process and outcome.[25] Structure relates to the attributes of care delivery settings, including the attributes of material resources (building, equipment, available drugs, services examinations, and money), human resources (number and qualification personnel) and organizational structure (medical staff organization, method of peer review and methods of reimbursement). Process denotes whether what is known to be

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good medical practice has been applied are not: clinical history, physical exam, diagnostic tests, justification of diagnosis and therapy, technical competence, evidence of preventive management, coordination of care and continuity of care, acceptability of care to the recipient. Outcome measures reflect the impact of care on the health status in patients and populations. They include recovery, restoration of function, survival and patient satisfaction.[24,25] *Closing the Gap* defines quality improvement targets as the structures, processes and outcomes process or structures that quality improvement strategies aims to influence.

Quality Improvement Strategies

Closing the Gap defines quality improvement strategies as any intervention aimed at reducing the quality gap. Studies were considered to include quality improvement strategies if: the intervention targeted implementation of a particular process of care believed to benefit patients or the intervention targeted implementation of a structural or organizational feature believed to benefit patients, or the intervention attempted to improve outcomes. The report lays out nine types of strategies including: provider reminder systems, facilitated relay of clinical data providers, audit feedback, provider education, patient education, promotion of self-management, patient reminder systems, organizational change, and financial, regulatory or legislative incentives.[31] To simplify the taxonomy further I developed three categories that each intervention could fall into - health care system or organizational level interventions, provider level interventions or patient level interventions.

The studies included in this literature review will be analyzed using both Donabedian's framework for evaluating quality of care and the modified taxonomy of

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quality improvement interventions described in the *Closing the Gap* series given their

wide acceptance and use in quality improvement literature. In addition, quality

improvement studies will be grouped by disease topic to identify notable patterns or

trends among studies, as well as to compare studies in this review with previously

conducted literature reviews.

Methods

Given the goal to complement the previously conducted literature review of

health center quality improvement efforts I used similar inclusion and exclusion criteria

for the peer-reviewed literature.[30] As noted in Figure 2.1, my search of the literature

began with several keyword searches in reputable electronic databases and included

search terms that included commonly used descriptors of health centers and quality

improvement, as well as key quality measure concepts used in primary care. Based on

the search terms I identified 242 articles, and subsequently narrowed the list down to 55

articles based on the inclusion and exclusion criteria as demonstrated in Figure 2.2. I

included articles that described quality improvement interventions conducted in health

centers that were formally evaluated. Studies conducted outside of the United States and

those that were not in English were excluded. Quality improvement interventions should

have aimed to change elements within the health center, providers or patients to increase

appropriate provision, utilization or outcomes of health care. This definition is based on

the framework used in AHRQ's *Closing the Gap* report. To be considered a formal

evaluation the article had to present data to support or refute the effectiveness of the

intervention. To be considered "in a health center setting" at least half of the sites

implementing the intervention had to include federally qualified health centers. Studies

published between January 1, 2006 and April 1, 2015 were included to ensure I built

upon the previous literature review, but did not include overlapping studies. After

identifying the final set of 55 studies to be included in the literature review, I

systematically reviewed each study, and developed an abstraction table to facilitate

analysis and ensure I consistently captured key elements of each study. See Table 2.1 for

a listing of the studies included in the literature review as well as with key elements of

each study noted.

Synthesis

Following the careful review of each study, I developed general observations

about the study set and how they compare with Chien and colleagues' previous literature

review of quality improvement studies in health centers.

Geographic Distribution

Given the scope and growth of the national Health Center Program, I was

interested in understanding if there were any geographic trends or patterns in the set of

studies included in my literature review. As noted in Table 2.2, most of the studies

included in this review were conducted either at the local level with one health center or

included multiple health centers in a state or region. However, about 20% of the studies

were national in scope, including health centers in more than three noncontiguous states.

Many of the national studies related to HRSA's Health Disparities Collaboratives, a

quality improvement program that had health center participation from every state. There

were no clear patterns regarding geographic distribution, health centers from almost

every state were included in the set of 55 studies. The previous literature review did not

discuss the geographic distribution of studies.

Quality Measures/Targets

Table 2.3 summarizes the variety of different quality target/metrics that review

studies used to assess quality of care in health centers. According to Donabedian's model

for evaluating health care quality, my study included quality of care indicators, assessing

the extent to which health centers provided appropriate primary health care services,

including preventive health screenings and chronic disease management

interventions.[24,25,28] Donabedian proposed three categories of metrics to evaluate quality

of health care: structure, process and outcome. Structure relates to the attributes of care

delivery settings: material resources, human resources and organizational structure. Only

11% of the studies in the review focused on the structural elements of care quality.

Process measures denote whether clinical standards or good medical practice has been

applied. Approximately 64% of the studies in this literature review included a focus on

process measures. Outcome measures reflect the impact of care on health status. Eighty-

one percent of the studies targeted improvement of health care outcome measures. More

than half of the quality improvement studies attempted to improve performance across

the three categories of structure, process, and outcome measures.

Quality Improvement Strategies/Interventions

Table 2.4 summarizes the different types of quality improvement interventions or

strategies utilized. I used a slightly modified version of the quality improvement strategy

taxonomy employed by AHRQ's *Closing the Gap* series and grouped interventions based

on the target of the intervention. The categories included the health care system/health center, provider, and patient levels.   Over 80% of the studies utilized system-level interventions to improve quality. Interventions at this level include organizational changes, use of financial incentives, changes in regulation or policy, changes to the care delivery model, use of health information technology, and participation in quality improvement or learning collaboratives. Fifty-six percent of the studies included provider-level interventions. These interventions focused on the development of reminder systems for providers, facilitating provider access to clinical and performance data, providing feedback to providers, or provider education. Finally, 45% of the studies included patient-level interventions. Interventions included patient reminder or recall systems, provision of patient education or self-management support. Almost half of the studies utilized only one strategy compared to about a quarter that utilized two strategies and another quarter that utilized interventions from all three levels. As demonstrated in Table 2.5, it is also interesting to note that 85% of the studies resulted in statistically or clinically significant improvements, 7% showed mixed results and another 7% showed no improvement.

Disease or Focus Area

Table 2.6 summarizes the range of disease topics or clinical areas included in the set of articles. The range of issues included this literature review is more expansive than in the previous literature review. I grouped the studies into four main categories: behavioral health, preventive health services, chronic disease management and other topics. In addition to the broader scope of topics included in this set of studies, it is also interesting to note the range of subcategories and relative number of studies in each.

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Within the chronic disease management four subcategories emerged – diabetes, hypertension, cardiovascular disease, and asthma. Seventy percent of the studies focused on improving diabetes metrics, 44% focused on hypertension and 37% aimed to improve asthma. The next category is preventive health services, which includes health screenings, health promotion and disease prevention activities. Forty percent of the studies in this category focused on obesity prevention, improving nutrition, and increasing physical activity. Forty percent of the studies sought to improve cancer screenings and 20% focused on improving pediatric and adolescent vaccinations. Finally, 16% of the studies in the literature review focused on behavioral health topics such as depression, developmental screening, substance abuse and tobacco use.

Behavioral Health

Nine studies examined interventions focused on improving behavioral health.[32-40] The studies examined a variety of behavioral health outcomes and employed diverse quality improvement interventions. Eight of the nine studies found significant improvements in behavioral health processes and outcomes. In Chien's previous literature review only two of the 18 studies addressed of behavioral health related topic, with both studies focusing on smoking cessation.[30] In the current literature review, 16% of the studies focused on behavioral health topics, an absolute and relative increase. Most of the studies focused on process and outcome measures. The studies employed multiple quality improvement strategies with all of the studies making changes at the health center level and half of the studies also focused on provider level interventions and/or patient level interventions.

Depression

Five of the nine studies focused on quality improvement interventions to improve depression screening and outcomes in health center patients.[32,34,35,37,39] The studies examined the impact of specific care models, different types of providers, and use of technology on depression screening and depression.

Some models included behavioral health specialists, while others focused solely on primary care providers. OA few studies focused on inclusion of behavioral health consultants or behavioral health providers to primary care, and found that when behavioral health providers support primary care providers depression screening and related outcomes improved.[35,37,39] One study looked at increasing primary care provider education, capacity and adherence to evidence-based guidelines and found that the depression program focused on primary care providers improved depression screening rates and mental health outcomes.[32] One study examined geographic differences and found that specific models of care may be more effective in urban settings versus rural settings. Another study examined collaborations with academic institutions to increase access to behavioral health services.[37] Each of the studies using a specific model of care included changes to the workflow, care delivery processes, and provider training.

Several studies assessed the use of tele-behavioral health services to improve access to care and improve behavioral health outcomes as well as the overall effectiveness of tele-behavioral health programs.[35,37] Tele-behavioral health was found to be an effective means of improving depression care and reducing depressive symptoms in health center patients. Fortney et al compared the collaborative care model versus the telemedicine approach and found the telemedicine approach to have greater

improvements in depression care.[35] The authors suggested the improvements were related to better adherence to treatment guidelines and evidence-based practices.

The studies in this group used interventions that involve the care delivery model as well as provider-level interventions and focused on improving both process and outcome measures. Based on the results of this group of studies it appears that care models that include behavioral health providers in addition to primary care providers, and utilize evidence-based guidelines can improve depression-related care and outcomes.

Substance Abuse

Two studies focused on improving care for substance use disorders.[33,36] Maeda et al showed that employing evidence-based guidelines using best practices increased tobacco screening rates.[36] Baumeister et al conducted a randomized control trial to assess the effect of screening, brief intervention and telephone follow-up on mental and physical health ratings, and found only marginal improvements in physical health.[33]

Other

Schonwald et al utilized a screening tool paired with provider education to increase screening and identification of developmental and behavioral concerns in children less than three years of age.[38] The paired intervention of education and using an evidence-based screening tool resulted in significant improvements in screening and referral to appropriate specialists being made. Vannoy et al examined the impact of a behavioral health integration learning collaborative on improvements in organizational support and patient supports for self-management of depression and substance abuse disorders.[40] The learning collaborative increased providers' self-assessment of primary

care resources and supports and provider comfort level with managing behavioral health issues in primary care.

Preventive Health Services

Cancer Screenings

Six quality improvement studies focused on improving cancer screening rates.[10,36,41-44] Most of the studies focused on colorectal cancer, cervical cancer and breast cancer screenings. All of the studies in this category focused on improving process measures, and included health center or systems-level interventions. Half of the studies included interventions focused on provider-level interventions and two included patient-level interventions. Two of the six studies utilized the chronic care model or health disparities collaboratives principles to improve screening outcomes and both demonstrated improvements in cancer screening rates.[10,44] Haggstrom et al improved cancer screening rates, while Taplin and colleagues also improved timely notification of results and follow-up on abnormal screenings.

Two studies examined the comparative effectiveness of interventions on improving colorectal cancer screening rates. Davis et al compared the effectiveness of the enhanced care model, compared to patient education alone and patient education paired with nurse support [42]. The study found the greatest improvements in screening rates with the patient education paired with nurse support. After controlling for age, race, sex, and literacy, patients who received education and nurse support were 1.6 times more likely to complete screening than those receiving enhanced care. Coronado and colleagues compared the impact of usual care to an electronic health record embedded

program that mailed fecal immunochemical test (FIT) kit patients or an intervention that included that mailed FIT kits plus linguistically and culturally appropriate telephone counseling.[41] Results showed improved rates of colorectal cancer screening in both groups, with a slightly higher performance among those who received only the mailed FIT kits.

Immunizations

The literature review included only three studies that focused on improving immunization rates in children and adolescents, which is a significant decrease from the previous review where immunization focused studies accounted for 16% of all studies. All three studies focused on process measures of care and included both systems and provider-level improvement interventions.[45-47] The greatest improvement was demonstrated in a study that utilized electronic health record templates with preloaded immunization records, automated diagnostic coding, alerts, a patient tracking system, and barcode scanning of immunization vials. This intervention increased vaccination completion rates as well as improved documentation and efficiency of documentation practices.[45] Perkins and colleagues utilized provider education, feedback and follow-up, and incentives to improve initiation of the human papillomavirus (HPV) vaccine and completion of next vaccination.[47]

Obesity/Physical Activity/Nutrition

The previous literature review conducted by Chien and colleagues did not include any studies on improving obesity, physical activity, or nutrition; whereas this literature review found six studies examining quality improvement interventions in these areas.

Three studies looked at quality improvement interventions to improve obesity in health center populations.[36,48,49] All three studies looked at body mass index (BMI), with one study examining improvements in the outcome measure of BMI while the other two studies focused on the process measure of BMI screening. Stephens et al employed a wellness check model in school-based health centers, training providers on appropriate screenings and patient education. Children's BMI screening rates increased, as did referrals to nutritionists, social workers, and primary care providers.[47] Anand and colleagues developed a new care model that employed a multidisciplinary team-based approach, used health information technology and included specialized provider training and patient self-management training.[48] Patients enrolled in the program increased physical activity and fruit and vegetable consumption, as well as decreased screen time, sugary beverage consumption, and overall BMI. In both studies, the multilevel interventions resulted in significant improvements.

Two studies examined interventions to improve fruit and vegetable consumption among health center patients. One study implemented a farmers market and provided subsidies to purchase the fruits and vegetables. Fruit and vegetable consumption increased by almost 2 servings a day among study participants.[50] Another study focused on mother-daughter dyads and utilized an intervention that included group meetings, home visits and routine booster calls.[51] This multidimensional approach resulted in increased weight loss, improved dietary patterns and increased feelings of social support and control. Finally, one study focused an intervention to improve patient perceptions of competency and clinician autonomy support for physical activity.[52] The intervention aimed to improve providers' ability to ask, advise, agree, assist and arrange follow-up.

While patient's perception of support from providers improved, their perceptions of competency for engaging in physical activity did not. Again, findings point to the strength of multilevel interventions to improve quality.

Chronic Disease Management

Twenty-seven peer-reviewed articles focused on improving process and outcome measures related to chronic diseases such as diabetes, asthma, hypertension and cardiovascular disease.[33,43,50,53-78] Approximately 28% of the studies in Chien's literature review focused on chronic diseases, whereas in the current literature review chronic disease focused studies accounted for 50% of the total. Almost all of the studies focused on both process and outcome measures, and employed interventions at the health center or systems-level.

Five of the 27 articles presented findings from HRSA's Health Disparities Collaboratives.[64-67,73] These studies focused on process and outcome measures and used multifaceted interventions to drive improvement. Health centers participating in the Health Disparities Collaboratives generally applied the chronic care model, intervening at the health center or systems level, in addition to both the patient and provider levels. The results of these interventions are somewhat mixed, while most of the studies demonstrated improvements in process measures, only three of the five demonstrated outcome improvement.

Diabetes

Nineteen studies focused on improving diabetes quality of care and patient outcomes, accounting for the largest share of chronic disease focused articles. [43,53-58,60,62-

[66,70,72,73,76,77] This finding falls in line with our expectations given the significant prevalence of diabetes in the United States, as well as the disproportionate burden of diabetes faced by low income, racial/ethnic minorities. Almost 70% of the studies demonstrated improvements in either process or outcome measures such as foot exams, self-management goal setting, hemoglobin A1C testing, and hemoglobin A1C control. Several studies described the most significant improvements in patients whose baseline hemoglobin A1C readings were above 9% or had BMIs over 30.

As previously described, many of the studies described health centers participating in HRSA's Health Disparities Collaboratives or health centers that employed the chronic care model to achieve improvements; however, there are a few notable exceptions that highlight alternative approaches to improving diabetic outcomes.

A few studies investigated adding nontraditional members to the care team, including community health workers, peer leaders and pharmacists.[54,60,77] These additional care team members were able to extend the capacity of primary care providers and provide additional support. Investigators used community health workers or peer leaders to engage patients in group sessions to provide more comprehensive education and self-management support. When pharmacists were members of the care team, patients received additional support via patient education as well as medication adherence and management support.

Several studies that successfully improved diabetes outcomes included the use of patient registries to identify patients who did not meet clinical targets, outreach to them and proactively plan their visit to ensure they receive appropriate care.[53,71] Only one study described moving beyond the chronic care model to a patient centered medical

home model of care and described improvements in diabetes outcomes as well as an

enhanced ability to engage patients in care.[56]

Two studies move beyond the care provided within the walls of the health center

and promoted partnerships with other community organizations such as the YMCA to

improve diabetes outcomes by increasing access to exercise facilities and physical

activity.[55,57] Finally, while most successful studies utilized approaches that engaged

patients in care and provided self-management support, one study described managing

substance abuse disorders and addiction through medication assisted treatment as an

effective strategy to engage patients in routine care and chronic disease management.[43]

While most studies showed improvement, it is important to learn from the

interventions that did not yield improvements in diabetic care. Chien et al demonstrated

that pay-for-performance programs or provider incentive programs may not result in

improved patient outcomes or process,[58] while Fisher et al found that routinely sharing

clinical performance report cards with providers improved outcomes, but sharing clinical

outcome data with patients on a regular basis had no impact.[63] Studies by Fiscella et al

and Ramirez-Zoheld et al demonstrate that interventions that focus solely on one level of

intervention whether only on patients or only on the health center or system of care, may

show some improvements in process measures but do not achieve outcome

improvement.[62,72]

Hypertension

Hypertension is another common chronic condition faced by health center

patients. The previous literature review conducted by Chien did not identify any studies

aimed at improving blood pressure control; however, in my literature review I identified

12 such studies. Most of the studies in this group utilized the chronic care model or

participated in the Health Disparities Collaboratives, and were able to improve blood

pressure outcomes. Many of the studies previously discussed in the diabetes section also

examined hypertension. Consequently, the strategies that were deemed effective in

improving diabetes such as using patient or clinical registries, utilizing nontraditional

members of the care team and partnering with community-based organizations to

promote physical activity were also effective in achieving blood pressure control. Two

studies focused solely on the use of electronic health records and clinical decision support

to improve blood pressure control.[75,78] The improved outcomes demonstrated in these two

studies show that moving beyond the use of registries to leveraging additional

functionality available electronic health record such as templates, order sets, clinical

decision support, and automated lab data transmission can significantly improve

documentation, provider performance and patient outcomes.

Cardiovascular Disease

Heart disease continues to be among the top causes of mortality across the United

States. I found an increased focus on improving heart health compared to the previous

literature review, with almost 25% of the studies aiming to improve heart health

compared to just 11% before 2005.[43,54,55,60,62,64,71,77] Quality improvement studies

focused on outcomes such as low density lipoprotein (LDL) levels, high density

lipoprotein (HDL) levels and cholesterol levels. Most of the studies included in the

chronic disease category aim to improve multiple chronic disease outcomes,

consequently the strategies discussed previously in the diabetes section also improved

cardiovascular disease outcomes.

Asthma

The last subcategory within chronic disease management is focused on

improvements in asthma management. The last review included only one study focused

on asthma, whereas in this review I found 10 studies focused on improving asthma

related processes and outcomes.[59,61,64-69,74,76] Asthma was a key area of focus in HRSA's

Health Disparities Collaboratives, so several of the quality improvement studies

participated in the Collaboratives and utilized the chronic care model to improve asthma

outcomes. Other studies focused on using similar strategies outside of the formal Health

Disparities Collaboratives to improve process measures and decrease asthma related

activity restriction and emergency department visits for asthma. Lob et al used a

multidisciplinary quality improvement team at each clinical site including a primary care

provider an asthma coordinator and other nonclinical staff to help improve outcomes[68].

Here again we see that studies that did not utilize interventions that impacted multiple

levels fail to improve outcomes. For example, Cloutier et al relied solely on provider

education and feedback to improve outcomes.[59] While the study improved provider self-

efficacy, asthma outcomes did not improve.

Other

This literature review included a couple of other studies that did not fall into the

main categories. For example, one study focused on improving low birthweight, while

others focused on improving elements of access to care, including missed appointments and wait times, and elements of quality of care and electronic health record use.

Increasing access to care is a key component of the Health Center Program mission and a few studies examined quality improvement in this area. A study by Feder et al found that providing same-day appointments and group visits decreased low birthweight rates, preterm births, cesarean sections and saved $2.1 million annually.[79] Another study examined missed appointment rates and found that an intervention that included patient education as well as a system-level policy changes resulted in improved rates.[80]

A few studies examined the impact of general quality improvements. Chien et al investigated the Health Disparities Collaboratives and health center staff's perception of the spillover effects of participation, as well as generalized improvements in conditions not directly targeted by the collaborative. Staff reported positive spillover effects and improved quality improvement environment as a result of participation in the collaboratives.[81] A study by Frimpong et al examined the use of electronic health records (EHR) in health centers.[82] EHR related benefits and costs to quality improvement teams were substantial. Another study conducted by Miller and colleagues found a positive association between health information technology use and quality care in health centers.[83] Higher EHR capacity and use were more likely to improve quality of care as demonstrated by improvements in receipt of discharge summaries, use of patient notification system for reminders, and timely appointments for specialty care.

Implications

Gaps in the Literature

In the last five years, health centers have increased their oral health capacity and are providing access to more and more patients.[2] Despite the significant growth in oral health programs across Health Center Program, my review did not identify any studies focused on improving oral health outcomes. Moving forward as health centers increase their capacity to provide oral health services they will serve as a critical access points for low-income, minority adults with limited or no dental coverage. Given the staggering statistics on unmet oral health needs and limited oral health resources, it is important health centers focus on maximizing access and quality in this area. Consequently, it will be critically important that studies focused on oral health improvement are conducted and findings are shared widely among health centers to facilitate evidence-based quality improvement.

Patient satisfaction/patient experience with care has been found to have a significant association with health outcomes improvement, yet none of the quality improvement studies in the review explicitly focused on improving patient satisfaction or experience of care.[26,84] As standardized measures of patient experience become a core part of the criteria or metrics used to assess the quality and value of care provided, it will become increasingly important for health centers to not only understand their patient experience of, but also be armed with evidence based strategies to improve those outcomes. A growing body of evidence points to the differences in patient experience by low-income individuals and racial/ethnic minorities[85-91]. As patient experience becomes an indicator of quality and tied to reimbursement policies' it will become of great importance that

health centers understand the variation in patient experience and are able to develop improvement strategies or find appropriate methods for adjusting for population differences in scoring bias.

Since the conclusion of Chien and colleagues' literature review there has been a growing interest in better understanding enabling services provided in health centers. My literature search did not find any studies focused on improving access or quality of enabling services. With improvements in access to health insurance coverage and Medicaid expansion that resulted from the implementation of the Affordable Care Act there is an increasing focus on the critically important, yet generally not reimbursed enabling services. HRSA defines enabling services as non-clinical services that enable individuals to access health care and improve health outcomes such as case management, translation/interpretation, transportation, outreach and eligibility assistance, health education, environmental health risk reduction, and health literacy.[92] While evidence shows that enabling services improve health care access and outcomes, there is a lack of peer-reviewed studies on the most effective enabling services or the use of enabling services to improve quality of care.[93,94] As the health care system shifts focus from access to health care coverage to effective utilization of health care services, additional study in this area will be of growing importance.

Many studies included in my review used data, provider feedback and patient registries to improve quality. Studies conducted within the last five years also utilized new capabilities introduced by the adoption of electronic health records, including leveraging clinical decision support, electronic templates, order sets, and sharing of health information across care settings to improve quality. A relatively new functionality

that exists within electronic health records facilitates patient access to information including their own health information and patient education and self-management resources. However, none of the studies included this literature review focused on leveraging health information technology to improve patient activation or engagement in care and facilitate shared decision-making to improve health outcomes. Moving forward this will be important area of focus to ensure patients benefit from health information technology investments and that they improve health outcomes. This is of particular importance for health centers given the language access and literacy issues faced by health center patients.

Currently over 60% of health centers are recognized as patient centered medical homes, a trend that has grown from less than 5% in 2010, yet only one study in the literature review examined the association between the patient centered medical home (PCMH) model of care and quality.[2] I anticipated that there would be several studies examining elements or attributes of the patient centered medical homes and its ability to improve quality; however, I did not find any explicitly studying the PCMH model. It will be interesting to see if investigators are able to study and identify the key attributes of the PCMH that improve quality or whether as with the Health Disparities Collaboratives, it takes a combination of care model, team approach and patient engagement to advance quality.

The previously conducted literature review identified 18 quality improvement studies that were published between 1998 and 2005. This literature review identified 55 quality improvement studies conducted in health centers between 2006 and 2015, a threefold increase in peer-reviewed quality improvement studies across the Health Center

Program. This growth could be related to a number of issues. First, the Health Center

Program grew significantly between 2005 and 2015; HRSA reports a 34% growth in the

number of health centers and health center patients between 2008 and 2014.[2] Second,

significant efforts have been made to increase quality improvement infrastructure such as

adoption of electronic health records and PCMH transformation. The Health Center

Program has also increased its focus on quality improvement in routine program

monitoring activities and has most recently begun to provide incentive awards for

improved quality. In addition to an increased focus on quality improvement activities,

many health centers have begun to increase their research capacity over the last five

years. In 2010, HRSA funded the Community Health Applied Research Network

(CHARN) that included 18 health centers and four academic partners across nine states to

build the health center research capacity.[95] A survey conducted in 2011 by the National

Association of Community Health Centers (NACHC) found that 65% of responding

health centers were engaged in sponsored research.[96] This increase in research capacity

and academic partnerships may result in an increase in peer-reviewed publications.

Given the continued growth in quality investments and focus on quality

improvement, I would expect to see a continuing upward trend in terms of the number of

quality improvement studies conducted in health centers. If this trend continues, it would

help accelerate knowledge of effective quality improvement practices with diverse patient

population that may be applicable across most primary care settings. This dissemination

of evidence-based, empirical findings facilitate our broad health system goals of

providing better care, better health, and smarter spending. Supporting health centers

participation in rigorous quality improvement studies would be warranted given the

opportunity to move closer to the ideal high performing, continuously learning healthcare system.[97]

Limitations

My review had some limitations that are important to consider. Although my study utilized a systematic approach to search for empirical quality improvement studies in federally qualified health centers, it is possible that some articles were inadvertently omitted. As described in Figure 2.1, I started with 242 articles and in the process of narrowing to the most relevant articles, some studies may have been missed. For example, some quality improvement studies were omitted because they did not report out on the results of the intervention. Next, it is likely that health centers participated in additional quality improvement studies, but study leads may not have developed manuscripts for peer-review publications based on a lack of time or interest in pursuing publications. It is also possible editorial boards did not accept their submissions. There is also a chance of publication bias impacted my review. There may have been additional quality improvement studies conducting during the period of interest, however, due to the lack of compelling findings, study leads may not have pursued publication. In this case, it would be impossible to assess if non-published studies utilized similar quality improvement strategies or different approaches and the impact of these interventions on quality. These limitations could influence my conclusions about changing trends in quality improvement targets and interventions, as well as the impact of interventions.

Conclusion

The Health Center Program has grown significantly since its inception almost 50 years ago. The health center mission focuses on increasing access to comprehensive, culturally competent quality health care services to underserved communities and vulnerable populations, and has a long history of focusing on quality improvement starting with its program requirements mandating a focus on quality improvement to more recent investments to improve the quality infrastructure. This literature review not only uncovered the increasing diversity and range of focus areas in health center quality improvement literature, but also documented an increase in the number and type of interventions utilized. While significant progress has been made in documenting and disseminating quality improvement studies there still a gap in understanding patient level interventions as well as interventions focused on patient satisfaction and experience of care. It will also be important to study the quality improvement investments made in recent years including patient centered medical home and electronic health record adoption. Future studies should examine the comparative effectiveness of various interventions on quality improvement relative to financial, staff and patient resources.

Figure 2.1: Search Terms

Databases: Academic Search Premier, PubMed, CINAHL, ProQuest Public Health, Scopus

Keywords:

Federally qualified health center and each of the following terms:		
patient satisfaction	patient experience	patient engagement
patient activation	enabling services	patient centered medical home
patient centered health home	quality improvement	performance improvement
accreditation	patient outcomes	quality of care
health information technology	electronic health record	health disparities
access	quality	cost
collaborative	patient portals	pay for performance
patient safety	risk management	quality assurance
incentives	Consumer Assessment of Healthcare Providers and Systems	

Time range – January 1, 2006 - April 15, 2015, Language - English, Location – US

Figure 2.2: Study Selection Process

Potential Quality Improvement Studies in FQHCs using Electronic Databases

N= 242

Quality Improvement Studies excluded based on Abstract Review

N= 149

Quality Improvement Studies included based on Abstract Review

N= 93

Quality Improvement Studies excluded for not meeting Inclusion Criteria

N= 38

Quality Improvement Studies included based on Inclusion Criteria

N= 55

Table 2.1: Quality Improvement Studies Included in Literature Review

Study	Disease or Focus Area	Quality Measure/ Improvement Target			Quality Improvement Strategy or Intervention			Location	Significant Improvement
		Structure	Process	Outcome	System	Provider	Patient		
Adams, S. J., Xu, S., Dong, F., Fortney, J., & Rost, K. (2006).[32]	Depression			X	X	X	X	US	Y
Anand, S. G., Adams, W. G., & Zuckerman, B. S. (2010).[48]	Obesity		X	X	X	X	X	MA	Y
Au, L., Oster, A., Yeh, G. H., Magno, J., & Paek, H. M. (2010).[45]	Immunization		X	X	X	X		NY	Y
Baty, P. J., Viviano, S. K., Schiller, M. R., & Wendling, A. L. (2010).[53]	Diabetes		X	X	X	X	X	MI	Y
Baumeister, S. E., Gelberg, L., Leake, B. D., Yacenda-Murphy, J., Vahidi, M., & Andersen, R. M. (2014).[33]	Substance Abuse			X	X	X	X	CA	M
Bluml, B. M., Watson, L. L., Skelton, J. B., Manolakis, P. G., & Brock, K. A. (2014).[54]	Diabetes		X	X	X		X	US	Y
Boyd, S. T., Scott, D. M., & Augustine, S. C. (2006).[55]	Diabetes, Exercise		X	X		X	X	IA	Y
Calman, N. S., Hauser, D., Weiss, L., Waltermaurer, E., Molina-Ortiz, E., Chantarat, T., & Bozack, A. (2013).[56]	Diabetes		X	X	X			NY	Y
Candib, L. M., Silva, M., Cashman, S. B., Ellstrom, D., & Mallett, K. (2008).[57]	Diabetes		X	X		X	X	MA	Y
Carroll, J. K., Fiscella, K., Epstein, R. M., Sanders, M. R., Winters, P. C., Moorhead, S. A., Williams, G. C. (2013).[52]	Physical Activity			X		X		NY	M
Chien, A. T., Eastman, D., Li, Z., & Rosenthal, M. B. (2012).[58]	Diabetes, Pay for Performance		X	X	X			NY	N
Chien, A. T., Kirchhoff, A. C., Schaefer, C. T., Huang, E. S., Brown, S. E. S., Heuer, L., Chin, M. H. (2010).[81]	Quality of Care		X	X	X			US	Y
Cloutier, M. M., Tennen, H., Wakefield, D. B., Brazil, K., & Hall, C. B. (2012).[59]	Asthma		X			X		CT	N
Cole, S. M. D., Reims, K. M. D., Kershner, L. M. S. W. L., McCombs, H. G. P., Little, K. P., & Ford, D. E. M. D. M. P. H. (2012).[34]	Depression			X	X	X	X	US	Y

Coronado, G. D., Vollmer, W. M., Petrik, A., Taplin, S. H., Burdick, T. E., Meenan, R. T., & Green, B. B. (2014). [41]	Colorectal Cancer			X	X	X	X	OR	Y
Davis, T., Arnold, C., Rademaker, A., Bennett, C., Bailey, S., Platt, D., Wolf, M. (2013). [42]	Colorectal Cancer	X		X	X	X	X	LA	Y
Feder, J. L. (2011). [79]	Low Birth Weight, Access to Care	X		X	X			CO	Y
Fernandes R, Braun KL, Spinner JR, et al. (2012) [60]	Cardiovascular Disease, Hypertension, Diabetes		X	X		X	X	HI	M
Fifield, J., McQuillan, J., Martin-Peele, M., Nazarov, V., Apter, A. J., Babor, T., Twiggs, J. (2010). [61]	Asthma		X	X	X	X		CT	Y
Fiscella, K., Volpe, E., Winters, P., Brown, M., Idris, A., & Harren, T. (2010). [62]	Hypertension, Diabetes, Cholesterol		X	X	X	X	X	NY	Y
Fischer, H. H., Eisert, S. L., Durfee, M. J., Moore, S. L., Steele, A. W., McCullen, K., Mackenzie, T. D. (2011). [63]	Diabetes		X	X		X	X	CO	Y
Fortney, J. C., Pyne, J. M., Mouden, S. B., Mittal, D., Hudson, T. J., Schroeder, G. W. Rost, K. M. (2013). [35]	Depression			X	X			AR	Y
Freedman, D. A., Choi, S. K., Hurley, T., Anadu, E., & Hébert, J. R. (2013). [50]	Nutrition			X	X		X	SC	Y
Frimpong, J. A., Jackson, B. E., Stewart, L. M., Singh, K. P., Rivers, P. A., & Bae, S. (2013). [82]	Quality of Care		X		X			US	Y
Grossman, E., Keegan, T., Lessler, A. L., Ly, M. H., Huynh, L., O'Malley, A. J., Landon, B. E. (2008). [64]	Asthma, Cardiovascular Disease, Diabetes			X	X			US	N
Haddad, M. S., Zelenev, A., & Altice, F. L. (2015). [43]	Hypertension, HIV, Cardiovascular Disease, Cancer Screening			X	X			CT	Y
Hicks, L. S., O'Malley, A. J., Lieu, T. A., Keegan, T., McNeil, B. J., Guadagnoli, E., & Landon, B. E. (2010). [98]	Asthma, Diabetes, Hypertension			X	X			US	Y
Landon, B. E., Hicks, L. S., O'Malley, A. J., Lieu, T. A., Keegan, T., McNeil, B. J., & Guadagnoli, E. (2007). [66]	Diabetes, Asthma, Hypertension		X	X	X			US	Y
Lester, D., Mohammad, A., Leach, E. E., Hernandez, P. I., & Walker, E. A. (2012). [67]	Asthma			X	X	X	X	NY	Y
Lob, S. H., Boer, J. H., Porter, P. G., Núñez, D., & Fox, P. (2011) [68]	Asthma			X	X	X	X	CA	Y
Maeda, J. L., Bradley, J. J., Eissler, S. R., Lobrano, M., Rubin, M. R., Gay, M., Loftus, B. C. (2015). [36]	Obesity, Tobacco Use, Breast Cancer		X	X	X			Regional	Y
Mansour, M. E., Rose, B., Toole, K., Luzader, C. P., & Atherton, H. D. (2008). [69]	Asthma		X	X	X	X	X	OH	Y
Maragakis, A., Snipes, C., Mazzucotelli, J., & Duarte, C. (2014). [99]	Behavioral Health, Access to Care	X	X		X	X		NV	Y

Author	Topic							State	
McCord, C. E., Elliott, T. R., Wendel, M. L., Brossart, D. F., Cano, M. A., Gonzalez, G. E., & Burdine, J. N. (2011). [37]	Depression		X	X	X			TX	Y
Miller, R. H., & West, C. E. (2007). [83]	Electronic Health Record Adoption	X			X			US	Y
Moss, J. L., Reiter, P. L., Dayton, A., & Brewer, N. T. (2012). [46]	Immunizations		X	X	X			NC	Y
Page, T. F., Amofah, S. A., McCann, S., Rivo, J., Varghese, A., James, T., . . . Williams, M. L. (2015). [70]	Diabetes		X	X	X		X	FL	Y
Perkins, R. B., Zisblatt, L., Legler, A., Trucks, E., Hanchate, A., & Gorin, S. S. (2015). [47]	Immunizations		X		X			MA	Y
Pollard, C., Bailey, K. A., Petitte, T., Baus, A., Swim, M., & Hendryx, M. (2009). [71]	Diabetes		X	X	X	X		WV	Y
Ramirez-Zohfeld V, Jean-Jacques M, Sanserino K, Buchanan D, Baker DW. [72]	Diabetes		X				X	IL	N
Scanlon, D. P., Hollenbeak, C. S., Belch, J., Dyer, A.-M., Gabbay, R. A., & Milstein, A. (2008). [73]	Diabetes		X	X				SC	Y
Schmalzried, H., & Liszak, J. (2012). [80]	Access To Care		X		X	X	X	OH	Y
Schonwald, A., Huntington, N., Chan, E., Risko, W., & Bridgemohan, C. (2009). [38]	Behavioral Health		X		X	X	X	MA	Y
Serrano, N., & Monden, K. (2011). [39]	Depression	X	X	X	X			WI	Y
Shapiro, A., Gracy, D., Quinones, W., Applebaum, J., & Sarmiento, A. (2011). [74]	Asthma		X	X	X			NY	Y
Shelley, D., Tseng, T.-Y., Matthews, A. G., Wu, D., Ferrari, P., Cohen, A., Kopal, H. (2011). [75]	Hypertension		X	X	X	X		NY	Y
Silver, A., Figge, J., Haskin, D. L., Pryor, V., Fuller, K., Lemme, T., O'Brien, M. J. (2011). [76]	Asthma, Diabetes		X	X	X			NY	Y
Sorkin, D. H., Mavandadi, S., Rook, K. S., Biegler, K. A., Kilgore, D., Dow, E., & Ngo-Metzger, Q. (2014). [51]	Nutrition		X	X		X		CA	Y
Stechna, S., Mravcak, S., Schultz, P., & Santolaya, J. (2013). [100]	Family Planning		X			X		NJ	Y
Stephens, M. M., McLean, K., Cannatelli, K., & Stillman, P. L. (2011). [49]	Obesity		X	X	X	X		DE	Y
Tang, T. S., Funnell, M., Sinco, B., Piatt, G., Palmisano, G., Spencer, M. S., Heisler, M. (2014). [77]	Diabetes, Hypertension			X			X	MI	Y
Taplin, S. H., Haggstrom, D., Jacobs, T., Determan, A., Granger, J., Montalvo, W., Calvo, A. (2008). [44]	Breast, Cervical, Colorectal Cancer		X	X	X	X	X	Regional	Y
Thomas, B. (2011). [78]	Chronic Kidney Disease		X	X	X	X	X	CT	Y

Vannoy, S. D., Mauer, B., Kern, J., Girn, K., Ingoglia, C., Campbell, J., Unützer, J. (2011). [40]	Behavioral Health, Substance Abuse	X	X		X	X		US	Y
Haggstrom DA, Clauser SB, Taplin SH. (2010)	Cancer Screening		X		X			US	Y

Table 2.2: Geographic Distribution of Study Locations

Study Locations	Number	Percent
National *(>3 non-contiguous states)*	11	20%
State/Regional *(>1 FQHC across state or region)*	21	38%
Local *(1 FQHC)*	23	42%

Table 2.3: Studies by Quality Metrics/QI Targets

Quality Metric/QI Target	Number	Percent
Structure	6	11%
Process	35	64%
Outcome	45	82%
One Target	25	45%
Two Targets	29	53%
Three Targets	1	2%

Table 2.4: Studies by Type of QI Strategies Employed

Type of QI Strategies Employed	Number of Studies
Health Center	**45** (82%)
Organizational Changes	
Financial Incentives/Regulation/Policy	
Care Delivery Model Changes	
Health Information Technology	
Quality Improvement/Learning Collaborative	
Provider	**31**(56%)
Reminder Systems	
Facilitate Clinical Data to Provider	
Audits & Feedback	
Education	
Changes to Care Team	
Patient	**25** (45%)
Reminder Systems	
Education	
Self-Management Support	
One Strategy	**25** (45%)
Two Strategies	**15** (27%)
Three Strategies	**15** (27%)

Table 2.5: Quality Improvements

Quality Improvement Findings	Number	Percent
Statistically or Clinically Significant Improvement	47	85%
Mixed Results	4	7%
No Improvement	4	7%

Table 2.6: Studies by Disease or Focus Area

Disease or Focus Area of QI Study	Number of QI Studies
Chronic Disease Management	**27**
Diabetes	*19*
Hypertension	*12*
Cardiovascular Disease	*7*
Asthma	*10*
Preventive Health Services	**15**
Obesity/Nutrition/Physical Activity	*6*
Immunizations	*3*
Family Planning	*1*
Cancer Screening	*6*
Behavioral Health & Substance Abuse	**9**
Depression	*6*
Developmental Screening	*1*
Substance Abuse/Tobacco Use	*3*
Perinatal Health – Low Birthweight	**1**
Access to Care	**3**
Quality of Care	**2**

CHAPTER 3:   IMPROVING QUALITY OF CARE IN FEDERALLY QUALIFIED HEALTH CENTERS THROUGH AMBULATORY CARE ACCREDITATION

INTRODUCTION

The Health Resources and Services Administration (HRSA) supports a primary care network of nearly 1,400 health centers that care for more than 24 million patients in underserved communities across the United States.[4] In 2013, HRSA-supported health centers, also known as federally qualified health centers (FQHCs), provided care for approximately 21.7 million patients across more than 9,500 service delivery sites. More than 18,000 primary care providers provided care to a population that was predominantly low-income, and racial or ethnic minorities.[2] Health centers also served socially and medically vulnerable populations including the uninsured, individuals experiencing homelessness, migrant or seasonal agricultural workers, and residents of public housing. As health centers serve a growing number of patients, the Health Center Program becomes vital to advancing the National Quality Strategy's three aims of achieving better individual health, improving population health, and increasing the affordability of care.[22] It is important to understand the factors that contribute to the quality of health center care and services in order to strengthen and spread initiatives that will improve quality of care and patient health outcomes.

Health centers are nonprofit, community-based primary care centers that receive grants from the U.S. Department of Health and Human Services' HRSA to provide access to comprehensive, culturally competent, and quality primary health care services. Health centers are required to meet key program requirements related to the provision of community-driven primary care services, including serving medically underserved populations, governance by a patient-majority community board, and providing comprehensive primary health care services and supportive services that are available to all patients irrespective of their ability to pay. Health centers must also have quality improvement and assurance systems in place and focus on quality of care and patient health outcomes.[101] Health centers have demonstrated a long-standing commitment to quality improvement through a variety of initiatives including participation in Health Disparities Collaboratives, adoption and meaningful use of electronic health records (EHR), and national quality recognition for ambulatory health care accreditation and patient centered medical home (PCMH) model of care.[8]

While health centers have been participating in voluntary ambulatory care accreditation for over 17 years, little information is available on the impact of accreditation on quality care or patient health outcomes. The purpose of ambulatory care accreditation is to support patient safety, quality assurance, and quality improvement in healthcare organizations. The accreditation process consists of pre-survey preparation, a multi-day on-site survey to review compliance with accreditation standards, and results in either accreditation, conditional or provisional accreditation, or denial of accreditation. The accreditation cycle is three years, after which organizations must successfully pass an unannounced onsite survey to receive accreditation for another 3-year cycle.[102]

International systematic reviews have examined the literature on accreditation to develop a better understanding of the impacts of accreditation. One review found that accreditation significantly improved clinical outcomes and stated accreditation should be supported as a tool to improve the quality of healthcare services in hospitals.[103] Another review focused on accreditation in primary care, and found that accreditation improved access to care, increased awareness of patient safety, improved practice systems and care processes, as well as care quality. However, the authors concluded that there is a lack of sufficient research on accreditation in primary care, including the impact on quality of care.[104]

The purpose of this study was to address a significant gap in the literature by examining the relationship between ambulatory care accreditation and quality of care and patient health outcomes in HRSA-supported health centers. We employed a linked data set, which covered all health centers in the US, and provided a comprehensive look at organizational and patient characteristics and clinical performance measures by ambulatory care accreditation status of health centers. We further examined the association between accreditation and quality of care.

METHODS

Design and Data

We conducted a cross-sectional study using secondary data to examine the relationship between accreditation and quality of care in health centers. We linked multiple data sets to conduct this study. The main data set was the 2013 Uniform Data System (UDS) data. The UDS is an annual reporting requirement for all HRSA-supported

health centers, and includes organizational level data on patient demographics, services

provided, staffing, clinical indicators, costs and revenues.[2] In 2013, the UDS included

data on 14 measures of health center quality of care and patient health outcomes, which

we describe in detail in the following section. HRSA receives monthly updates on

ambulatory care accreditation and patient-centered medical recognition data for health

centers participating in either of HRSA's national quality recognition initiatives. Using a

unique health center identifier across these data sets, we linked UDS data with HRSA

data on accreditation and patient centered medical home status. The linked data set

yielded a final analytical sample size of 1,202 health centers, with comprehensive data on

the characteristics of health centers, patients, as well as measures of quality of care and

patient health outcomes.

Dependent Variables

In this study, we examined two aspects of quality – quality of care and patient health

outcomes.

I.   *Quality of Care Measures*: According to Donabedian's model for
      evaluating
      quality of care our study included eleven quality of care indicators,
      assessing the extent to which health centers provided appropriate
      preventive health screenings and chronic disease management
      interventions.[24,25,28] Specifically, these measures were (1) Entry to
      Prenatal Care; (2) Childhood Immunizations; (3) Weight Assessment and
      Counseling for Children and Adolescents; (4) Asthma Pharmacologic
      Therapy; (5) Cervical Cancer Screening; (6) Colorectal Cancer Screening;

(7) Tobacco Use Assessment; (8) Tobacco Cessation Intervention; (9) Adult Weight Screening and Follow Up; (10) Lipid Lowering Therapy for CAD; and (11) Use of Aspirin or Another Antithrombotic for IVD.

II. *Patient Health Outcomes:* We examined three measures of patient health outcomes: (1) Low Birth Weight; (2) Diabetes Control; and (3) Blood Pressure Control.

The UDS clinical quality measures were selected to reflect a balance of clinical issues that cross the lifespan and are common health concerns of underserved populations, as well as align with other national quality improvement initiatives.[12] Specific definitions and measures of each of these clinical measures are listed in Appendix 1. Our outcome variables were measured as the percentage of patients across the entire health center that received the services in a specific timeframe (timeframe varies by services, please see Appendix 1). Hence, fourteen dependent variables (eleven quality measures and three health outcome measures) were constructed. A detailed review of each clinical measure is available in the 2013 UDS manual.[2]

Independent Variables

The covariates used in our regression and estimation models were derived from widely accepted principles grounded in scientific literature and mirror adjustment factors previously used by HRSA.[12,14,105] These covariates can be categorized into two groups (1) health center characteristics, which reflect organizational attributes; and (2) patient characteristics, which influence patients' health needs. Health center characteristics included: total number of patients cared for annually, total number of staff full time equivalents (FTEs), whether the health center adopted electronic health records, and

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whether the health center received ambulatory care accreditation and/or patient centered medical home recognition. Patient characteristics were measured by percentages of patients served in a health center. These measures were race (White, Black/African-American, Asian, American Indian/Alaska Native, Native Hawaiian/other Pacific Islander, or more than one race), ethnicity (Hispanic or Non-Hispanic), age (<18 years old, 18-64 years old, >65 years old), insurance status (uninsured), language preference (best served in a language other than English), and percentages of special populations (individuals experiencing homelessness, migratory or seasonal agricultural workers, and residents of public housing).

Statistical Methods

Our analysis began with descriptive statistics of quality of care measures, patient health outcomes, and organizational and patient characteristics of accredited and non-accredited health centers. We used t-tests and chi-squared tests to assess the differences between accredited and non-accredited health centers for the variables of interest.   Next, we used multivariate ordinary least square regressions to estimate the association between accreditation and outcomes of interest while controlling for covariates presented above. Finally, we estimated the aggregated impact of accreditation on clinical quality performance nationwide. Specifically, we calculated the aggregated impact by multiplying the estimated value of accreditation to the total adult population served by health centers in 2013, and by applying national prevalence data to UDS data to estimate the number of patients with a specific condition.[106,107]

To test the robustness of our results, different model specifications were assessed. For example, total FTEs and total patients were highly correlated so we chose to include

total FTEs as a measure of health center capacity and excluded total patients. Another consideration was the inclusion of both PCMH and EHR in our model. PCMH recognition and patient-centered care are facilitated by use of electronic health records and over ninety percent of health centers were using this technology so we suspected that including both variables could confound our results. Hence, we selected the most parsimonious model, which excluded total patients and EHR use and found similar results. Our model also passed the multicollinearity test. We used Stata 11.2 to conduct all of the analyses included in this study.[108]

RESULTS

As illustrated in Table 3.1, accredited health centers were larger or had more primary care capacity compared to non-accredited health centers as demonstrated by higher numbers of patients, visits, and FTEs. Accredited health centers also had lower medical costs per patient, compared to non-accredited health centers. Accredited health centers cared for higher percentages of racial/ethnic minority patients, patients best served in a language other than English, and patients less than 18 years old than their non-accredited counterparts. Accredited health centers had comparable levels of EHR adoption, but greater percentages of PCMH recognition. Performance on eight of eleven quality of care measures were significantly higher in accredited health centers; however, there was no difference in patient health outcomes.

Table 3.2 shows the results of the multivariate regression models, controlling for both organizational characteristics and patient characteristics that influence quality of care and patient health outcomes. Covariates used in the model include - age, race, ethnicity, special populations, patients that are better served in a language other than

English, insurance status, total staff, and patient-centered medical home recognition. Three of the eleven quality of care metrics were found to be significantly associated with accreditation. They include adult weight screening and follow up (coef=.037, p<.05), tobacco cessation interventions (coef=.042, p<.05), and lipid lowering therapy for patients with coronary artery disease (coef=.028, p<.05). Multivariate regressions did not reveal any statistically significant association between accreditation and health outcomes.

Based upon the results of the multivariate regressions described above, we predicted the impact of accreditation on quality of care, and estimated the average performance if all health centers were accredited. Table 3.3 includes the results of this analysis. If all health centers in our data set were accredited, we would expect significant improvements in key quality of care metrics. The model predicts that an additional 552,087 patients would have received weight screening and counselling, 157,434 additional patients would have received tobacco use cessation counselling, and 25,289 additional patients with coronary artery disease would have been prescribed the appropriate lipid lowering therapy.

DISCUSSION

Our study presents an important contribution to the literature as the first study examining the relationship between ambulatory care accreditation and quality of care and patient health outcomes in HRSA supported health centers. Summary statistics showed accredited health centers are likely to be larger with more staff and patients, and serve greater proportions of racial/ethnic minority patients, with lower medical costs per patient. These observations could stem from the differences in resources and capacities between large and small health centers pursuing accreditation requires leadership,

financial and staff resources to meet all of the standards, and requires an ongoing investment of resources to maintain accreditation status. Several studies have examined organizational characteristics associated with participation in quality improvement initiatives and support this hypothesis.[109-111] It is likely that smaller, less resourced health centers could not afford to make the investments necessary to go through the accreditation process. Conversely, larger health centers who have gone through the accreditation process may find it easier to pursue other quality improvement processes and initiatives that may positively influence quality of care and patient health outcomes. Larger health centers may also be able to leverage economies of scale and other efficiencies that contribute to lower medical costs per patient and improve quality. Given the investments accredited health centers have made in quality, we expected to see higher performance on quality of care measures.

Health centers provide access to comprehensive, integrated primary health care and enabling services to the nation's underserved communities and vulnerable populations. Health centers have demonstrated a long-standing commitment to quality improvement through a variety of initiatives.[8] Ninety-six percent of health centers have adopted EHRs, 54% of health centers have received PCMH recognition and 25% have received ambulatory health care accreditation.[105]

Health centers investments in quality infrastructure and quality improvement activities have undoubtedly had an impact on quality care. Higher performance on quality indicators by health centers compared to other care settings is well documented in the literature.[13,112-115] A key contributor to these quality outcomes may be the health center model of care, which emphasizes culturally competent care, and the provision of enabling

services such as translation, transportation, and eligibility assistance. Health center propensity to provide services that reflect patients' cultural background and language preference may contribute to the lack of significant differences in quality in the multivariate regression after controlling for these variables.

After controlling for patient and organizational characteristics, we found accreditation status significantly correlated with the percentages of patients who received weight assessment, tobacco cessation counseling, and lipid lowering therapy. Given ambulatory care accreditation's focus on implementing systems and processes to ensure patient safety and improve the quality of care, the findings demonstrate that in the health center setting accreditation is having the anticipated impact.

Improvement on outcome measures is often a combined result of health care interventions, patient education and engagement, and lifestyle and behavioral changes. Consequently, patient health outcomes are often more challenging than process measures for health care organizations to improve. Patient health outcomes are often less sensitive to improvement based solely on clinic-based interventions, which could explain the lack of association between accreditation and patient health outcomes.

While performance increases on quality of care metrics in accredited health centers may seem nominal, given that health centers care for more than 24 million patients, even small improvements could lead to substantial impacts on quality of care, patient health outcomes, and total cost of care. This study suggests that federal support for accreditation has positively influenced quality of care in health centers. The national estimates were calculated based on the health center population nationwide and the prevalence rates of tobacco use and coronary artery disease (CAD) in the general U.S.

population. Low-income, minority patients may be more likely to use tobacco and have CAD. Therefore, national estimates may underestimate the true impact of accreditation considering the disproportionate burden of disease and differences in preventive health care utilization patterns in safety net populations.

There are several important limitations to consider. Like all cross-sectional studies, we cannot conclude if there is a causal relationship between health center accreditation and quality of care and/or patient health outcomes. Performance on quality of care and health outcome measures are multifactorial, despite our best attempt to control for known covariates, residual confounding could affect our results. While we controlled for comprehensive patients' characteristics, such as age, races/ethnicities, and language preference as proxies for patients' health needs and health behavior, it is possible that our model did not fully capture the variation in patient complexity. Next, our study was not able to control for potential variability in the accreditation measure since we grouped together health centers that were recognized under different accrediting organizations with differing standards/criteria. Finally, PCMH recognition is often conferred at the site level and there are varying degrees of recognition; however, our analysis was at the health center level and did not differentiate between levels of recognition, potentially introducing measurement error related to the care delivery model and its impact on quality.

Future research should look at the temporal relationship between accreditation and trends over time in quality of care measures. Additional studies could examine the association between higher levels of performance on specific accreditation standards and quality of care. Results of these studies may identify best practices or model systems or

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processes that could be implemented across health centers nationwide to improve health outcomes. If we are able to distill the most effective elements of or standards within the accreditation process and promote them without wasting effort on the less impactful standards, we may be able to maximize quality improvement efforts.

While accreditation was positively correlated with quality of care process measures, significant improvement in patient health outcomes remain elusive. This finding should be examined further to strengthen accreditation standards by focusing on systems and processes that improve patient health outcomes such as patient engagement, self-management education and referrals to community resources. Refining existing standards to provide a greater emphasis on evidence-based strategies for improving health outcomes could significantly improve the impact of accreditation. Recently, several national accreditation organizations have begun to add standards assessing patient centeredness of care to the accreditation process, which may improve the long-term relationship between accreditation and patient health outcomes.

CONCLUSION

This study, the first to the authors' knowledge examining accreditation and quality in health centers, lends support for previous research that describes the benefits of accreditation in hospital and primary care settings.[103,104] Our findings suggest that federal support for accreditation may improve quality of care in health centers and quality recognition programs such as accreditation and patient centered medical home can serve as important levers for achieving national quality and health equity goals. Health centers have served more than 3 million new patients since 2013, and this study shows that even small improvements in quality of care could improve the health of more than 730,000

additional patients. Such improvements could accelerate the nation's efforts to improve

quality of care, patient health outcomes, total cost of care, and health disparities.

Table 3.1: Organizational Characteristics, Patient Characteristics and Measures of Quality of Care and Patient Health Outcomes by Accreditation Status

	Accredited HCs (n=297)	Non-Accredited HCs (n=905)
Health Center Characteristics		
Total Patients (SD)	31,175 (28,483)	13,777 (14,791) ***
Total Patient Visits (SD)	126,245 (126,646)	53,437 (64,104) ***
Total FTEs (SD)	105.7 (97.0)	45.1 (52.7) ***
Medical Cost/Patient (SD)	$162.51 ($58.88)	$181.86 ($105.07) **
PCMH Recognition (%)	228 (76.8)	444 (49.1)***
EHR Adoption (%)	290 (97.6)	862 (95.2)
Patient Characteristics	% of total patients (SD)	
Uninsured	37.1 (16.6)	37.7 (21.1)
Homeless	4.3 (10.1)	9.2 (23.5)***
Migratory Seasonal Agricultural Workers	3.6 (9.6)	3.1 (12.6)
Public Housing Residents	1.3 (7.6)	1.0 (7.7)
Black/African-American	24.6 (25.2)	18.7 (24.4)***
White	53.8 (29.3)	60.4 (30.5)**
Asian	2.2 (6.3)	2.6 (8.4)
American Indian/Alaska Native	2.1 (8.7)	2.6 (10.9)
Pacific Islander/Native Hawaiian	0.4 (0.6)	1.8 (9.7)*
More than one race	3.2 (12.1)	10 (51.3)*
Hispanic	25.2(27.2)	16 (21.9)***
Non-Hispanic	61.6 (29.2)	72.1 (26.7)***
Best served in language other than English	22.3 (23.8)	16.6 (22.9)***
Under 18 years	30.5 (11.2)	26.5 (13.6)***
18-64 years	62 (10.4)	64.9 (13.5)***
65 years and over	7.5 (4.6)	8.6 (6.2)**
Quality Of Care	% of patients meeting performance measure standard (SD)	
Early Entry To Prenatal Care	71.3 (13.3)	72.4 (15.1)
Child and Adolescent Weight Assessment & Counseling	51.3 (23.4)	45.1 (26.1) ***
Childhood Immunizations	75.8 (18.1)	67.7 (23.0) ***
Adult Weight Assessment & Counseling	54.7 (20.2)	50.0 (21.7)**
Tobacco Use Screening	91.8 (13.9)	90.4 (14.1)
Tobacco Use Cessation Counseling	65.0 (23.8)	61.8 (23.8)*
Colorectal Cancer Screening	32.0 (18.6)	29.4 (18.9)*
Cervical Cancer Screening	56.9 (16.8)	51.9 (18.7)***

Asthma Therapy	80.8 (17.7)	78.2 (21.0)*
CAD and Lipid Lowering Therapy	77.2 (15.7)	73.0 (18.5)***
IVD and Aspirin Therapy	73.9 (17.0)	74.0 (18.8)
Patient Health Outcomes	% of patients meeting performance measure standard (SD)	
Low Birth Weight	8.5 (.1)	8.2 (.1)
Blood Pressure Control	63.6 (10.5)	63.3 (11.2)
Diabetes Control	68.6 (12.4)	68.3 (13.9)

Note:
FTE: full time equivalents; CAD: Coronary Artery Disease; IVD: Ischemic Vascular Disease

T-tests have been implemented to test the differences between "Accredited HC" and "Non-Accredited HC", *p<.05, **p<.01, ***p<.001

Table 3.2: Estimates of the Association Between Accreditation Status Of Health Center and Quality of Care And Patient Health Outcomes

	Estimate	95% CI	P Value
Quality Of Care			
Early Entry To Prenatal Care	0.000	(-.023, .022)	NS
Child Weight Assessment & Counseling	0.022	(-.015, .058)	NS
Childhood Immunizations	0.031	(-.002, .063)	NS
Adult Weight Assessment & Counseling	0.037	(.005, .069)	p<.05
Tobacco Use Screening	0.004	(-.016, .024)	NS
Tobacco Use Cessation Counseling	0.042	(.005, .077)	p<.05
Colorectal Cancer Screening	0.001	(-.025, .027)	NS
Cervical Cancer Screening	0.002	(-.025, .028)	NS
Asthma Therapy	0.014	(-.017, .044)	NS
CAD and Lipid Lowering Therapy	0.028	(.001, .055)	p<.05
IVD and Aspirin Therapy	-0.006	(-.034, .021)	NS
Patient Health Outcomes			
Low Birth Weight	0.006	(-.011, .022)	NS
Blood Pressure Control	-0.004	(-.020, .013)	NS
Diabetes Control	-0.006	(-.025, .014)	NS

Note: NS: not significant.

This table only presents the coefficients of the variable "accreditation". Covariates controlled include Age, Race, Ethnicity, Special Populations, Total FTEs, PCMH, Language Preference, and Insurance Status. Full sets of results were omitted for brevity, but are available upon request.

Table 3.3: Accreditation Impact on Quality of Care

	Predicted Impact of Accreditation	National Patient Impact
Quality Of Care		
Adult Weight Assessment & Counseling	3.72%	552,087[a] adult patients who would have had their weight assessed and received appropriate counselling annually
Tobacco Use Cessation Counseling	4.16%	157,434[b] adult patients who would have been counselled on tobacco cessation
CAD and Lipid Lowering Therapy	2.84%	25,289[c] adult patients with coronary artery disease who would have been prescribed appropriate lipid lowering therapy

Note: These predictions were estimated using the multivariate regression model and total number of patients eligible for each measure.

    a. The aggregated values were calculate by multiplying the predicted value and the total adult populations served in health centers (n=14,841,059 from UDS 2013 data).

    b. The aggregated values were calculate by multiplying the predicted value to the total adult populations served in health centers who used tobacco products (n=3,784,470 from UDS 2013 data and 2013 CDC tobacco use prevalence data).

    c. The aggregated values were calculate by multiply the predicted value to the total adult populations served in health centers who had coronary artery disease (n=890,464 from UDS 2013 data and 2014 CDC coronary heart disease prevalence data).

CHAPTER 4:   PATIENT EXPERIENCE OF CARE IN UNDERSERVED COMMUNITIES ACROSS THE UNITED STATES: FINDINGS FROM A NATIONAL SURVEY OF PATIENT EXPERIENCE OF CARE IN HEALTH CENTERS

INTRODUCTION

Health centers (HCs) are nonprofit, community-based primary care clinics that receive grants from the U.S. Department of Health and Human Services' Health Resources and Services Administration (HRSA) to provide access to comprehensive, culturally competent, and quality primary health care services. In 2015, HRSA-supported HCs provided care for 1 in 13 people in the U.S. or over 24 million patients. Health centers serve vulnerable populations including the uninsured, individuals experiencing homelessness, migrant or seasonal agricultural workers and residents of public housing.[2] In addition to providing access to comprehensive primary care services to medically underserved populations, health centers must also have quality improvement (QI) and assurance systems in place to improve quality of care and patient health outcomes. [101] Quality improvement plans are required to include findings from patient satisfaction surveys. Beyond the HRSA requirements, health centers have demonstrated a commitment to clinical quality improvement through a variety of initiatives including quality improvement collaboratives, meaningful use of electronic health records (EHR), and patient centered medical home (PCMH) transformation.[8] These efforts have increased health center capacity to provide patient-centered care and improve clinical quality.[116-118]

Interest in patient experiences with health care has accelerated in recent years as a result of the increasing focus on transforming the healthcare delivery system to increase the value of care provided. Patient experience of care (PEC) data is increasingly being included in pay-for-performance and public reporting programs.[84,119] PEC is considered an important outcome measure in the evaluation of quality of care and believed to impact not only healthcare utilization, but also health behaviors and outcomes.[26,84] Research indicates that positive PECs are associated with higher levels of adherence to recommended preventive and treatment processes, better clinical outcomes, better patient safety and more appropriate healthcare utilization.[84,119-121] Health centers have begun to collect information on PEC in response to payer mandates and an increasing industry-wide preference for PEC data over patient satisfaction data.

The Consumer Assessment of Healthcare Providers and Systems (CAHPS) is considered the gold standard in PEC measurement and has been widely used in a variety of care settings and with diverse patient populations.[119] Despite the increasing use of PEC metrics in healthcare, there is limited information on PEC in health center settings. Existing research on PEC documents disparities in ratings by patient characteristics such as race/ethnicity and socioeconomic status; however, there is a dearth of literature examining PEC in health center patients.[122,123]

The purpose of this study is to address gaps in our understanding of PEC in underserved and vulnerable populations and identify quality improvement opportunities for the largest safety-net primary care network in the United States. We will accomplish this objective through the following aims: 1) describe HC PEC ratings and compare HC

PEC with PEC ratings in other health care settings, 2) examine HC PEC by patient characteristics, and 3) identify patient and HC level correlates of ideal PEC.

METHODS

Data

This study utilized data from the 2014 Health Center Patient Survey (HCPS), a nationally representative survey sponsored by HRSA. The 2014 HCPS included a probability sample of 7,002 patients representing more than 23 million patients seen at health centers between October 2014 and April 2015. The computer-assisted personal interviews were conducted in English, Spanish, Chinese, Korean, and Vietnamese. Research Triangle Institute (RTI), the organization funded by HRSA to develop and field the HCPS, obtained Institutional Review Board (IRB) approval.

The 2014 HCPS included 7,002 patients, with 66% of patients referred participating in the initial screening and 91% of screened patients completing the survey. The final sample included 5,299 patients after removing patients under 18 years of age (n=1,410) or those with missing values for outcomes or variables of interest. We linked HRSA's 2014 Uniform Data System (UDS) data and HRSA's Patient Centered Medical Home (PCMH) Recognition data to the HCPS sample. The UDS is an annual reporting requirement for all HRSA-supported health centers and includes organizational level data on patient demographics, services provided, staffing, clinical indicators, costs, and revenues.[2]   The PCMH report provided information on a health center's PCMH recognition status based on information from national or state recognition bodies.

The 2014 HCPS included questions from the Agency on Healthcare Research and Quality's (AHRQ) Clinician and Group Consumer Assessment of Healthcare Providers and Systems (CG CAHPS) Adult 12-Month Survey. In this study, we analyzed five domains of PEC including access to care, provider communication, office staff interactions, follow up on results and overall provider rating. Access to care, provider communication, and office staff domains include both composite measures as well as subcomponent measures.

Figure 4.1 describes the five PEC domains, composite measures and subcomponent measures. Access to care metrics examine a patients' experience with access to routine and urgent care as well as with telephone access during and after office hours, and wait times experienced during appointments. Provider communication metrics assess different elements of patient-provider interactions including how well the provider listened to and respected the patient, provided easy to understand information, spent enough time with the patient and had a knowledge of the patient's important medical history. Office staff measures examine the helpfulness, courteousness and respectfulness of health center staff. Each metric (except overall provider rating) is evaluated on a rating scale of 1 to 4, with 1 representing "Never" and 4 representing "Always". The rating scale for the overall rating of providers is 0 to 10, with 10 representing the highest level of performance.

To simplify the interpretation of the PEC data, AHRQ has established a methodology for calculating "top box scores" which display the percent of survey

respondents who chose the most positive score for a given measure. We used this method to calculate health center top box scores and compare results with data from the national CAHPS Database.[124] Next, we constructed "ideal" composite measures for each PEC domain by creating a new dichotomous variable for each subcomponent measure that represented the patients who reported "Always". Finally, we constructed a dichotomous variable that assessed whether patients had "ideal" patient experiences across the entire PEC domain by creating a category for patients who reported "Always" for each subcomponent question or "9" or"10" on the overall rating.

We included selected patient and organizational variables based upon the scientific literature describing factors associated with quality of care and PEC.[84,116,119] Patient socio-demographic variables used in the analyses include: age (18-44 years, 45-64 years, 65-74 years and 75 or more years), race/ethnicity (Hispanic, White, Black, Asian, Native American/Alaska Native, Native Hawaiian/Pacific Islander or Other), gender (male or female), language preference (English only, non-English language only, or bilingual), nativity (born in the U.S. or another country), educational attainment (less than high school, high school, or more than high school), household income (<100% federal poverty level [FPL], 101-138% FPL, 139-199% FPL 200-299% FPL, 300-399% FPL, and > 400% FPL), insurance status (private, Medicare, Medicaid, uninsured or public), and employment status (employed, unemployed, or not in the labor force). The following patient-reported health variables were also included self-identified health status (excellent, very good, good, fair, or poor), mental health status (mild, moderate, or severe mental distress as measured by Kessler-6 score), and chronic disease status (no chronic diseases or one/more chronic diseases).

Health center or organizational characteristics include: PCMH Recognition (yes or no), provision of enabling services (yes or no), use of EHR (yes or no), total number of patients (per 10,000 pts), geography (urban and rural), US census region (Northeast, Midwest, South, or West) and funding type (general Community Health Center funding, or special population focused funding - Public Housing Primary Care, Health Care for the Homeless, or Migrant/Seasonal Agricultural Workers).

<u>Analysis</u>

We conducted univariate and bivariate analyses to examine the average patient experience of care ratings reported by health center patients and the percentage of patients reporting ideal experiences of care for composite and subcomponent measures across patient and health center factors. Chi-square tests for independence were used to determine the association between patient and health center attributes and ideal care experiences. We used multivariate logistic regression with survey weights to estimate the odds ratios of reporting ideal patient experiences of care nationally. Several sensitivity analyses were conducted to test the robustness of our results, including evaluating the dependent variable both as continuous and categorical variables, and testing different model specifications. The results were similar across the different scenarios. All statistical analyses were conducted using STATA software version 14.0.

RESULTS

Ideal Patient Experience of Care in HCs

Figure 4.2 shows the top box scores from the 2014 Health Center Patient Survey (HCPS) compared to data from the national estimates (across various health care settings)

and primary care estimates in the CAHPS Database. Unadjusted results show PEC scores in HCs were lower or similar compared to national data. Such differences were more pronounced in the "overall provider rating", "access to care" and "follow up on results" measures.

Table 4.1 presents HC population characteristics, and compares the percentage of patients reporting ideal PEC across patient and health center characteristics for all five domains. Thirty percent of patients reported having ideal access to care overall. Sixty-eight percent of patients reported being able to access routine care, while only 38% reported waiting for less than 15 minutes to see a provider. Sixty percent of patients rated provider communications as ideal, with the largest proportion reporting their providers showed respect for them (90%), compared to lower ratings of provider's knowledge of their medical history (74%). Seventy-three percent of patients reported having ideal interactions with HC staff, with the most reporting that HC staff were always courteous and respectful (84%) and helpful (74%). Seventy percent of patients reported ideal follow up on results from HCs and 74% reported ideal overall ratings of providers.

Almost half of the sample population were racial/ethnic minorities, 20% were immigrants and 12% did not speak English. Thirty-four percent of the sample had less than a high school education, 84% were below 200% of the federal poverty level and 16% were unemployed. Twenty-six percent of patients were uninsured, 42% reported being in fair or poor health, 61% had been diagnosed with one or more chronic diseases and 14% reported being in serious mental distress. These sample characteristics

demonstrate the vulnerable and disadvantaged nature of HC patients compared to the general U.S. populations treated elsewhere.

Tables 4.2 and 4.3 present adjusted odds ratios for ideal ratings of patient experience of care composite and subcomponent measures.

Race/Ethnicity, Age, and Gender

The reports of ideal PEC were generally similar across racial/ethnic groups compared to non-Hispanic White patients, except among Asians, who were more than 3 times less likely to report ideal experiences for most PEC domains. Among the subcomponent ratings, in comparison to non-Hispanic Whites, Asians were 2.9 times less likely to report waiting less than 15 minutes during an appointment. Additionally, Asians were 2.3 to 5.3 times less likely to report ideal experiences across the provider communication subcomponents, with the lowest ratings on providers spending enough time with them.

The only significant difference in PEC ratings across age groups was among patients aged 65-74 years old who were 1.8 times as likely to report the highest overall provider ratings compared to 18-44 year olds. Patients 45-64 years old were 2.9 times less likely to report ideal after hours telephone access, but 1.5 times as likely to report wait times less than 15 minutes and report their provider gave easy to understand information compared to younger patients.

Male patients were consistently about 1.4 times more likely to report ideal PEC ratings compared to females. Males were 1.4 times as likely to wait less than 15 minutes, and 1.5 times as likely to report staff were helpful and respectful. Males were also 1.4 to

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1.8 times as likely to report that providers always knew their important medical history, showed them respect and spent enough time with them.

Nativity and Language Preference

Patients born in the U.S. were 1.5 times as likely to report ideal provider communications and 2.2 times as likely to report HC staff were respectful, compared to patients born outside of the US. Non-English speakers were 2.8 times as likely to report ideal access to care, 2.5 times as likely to report ideal provider communications overall and 3.4 times as likely that their providers always spent enough time with them, in comparison to English speakers. Non-English speakers were 2.6 times as likely to report HC staff were always courteous and respectful. Bilingual patients were 1.9 times as likely to report ideal provider communications and 1.8 times as likely to report providers spent enough time with them, but 1.8 times less likely to report ideal overall provider ratings, compared with English speakers.

Education and Employment

Patients with higher educational attainment were consistently less likely to report ideal PEC. Patients with higher than high school education were more than 1.6 times less likely to report ideal access to urgent care appointments and telephone access during office hours than patients with less than a high school education. Patients with the highest levels of education were between 1.5 and 2.3 times less likely to report ideal staff interactions, follow up on results and overall provider ratings. They were also 1.5 to 2.0 times less likely to report ideal ratings across each of the subcomponent metrics for provider communication and office staff interactions. Patients who were currently not in

the labor force reported being 1.5 times as likely to receive ideal follow up on results compared to employed patients. These patients were also 1.5 to 1.8 times as likely to report their providers listened to them and both providers and office staff were always respectful.

Income and Insurance

Patients with incomes at 300% of the federal poverty level (FPL) were 2.2 to 2.7 times as likely to report ideal access to care and interactions with HC staff compared to those with incomes less than 100% FPL. They were also 7.6 times as likely to report ideal access to routine appointments, 6 times as likely to report their providers listen to them carefully and spend enough time with them. They were also 2.5 to 2.7 times as likely to report HC staff were both helpful and respectful.

Patients reported similar PEC ratings across all insurance categories, with the exception of Medicare patients, who were 1.7 times as likely to report receiving ideal follow up on results compared to the privately insured. Medicare patients were also more likely to report waiting 15 minutes or less and describe HC staff as helpful. Medicaid patients were 1.9 times as likely to report their providers always listened to them carefully, whereas publicly insured patients were less likely to report their providers gave them easy to understand information.

Health and Mental Health Status

Patients with lower self-reported health status were consistently less likely to report ideal PEC, with those reporting the poorest health being between 2.2 and 2.8 times less likely to rate ideal provider communication, office staff interactions and overall

provider ratings. Differences are most notable in reports of providers listening carefully, knowing their medical history, and spending enough time with them. They were also 3.2 times less likely to report HC staff were always respectful.

Patients with mental health issues also were significantly less likely to report having ideal overall access to care. These patients were less likely to report ideal access to routine appointments, after-hours telephone access and wait times compared to those without mental health issues. They were also 2 to 3 times less likely to report that their providers knew their important medical history. Patients with mild/moderate mental distress were 1.8 times less likely to report having ideal experiences with office staff overall.

Health Center Characteristics – Location, Volume, Service Delivery and Funding Type

While PCMH recognition was not statistically associated with ideal PEC ratings, patients served at health centers that used EHRs were 2.1 times more likely to report ideal overall provider ratings. Larger health centers (i.e. with more patients) were slightly less likely to report ideal PECs across all of the domains except follow up on results. Patients seeking care at HCs in the Midwest were more likely to report ideal access to care, provider communications and office staff interactions than those in the Northeast.

Patients receiving care at homeless sites were 1.4 times as likely to report ideal ratings on the access to care composite measure compared to patients seen at community health center sites. However, homeless patients were also 1.4 times less likely to report ideal overall provider ratings. Homeless patients were less likely to report ideal access to

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after-hours telephone coverage, that providers listened carefully and that HC staff were respectful. Agricultural workers also reported being less likely to have ideal after-hours telephone access.

DISCUSSION

This is the first published study to examine PEC ratings in a nationally representative sample of health center patients that we are aware of. The results from our study contribute to the understanding of PEC in underserved communities and vulnerable populations across the United States. The sample characteristics illustrate the disadvantaged and vulnerable nature of patients served by health centers, including low levels of educational attainment, and high levels of poverty and unemployment. Health center patients were more likely to report lower health and mental health status compared to the U.S. populations.[125] Health centers also had the added challenge of providing care to a larger immigrant population as well as those who preferred to communicate in a language other than English. This data highlights the medical and social complexity of health center patients and the challenges associated with providing high quality, culturally competent care.

Despite these challenges, we found that patients report positive primary care experiences in similar or slightly lower proportions as the 2014 CAHPS database respondents. This is especially interesting considering the differences between the two groups; CAHPS respondents were 90% White, 30% were 65 and over, 64% had more than a high school education and 44% reported being in excellent or very good health status. [126] The patient experience of care top box scores demonstrate that the health center

model of care, focused on overcoming traditional barriers to care and providing culturally competent care, is achieving its mission of providing high quality care.

Our findings are generally consistent with studies that examined differences in patient experience of care ratings across various patient characteristics.[26,84,127] Notably, our study results did not demonstrate a disparity in patient experience of care across racial/ethnic groups, except among Asian patients.[90,126,128-130] This finding supports previous research conducted across different types of CAHPS survey instruments in a variety of health care settings.[129] Previous research has found that compared to Whites, African American and Hispanic are more likely to use extreme responses on scales; whereas, Asians are more likely to use the midpoint of scales. Researchers have attributed these differences to cultural conversational norms suggesting that African American and Hispanics favor sincerity in social interactions, consequently using stronger terms in responses while Asians tend to favor modesty and respond in more cautious terms.[129]

Across most of the PEC domains, males were more likely to provide ideal ratings than female patients. Consistent with previous research we noticed difference in ideal ratings of care across educational levels, and across patients with lower health and mental health statuses. Health centers should focus on the PEC disparities faced by these groups of patients by tailoring interventions to improve accessibility, provider and staff communications and interactions to keep patients engaged in care as a means to improving quality of care and health outcomes.[84,119]

We did not find significant disparities across insurance status, income levels, employment, language preference or nativity. Populations typically considered hard to

serve were more likely to report ideal PEC. Health centers' focus on providing culturally and linguistically appropriate, patient and community centered care, likely supported high PEC ratings. Our findings are generally consistent with studies that examined differences in patient experience of care ratings across various patient characteristics.

While this is the first nationally representative study of PEC in health center patients, using survey questions that have been previously validated and have long been used in health services research, there are still a few limitations to consider. Our study represents a cross-sectional examination of PEC using self-reported data that could have been subject to social desirability bias, as well as bias inherent in the sample design. Given the cross-sectional nature of the data we cannot draw any causal inferences.

Results of the first national survey provides additional evidence for patient-mix adjustment of patient experience of care ratings and highlight opportunities to improve care experiences for all health center patients. Payment methodologies and public reporting programs that include patient experience of care metrics, should consider the impact on providers serving vulnerable populations and underserved communities. This study provides benchmarking data for health center quality improvement efforts, and presents several opportunities for further study. For example, further examination of the relationship between patient centered care delivery and PEC is necessary to ensure the care transformation efforts are implemented in a manner supportive of positive PEC. Additional research on tailoring care delivery to the diverse populations served by health centers, as well as the use of health information technology or telehealth to improve patient experiences would facilitate PEC improvement.

Figure 4.1. Patient Experience of Care Composite Measures and Subcomponents Measures

Access to Care *Ideal access to care measure =* *1/Yes if individual reported* *Always/4 for each of the 5* *subcomponent measures*	1. **Access to Urgent Appointments** *In the last 12 months, when you phoned this health center to get an appointment for care you needed right away, how often did you get an appointment as soon as you needed?* 2. **Access to Routine Appointments** *In the last 12 months, when you made an appointment for a check-up or routine care with this health center, how often did you get an appointment as soon as you needed?* 3. **Telephone Access During Office Hours** *In the last 12 months, when you phoned this health center during regular office hours, how often did you get an answer to your medical question that same day?* 4. **Telephone Access After Office Hours** *In the last 12 months, when you phoned this health center after regular office hours, how often did you get an answer to your medical question as soon as you needed?* 5. **Wait Time During Appointments** *In the last 12 months, how often did you see a doctor or other health professional at this health center within 15 minutes of your appointment time?* Rating Scale: "Always" , "Usually", "Sometimes", "Never"
Provider Communication *Ideal Provider Communication* *measure = 1/Yes if individual* *reported Always/4 for each of the 5* *subcomponent measures*	1. **Listens Carefully to Patient** *In the last 12 months, how often did this doctor or other health professional listen carefully to you?* 2. **Provides Easy to Understand Information** *In the last 12 months, how often did this doctor or other health professional give you easy to understand information about these health questions or concerns?* 3. **Has Knowledge of Important Medical History** *In the last 12 months, how often did this doctor or other health professional seem to know the important information about your medical history?* 4. **Respects Patient** *In the last 12 months, how often did this doctor or other health professional show respect for what you had to say?* 5. **Spends Enough Time with Patient** *In the last 12 months, how often did this doctor or other health professional spend enough time with you?* Rating Scale: "Always" , "Usually", "Sometimes", "Never"

Office Staff Interactions *Ideal Office Staff Interactions* *measure = 1/Yes if individual* *reported 4/Always for each of the 2* *subcomponent measures*	1. **Office Staff is Helpful** *In the last 12 months, how often were clerks and receptionists at this health center as helpful as you thought they should be?* 2. **Office Staff is Courteous & Respectful** *In the last 12 months, how often did clerks and receptionists at this health center treat you with courtesy and respect?* Rating Scale: "Always" , "Usually", "Sometimes", "Never"
Follow Up on Results *Ideal Follow Up measure = 1/Yes if* *individual reported 4/Always*	1. *In the last 12 months, when this doctor or other health professional ordered a blood test, x-ray, or other test for you, how often did someone from this health center follow up to give you those results?* Rating Scale: "Always" , "Usually", "Sometimes", "Never"
Overall Provider Rating *Ideal Overall Rating measure =* *1/Yes if individual reported 9 or 10*	1. *Using any number from 0 to 10, where 0 is the worst provider possible and 10 is the best provider possible, what number would you use to rate this doctor or other health professional?* Rating Scale: 0 (worst) - 10 (best)

Figure 4.2. 2014 Patient Experience of Care Top Box Scores across Various Care Settings

2014 Patient Experience of Care Top Box Scores
(without case-mix adjustment)
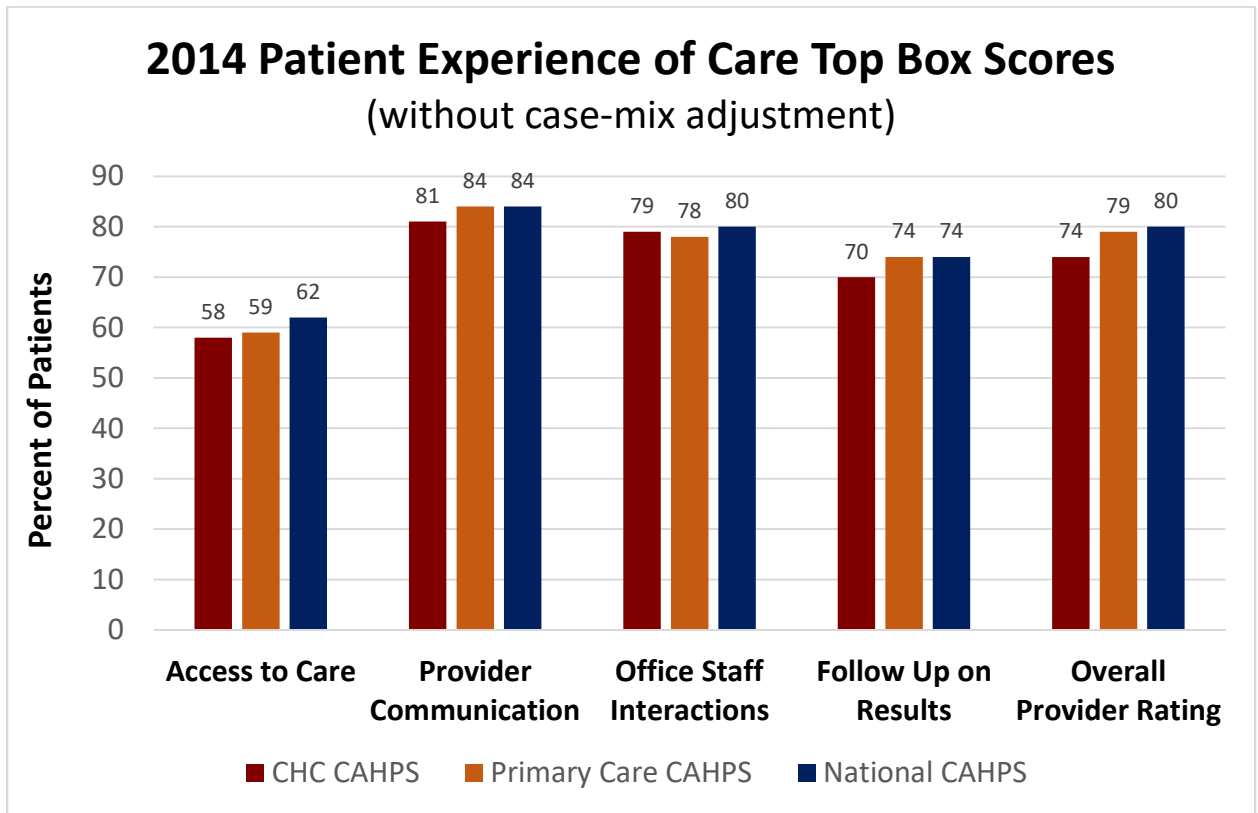
Data Sources: CHC CAHPS data from 2014 Health Center Patient Survey, Primary Care and National CAHPS data from AHRQ CAHPS Database

Table 4.1. Percent of HC Patients Reporting Ideal Patient Experience of Care by Patient and Health Center Characteristics

	% of Patients	SE	% of Patients Reporting				
			Ideal Access to Care	Ideal Provider Communication	Ideal Office Staff Interactions	Ideal Follow Up on Results	Overall Provider Rating
Total Sample			30%	60%	73%	70%	74%
Patient Characteristics							
Race/Ethnicity			p=.502	p=.066	**p=.019**	p=.226	**p=.006**
White	51%	(0.04)	31%	61%	75%	70%	77%
Asian	3%	(0.01)	20%	35%	43%	56%	54%
Native Hawaiian/Pacific Islander	0.5%	(0.00)	29%	69%	83%	64%	72%
Black	19%	(0.02)	31%	63%	74%	70%	74%
Hispanic	24%	(0.03)	28%	56%	70%	71%	70%
Native American/Alaska Native	1%	(0.00)	25%	53%	66%	76%	73%
Other	1%	(0.00)	13%	69%	76%	34%	96%
Age			p=.062	p=.149	p=.058	p=.371	p=.236
18-44 years	53%	(0.02)	26%	56%*	68%	67%	71%
45-64 years	37%	(0.03)	35%	64%*	79%	72%	77%
65-74 years	7%	(0.02)	31%	58%	76%	77%	84%
75 years and older	3%	(0.01)	37%	70%	75%	70%	80%
Biological Gender			**p=.000**	p=.055	**p=.018**	**p=.034**	p=.467
Male	36%	(0.02)	36%	64%	78%	75%	76%
Female	64%	(0.02)	26%	57%	70%	67%	73%
Nativity			p=.558	p=.069	p=.135	p=.473	p=.669
Born in the United States	80%	(0.02)	29%	61%	74%	69%	75%
Foreign Born	20%	(0.02)	30%	53%	68%	72%	73%
Language Preference			p=.331	p=.571	**p=.001**	p=.728	**p=.007**
English Only	72%	(0.03)	30%	61%	75%	69%	77%
Non-English Only	12%	(0.02)	35%	56%	74%	73%	72%
Bilingual	16%	(0.02)	26%	58%	63%	69%	65%
Education			p=.225	p=.202	**p=.008**	**p=.009**	**p=.000**
Less than High School	34%	(0.02)	34%	62%	76%	76%	80%
High School	29%	(0.02)	29%	62%	77%	72%	80%
More than High School	37%	(0.02)	26%	56%	67%	63%	65%
Employment Status			p=.837	p=.101	**p=.047**	p=.112	p=.350
Employed	37%	(0.02)	30%	61%	71%	66%	73%
Unemployed	16%	(0.01)	28%	52%	67%	67%	72%
Not in Labor Force	47%	(0.03)	30%	61%	76%	73%	77%

Income			p=.223	p=.418	p=.259	p=.395	p=.814
Less than or equal to 100% FPL	56%	(0.02)	27%	59%	73%	71%	74%
101-138% FPL	16%	(0.01)	34%	60%	69%	66%	78%
139-199% FPL	12%	(0.01)	31%	54%	75%	63%	76%
200-299% FPL	8%	(0.01)	33%	63%	67%	66%	69%
300-399% FPL	4%	(0.01)	45%	73%	87%	75%	75%
400% FPL or higher	4%	(0.01)	27%	66%	71%	85%	73%
Insurance			p=.055	p=.973	p=.144	p=.135	p=.167
Private	19%	(0.02)	32%	60%	71%	69%	72%
Medicare	11%	(0.01)	42%	61%	79%	81%	81%
Medicaid	42%	(0.03)	27%	59%	70%	68%	72%
Public	2%	(0.00)	26%	56%	78%	62%	71%
Uninsured	26%	(0.03)	29%	60%	76%	68%	77%
Health Status			p=.267	**p=.050**	p=.105	p=.912	p=.058
Excellent	8%	(0.01)	42%	76%	86%	70%	89%
Very Good	12%	(0.01)	30%	61%	72%	67%	71%
Good	37%	(0.01)	29%	59%	73%	71%	75%
Fair	31%	(0.01)	28%	57%	70%	68%	71%
Poor	11%	(0.01)	31%	58%	73%	72%	75%
Mental Health Status			**p=.000**	**p=.004**	**p=.027**	p=.066	p=.258
No Mental Distress	14%	(0.01)	46%	73%	82%	79%	80%
Mild/Moderate Mental Distress	71%	(0.01)	27%	56%	71%	69%	73%
Serious Mental Distress	14%	(0.01)	27%	55%	73%	63%	75%
Chronic Disease Status			p=.684	p=.594	p=.179	p=.303	p=.142
No Chronic Diseases	39%	(0.02)	29%	58%	70%	67%	72%
One or More Chronic Diseases	61%	(0.02)	30%	60%	75%	71%	76%
Health Center Characteristics							
Location			p=.682	p=.441	**p=.020**	p=.299	p=.672
Urban	49%	(0.06)	29%	58%	68%	67%	74%
Rural	51%	(0.06)	31%	61%	78%	77%	75%
U.S. Census Region			p=.163	**p=.023**	**p=.004**	p=.302	**p=.030**
Northeast	20%	(0.05)	24%	52%	61%	63%	70%
Midwest	21%	(0.05)	39%	68%	80%	75%	81%
West	30%	(0.06)	28%	56%	70%	70%	70%
South	29%	(0.06)	28%	63%	78%	71%	78%
Patient Volume			**p=.000**	**p=.024**	**p=.022**	p=.415	**p=.002**
Total Patients (per 10,000)	3.93	(0.34)	3.21	3.67	3.74	3.86	3.74
Service Delivery Model							
Electronic Health Record Use	97%	(0.02)	30% (p=.180)	60% (p=.450)	73% (p=.284)	70% (p=.202)	75% **(p=.035)**

Patient Centered Medical Home Recognition	85%	(0.05)	29% (p= .621)	59% (p=.846)	72% (p=.627)	70% (p=.859)	74% (p=.935)
Provision of Enabling Services	68%	(0.02)	27% **(p=.041)**	60% (p=.680)	74% (p=.480)	69% (p=.646)	76% (p=.226)
Funding Type							
Public Housing Primary Care	1%	(0.00)	26% (p=.360)	59% (p=.856)	72% (p=.899)	71% (p=.841)	69% (p=.146)
Migrant/Seasonal Agricultural Worker	3%	(0.01)	35% (p=.173)	60% (p=.993)	77% (p=.223)	76% (p=.281)	77% (p=.613)
Health Care for the Homeless	3%	(0.01)	34% (p=.246)	56% (p=.299)	70% (p=.551)	73% (p=.309)	68% **(p=.023)**
Community Health Center	92%	(0.01)	29% (p=.220)	60% (p=.547)	73% (p=.939)	69% (p=.186)	75% (p=.280)

Note: Analysis conducted using survey weights, results are nationally representative

Table 4.2. Adjusted Odds Ratios for Patient Experience of Care Composite Ratings

	Ideal Access to Care Composite	Ideal Provider Communication Composite	Ideal Office Staff Interaction Composite	Ideal Follow Up on Results	Ideal Overall Provider Rating
Race/Ethnicity *(ref Non-Hispanic White)*					
Asian	**0.27***	**0.29****	**0.33****	0.40	**0.33****
Native Hawaiian/ Pacific Islander	0.91	1.60	2.53	0.80	1.11
Black	1.28	1.32	1.39	1.15	0.88
Hispanic	0.55	0.69	1.16	0.87	0.86
Native American/ Alaska Native	0.63	0.69	0.84	1.28	0.99
Other	0.32	1.55	1.20	**0.17***	**7.32***
Age *(ref 18-44 years)*					
45-64 years	1.34	1.25	1.38	1.02	1.05
65-74 years	0.78	0.93	1.08	0.91	**1.84****
75 years and older	1.20	1.77	1.03	0.75	1.36
Biological Gender *(ref Female)*					
Male	**1.36***	1.33	**1.47***	**1.44***	1.12
Nativity *(ref Born Outside of the U.S.)*					
Born in U.S.	0.80	**1.49***	1.24	0.68	0.59
Language Preference *(ref English Only)*					
Non-English Only	**2.80***	**2.47****	1.93	1.34	0.64
Bilingual	1.45	**1.93***	0.78	1.23	**0.57***
Education *(ref Less than High School)*					
High School	0.77	0.89	1.10	0.83	1.00
More than High School	0.71	0.79	**0.66***	**0.52*****	**0.43*****
Employment Status *(ref Employed)*					
Unemployed	1.19	0.74	0.82	1.29	0.95
Not in Labor Force	1.14	1.10	1.22	**1.53***	1.02
Income *(ref 100% FPL or lower)*					
101-138% FPL	1.40	1.04	0.79	0.80	1.34
139-199% FPL	1.51	0.94	1.38	0.81	1.31
200-299% FPL	1.57	1.52	0.91	1.00	1.08
300-399% FPL	**2.24***	1.91	**2.69***	**2.93***	1.22
400% FPL or higher	1.14	1.55	0.97	1.60	1.16
Insurance *(ref Private)*					
Medicare	1.69	1.10	1.28	**1.70***	1.17
Medicaid	1.00	1.43	1.17	1.10	1.09
Public	1.15	1.02	1.48	0.59	1.00
Uninsured	0.86	1.21	1.18	0.86	1.25
Health Status *(ref Excellent)*					
Very Good	0.63	0.56	**0.48***	0.80	**0.34***
Good	0.67	0.56	**0.54***	1.09	**0.43***
Fair	0.58	**0.49****	**0.37****	0.83	**0.30****
Poor	0.79	**0.45***	**0.40***	1.06	**0.36***
Mental Health Status *(ref No Mental Distress)*					
Mild/Moderate Mental Distress	**0.48*****	**0.54****	**0.56***	0.66	0.67
Serious Mental Distress	**0.45****	**0.48***	0.61	**0.48***	0.71

Chronic Disease (ref No Chronic Disease)					
Chronic Disease	0.94	1.04	1.12	1.18	1.00
Location *(ref Rural)*					
Urban	0.93	0.98	0.70	0.84	1.11
U.S. Census Region *(ref Northeast)*					
Midwest	**1.70**[*]	**2.00**[**]	**2.33**[**]	1.83	1.61
West	1.07	1.16	1.27	1.16	0.97
South	1.05	1.46	**1.68**[*]	1.37	1.25
Patient Volume					
Total Patients (per 10,000)	**0.88**[***]	**0.94**[*]	**0.95**[*]	0.98	**0.96**[*]
Service Delivery Model					
EHR Use	1.04	1.19	1.20	1.34	**2.13**[**]
PCMH Recognition	0.99	1.10	0.97	1.22	1.21
Enabling Services	0.75	1.22	1.32	1.04	1.49
Funding Type *(ref Community Health Center)*					
Public Housing	0.71	0.97	0.94	1.02	0.78
Agricultural Worker	1.21	1.17	1.17	1.08	1.39
Homeless	**1.43**[*]	0.97	0.83	1.19	**0.69**[*]

Note: Analysis calculated using survey weights, results are nationally representative

[*] $p < 0.05$, [**] $p < 0.01$, [***] $p < 0.001$

Table 4.3. Adjusted Odds Ratios for Patient and Health Center Characteristics by Patient Experience of Care Subcomponent

Metrics

	IDEAL ACCESS TO CARE					IDEAL PROVIDER COMMUNICATION					IDEAL OFFICE STAFF INTERACTION	
	Access to Urgent Appt.	Access to Routine Appt.	Telephone Access During Office Hours	Telephone Access After Office Hours	15 min or less Wait Times During Appt.	Provider Listens Carefully	Provider Gave Easy to Understand Information	Provider Knew Important Medical History	Provider Showed Respect for Patient	Provider Spent Enough Time with Patient	Office Staff is Helpful	Office Staff is Courteous and Respectful
Population Mean	60%	68%	63%	59%	38%	82%	83%	74%	90%	78%	74%	84%
Race/Ethnicity *(ref Non-Hispanic White)*												
Asian	0.79	0.39	0.56	0.09	**0.34**[*]	**0.28**[*]	**0.44**[*]	**0.28**[**]	**0.24**[**]	**0.19**[***]	**0.32**[**]	0.39
Native Hawaiian/ Pacific Islander	1.43	2.26	1.30	17.42	0.71	2.51	2.44	1.65	1.99	1.01	2.37	1.60
Black	1.02	1.34	1.72	**3.17**[*]	1.13	1.43	1.13	0.86	1.40	1.20	1.25	1.29
Hispanic	1.01	1.00	1.19	1.54	0.62	1.22	0.71	0.77	1.30	0.61	1.14	0.98
Native American/ Alaska Native	0.59	0.92	0.88	0.68	0.76	0.80	0.67	0.83	0.70	0.71	0.91	0.62
Other	0.27	0.42	0.42	1	0.30	0.85	**10.75**[*]	1.77	7.02	1.67	1.12	0.50
Age *(ref 18-44 years)*												
45-64 years	0.80	1.16	0.88	**0.34**[*]	**1.54**[*]	1.26	**1.45**[*]	1.00	0.90	1.14	1.39	1.41
65-74 years	0.48	0.93	0.58	0.20	0.99	1.21	0.91	1.02	0.70	1.03	0.99	0.86
75 years and older	1.15	0.42	0.62	0.00	1.27	1.13	1.14	0.93	1.23	1.35	0.95	1.05
Gender *(ref Female)*												
Male	1.35	1.48	1.41	0.76	**1.36**[*]	1.20	0.98	**1.52**[*]	**1.79**[*]	**1.37**[*]	**1.49**[*]	**1.52**[*]
Nativity												
Born in US	1.02	0.87	0.66	1.05	0.69	1.50	1.27	1.27	0.69	1.25	1.13	**2.16**[*]
Language Preference *(ref English Only)*												
Non-English Only	2.14	2.33	1.26	2.80	1.85	2.25	1.22	1.26	1.20	**3.37**[**]	1.92	**2.56**[**]
Bilingual	1.43	0.67	1.07	0.58	1.23	1.07	1.24	1.13	0.74	**1.76**[*]	0.77	1.31
Education *(ref Less than High School)*												
High School	0.92	1.01	**0.51**[*]	0.49	0.86	0.74	1.15	0.70	0.92	1.13	1.16	0.85
More than High School	**0.51**[**]	0.84	**0.63**[*]	1.04	0.83	**0.52**[**]	**0.63**[*]	**0.61**[*]	**0.56**[**]	**0.59**[*]	**0.66**[*]	**0.53**[***]

Employment Status *(ref Employed)*												
Unemployed	1.21	1.25	0.94	1.16	0.98	0.82	0.98	0.97	0.97	0.76	0.89	0.69
Not in Labor Force	1.63	1.38	1.09	1.11	0.93	**1.73***	1.28	1.10	**1.83***	1.08	1.15	**1.54***
Income *(ref 100% FPL or lower)*												
101-138% FPL	1.23	1.06	1.24	2.50	1.21	1.04	1.00	1.37	1.10	0.91	0.73	0.85
139-199% FPL	**2.38****	1.62	1.58	1.01	1.15	1.08	1.51	0.96	1.44	1.00	1.31	1.11
200-299% FPL	1.01	1.21	1.58	1.01	1.23	**2.54****	1.38	0.84	1.19	1.42	0.82	1.30
300-399% FPL	1.69	**7.64****	2.87	1	1.80	**6.26****	2.24	1.11	2.70	**6.44****	**2.53***	**2.77***
400% FPL or higher	2.83	1.22	0.84	1.82	1.04	0.94	1.42	1.42	0.97	1.16	0.91	0.49
Insurance *(ref Private)*												
Medicare	1.19	1.25	0.62	1.08	**1.82***	1.29	0.67	1.10	0.93	0.88	**1.60***	0.87
Medicaid	0.92	1.04	0.86	1.55	1.25	**1.90***	0.67	1.24	1.09	0.93	1.14	0.97
Public	0.76	0.89	0.42	2.51	1.32	1.42	**0.50***	0.89	0.90	0.86	1.39	1.59
Uninsured	0.97	0.70	1.24	0.54	0.96	1.39	1.85	1.14	1.05	0.88	1.31	1.03
Health Status *(ref Excellent)*												
Very Good	1.14	0.47	0.83	0.45	0.73	**0.22*****	0.91	0.55	0.92	0.87	**0.48***	0.56
Good	0.93	0.54	1.03	0.31	0.78	**0.38***	1.04	0.60	1.19	0.65	0.58	0.58
Fair	0.75	0.66	0.80	0.51	0.64	**0.18*****	0.85	**0.47***	0.74	0.62	**0.42***	0.43
Poor	1.04	0.51	0.94	0.69	0.87	**0.17*****	1.07	0.58	1.04	**0.43***	0.48	**0.31***
Mental Health Status *(ref No Mental Distress)*												
Mild/Moderate Mental Distress	0.56	**0.51***	0.88	**0.17***	**0.50*****	0.75	0.63	**0.51***	0.80	0.81	**0.51***	0.67
Serious Mental Distress	0.77	**0.47***	0.63	0.27	**0.51***	0.64	0.48	**0.34****	0.81	0.75	0.52	0.72
Chronic Disease *(ref No Chronic Disease)*												
Chronic Disease	1.35	1.33	1.11	**3.01***	0.97	0.98	0.93	0.97	0.75	1.09	1.07	1.02
Location *(ref Rural)*												
Urban	0.95	**0.64***	0.67	0.71	1.14	1.30	0.78	0.98	1.13	1.05	**0.65***	0.71
U.S. Census Region *(ref Northeast)*												
Midwest	1.01	**1.94***	1.13	0.86	**2.33****	1.51	1.39	1.12	0.89	1.32	**2.33****	**2.15***
West	0.55	0.84	0.75	0.94	1.46	0.91	0.75	0.74	0.58	0.82	1.12	1.11
South	0.64	1.04	0.55	0.37	1.43	0.91	0.76	1.23	0.91	1.17	1.58	1.27
Patient Volume												
Total Patients (per 10,000)	**0.92***	**0.92*****	0.95	**0.84***	**0.89*****	**0.94****	0.99	**0.95***	**0.92****	**0.94****	**0.96***	**0.94****
Service Delivery Model												
EHR Use	0.79	**0.51****	0.56	**0.02*****	0.98	1.40	1.45	1.06	**2.17***	1.24	1.18	1.03
PCMH Recognition	1.32	1.45	1.13	0.47	0.80	0.93	0.91	**1.41***	0.69	1.06	0.94	1.65
Enabling Services	**1.57***	1.02	0.85	1.60	0.98	0.95	0.83	1.38	1.13	1.12	1.30	1.41

Funding Type *(ref Community Health Center)*												
Public Housing	0.96	0.95	1.30	**0.08****	0.73	**0.63***	0.77	0.96	**0.55***	0.64	0.91	0.82
Agricultural Worker	1.60	1.27	1.03	0.49	1.28	1.12	1.55	1.04	1.69	1.37	1.03	1.30
Homeless	0.79	1.04	0.82	**0.22***	1.31	1.11	0.89	0.77	0.78	1.03	0.82	0.72

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

CHAPTER 5:   POSITIVE PATIENT EXPERIENCES AND RECEIPT OF CARE, ADHERENCE AND ACTIVATION IN HEALTH CENTERS

INTRODUCTION

Almost 1,400 federally qualified health centers (FQHCs) across the United States receive support from the Health Resources and Services Administration to improve the health of the Nation's underserved communities by increasing access to high quality primary care services. These primary care organizations, commonly referred to as health centers, have a rich history of providing high quality, culturally competent care to patients that go beyond traditional medical services to a range of enabling services and include a focus on both individual and community health.[5] Health centers currently provide care for over 24 million patients, nearly one in 13 people in the United States, putting this national network among the largest primary care systems in the country.[4]

The quality of health center services has been well established in the literature, as well as health centers' focus on quality improvement and patient-centered care.[113,115,116,118,131] In addition to focusing on technical quality of care and clinical outcomes, health centers are increasingly focused on patient experiences of care (PEC). While PEC measurement and improvement has been studied extensively, including examining PEC outcomes in different care settings and with diverse populations, studies in health center populations have been limited. A recent study examined five domains of PEC in health centers and identified that PECs vary significantly by patients' characteristics, such as race and ethnicity and educational background, and health center organizational factors, such as patient volume and funding type.[132] These results provided

additional support for the importance of adjusting for patient characteristics and identified areas for improving PEC in health centers.

As payers use PEC to complement measures of technical quality and health outcomes, there is growing interest in the association between these elements of care quality. Two systematic reviews examined the association between PEC and other measures of health care quality.[119,120] Authors found positive associations between PEC and quality of care and patient behavioral change, patient activation/empowerment, self-management, etc. However, only a few of the studies reviewed included a focus on primary care and underserved patients, or provided a comprehensive view that examined technical quality, patient adherence/behavior change, patient activation (confidence in self-management abilities), and clinical outcomes.

Using the first nationally representative sample of health center patients, this study investigated the relationship between PEC and health center quality of care. Specifically, this study evaluated whether and how the receipt of appropriate care, adherence with treatment plans, patient activation, and clinical outcomes varied by patient experience with access to care, provider communication, office staff interactions, and follow up among the health center patients. While recent quality trends have demonstrated improvements across most quality measures, including exceeding national benchmarks, there is still room for improvement in improving health outcomes and achieving health equity.[128] Improving health outcomes in health center patients is challenging given the prevalence of socio-economic and demographic factors associated with decreased health care utilization, lower levels of patient activation, and healthy behaviors.[132] If PEC is found to be associated with quality of care, health centers will

have another quality improvement tool to facilitate their efforts to improve the health of underserved and vulnerable populations. Given the increasing use of PEC data in quality payment programs, focusing quality improvement efforts on PEC could result in significant improvements in both PEC and health outcomes.

METHODS

Conceptual Framework

Figure 5.1 depicts our conceptual model delineating the relationships between PEC and clinical processes, patient outcomes, and clinical outcomes. This model is adapted from the conceptual framework describing the assessment of quality of care by Donabedian and Coyle and Battles, as well as Price and colleagues' conceptual model describing how patient care experiences are associated with health care quality.[25-29] We used the model to illustrate the influence of individual and environmental factors on quality of care and the relationships between the various domains of health care quality.

We hypothesized that PEC ratings would be positively associated with clinical processes (e.g., receipt of appropriate care), patient outcomes (e.g., adherence to treatment plans, behavioral changes, and patient activation), and clinical outcomes (e.g., blood glucose level, blood pressure, BMI) based upon extensive literature.[119,120,133,134] Specifically, patients who reported always having access to care could be more likely to receive appropriate care in a timely manner. Good patient-provider communication could also increase a patient's activation levels and adherence to care plans, both of which would improve clinical outcomes. Ideal interactions with health center staff and ideal follow up on results would encourage patients to routinely access care at the health center

and facilitate care management, which would positively influence adherence, activation, and clinical outcomes.

Our model also illustrates that contextual factors (both environmental and individual) influence quality of care. Patient/individual factors were selected based on the existing literature examining factors related to quality of care as well as PEC.[115-117,119,120,135] We also identified health center and environmental factors, such as geographic location, patient volume, use of electronic health records (EHR), provision of patient-centered care, that were associated with PEC or quality of care in this literature. As a result, our study controlled for these factors in assessing the relationship between PEC ratings and other dimensions of care quality.

Data

This study was conducted with data from the 2014 Health Center Patient Survey (HCPS), a nationally representative survey sponsored by the Health Resources and Services Administration (HRSA). The 2014 HCPS utilized a three stage sampling design to build a sample representing more than 23 million patients seen at health centers between October 2014 and April 2015. The computer-assisted personal interviews were conducted in English, Spanish, Chinese, Korean, and Vietnamese. Research Triangle Institute (RTI), the organization funded by HRSA to develop and field the HCPS, obtained Institutional Review Board (IRB) approval. A total of 7,002 patients were surveyed in the 2014 HCPS. We removed any patients who were less than 18 years old or who had missing values for outcomes of interest or variables that we planned to control for. The final study sample consisted of 5,299 patients. We linked HCPS data with

HRSA's 2014 Uniform Data System (UDS) data and HRSA's Patient Centered Medical Home (PCMH) Recognition report.

Dependent Variables – Measures of Health Care Quality

In this study, we examined the association of patient experience of care ratings with patient reported measures related to the technical quality of care, adherence with treatment plans, changes in health behaviors, patient activation, and clinical outcomes. To develop a comprehensive picture of the relationship between PEC and quality of care, we focused on clinical processes and outcomes in both preventive care and chronic disease management in adult health center patients. All measures were dichotomous (yes or no) with patients reporting if they had experienced a particular intervention or change.

Chronic Disease Management

We included measures related to hypertension, diabetes, and cholesterol management. For each area, we examined technical quality and patient outcomes. The diabetes measures evaluated whether or not non-elderly adult patients reported receiving appropriate care including diabetes self-management education, annual retinal exam, annual dental exam, annual foot exam, routine hemoglobin A1C tests, and a diabetes management care plan. We also studied whether their blood glucose was controlled. We examined a complement of services aimed at supporting blood pressure control including receiving advice on diet, salt intake, exercise, alcohol consumption, and medications. Next, we evaluated patient adherence with this advice and the resulting changes in behavior and confidence in managing hypertension. Finally, we examined quality of care for patients with high cholesterol. Measures for cholesterol quality of care included receipt of appropriate counseling on diet, weight management and exercise, and

prescription for medication. We also studied changes in patient behavior and adherence with provider advice/care plan.

Preventive Care

Primary care providers are responsible for ensuring patients have access to preventive care services to promote health and prevent disease, so we included several preventive care measures in our study. We examined the quality of care associated with obesity management, cancer prevention, and tobacco cessation services. Weight management measures assessed how many overweight or obese patients received notification of their weight issues, nutrition counseling, exercise advice, or a referral to a registered dietician. In addition, our study included measures on whether patients followed through on this advice or sought additional professional support to manage their weight. Cancer screening measures were included in our panel of preventive care measures, including cervical, breast, and colorectal cancer screenings. Finally, we included a measure on tobacco cessation counseling for patients who were current smokers.

Independent Variables

Patient Experience of Care Metrics

In this study, we analyzed five measures of patient experience of care outcomes including access to care, provider communication, office staff interactions, follow up on results, and overall provider rating, which were derived from the Agency on Healthcare Research and Quality's (AHRQ) Clinician and Group Consumer Assessment of Healthcare Providers and Systems (CG CAHPS) Adult 12-Month Survey. Access to care,

provider communication, and office staff are composite metrics that reflect an average rating across their subcomponent measures.

The access to care composite measure examined patients' experience with accessing appointments for routine and urgent care as well as with telephone access during and after office hours. Wait times experienced during appointments were also assessed. The provider communication composite measure assessed several different elements of patient-provider communication including how well the provider listened to the patient, respected the patient, provided easy to understand information, spent enough time with the patient, and had knowledge of important medical history. The office staff interaction composite examined the helpfulness, courteousness, and respectfulness of office staff towards patients.

We constructed "ideal" composite measures for the patient experience of care domains by creating a new dichotomous variable for each subcomponent measure of the 5 PEC domains that combined "Never," "Sometimes," and "Usually" into one category and "Always" (or a rating of "9" or "10" on the overall provider measure) as another category. We then constructed a composite dichotomous variable that assessed whether patients had ideal patient experiences for each subcomponent measure across the entire PEC domain.

Patient and Health Center Characteristics

We included selected patient and organizational variables based upon the scientific literature describing factors associated with quality of care and patient experience of care. Patient socio-demographic variables used in the analyses included age (18–44 years, 45–64 years, 65–74 years, and 75 or more years), race/ethnicity (Hispanic,

White, Black, Asian, Native American/Alaska Native, Native Hawaiian/Pacific Islander,

or Other), gender (male or female), language preference (English only, non-English

language only, or bilingual), nativity (born in the U.S. or born in another country),

educational attainment (less than high school, high school, or more than high school),

household income ($\leq$ 100% federal poverty level [FPL], 101–138% FPL, 139–199%

FPL, 200–299% FPL, 300–399% FPL, and $\geq$ 400% FPL), insurance status (Medicare,

Medicaid, uninsured, public, or private), and employment status (employed, unemployed,

or not in the labor force). The following patient-reported health variables were also

included: health status (excellent, very good, good, fair, or poor), mental health status

(mild, moderate, or severe mental distress as measured by the Kessler 6 score), and

chronic disease status (no chronic diseases or one/more chronic diseases).

Health center characteristics included PCMH Recognition (yes or no), provision

of enabling services (yes or no), use of electronic health records (yes or no), total number

of patients (per 10,000 patients), geography (urban or rural), U.S. census region

(Northeast, Midwest, South, or West), and funding type (Community Health Center,

Public Housing Primary Care, Health Care for the Homeless, or Migrant/Seasonal

Agricultural Workers).

Data Analysis

We conducted univariate and bivariate analyses to examine differences in

patients' receipt of appropriate care, changes in health behaviors, activation, and health

outcomes by PEC ratings. Chi-square tests for independence were used to determine

associations between patient experience of care and health care quality. We then used

multivariate logistic regression to estimate the odds ratios of receipt of quality of care and

behavior changes based on PEC ratings while controlling for a variety of covariates. All statistical analyses were conducted using STATA software version 14.0. All the analyses were adjusted by survey weights.

RESULTS

Table 5.1 presents a summary of the quality of care patients received and compares the results by ideal ratings of PEC. Patients reported significantly higher rates of diabetes (22% vs. 9.3%), hypertension (43% vs. 29%), obesity (78% vs. 70%), and smoking (31% vs. 15%) than in the general US population.[136-139] The unadjusted analyses showed there was increased quality of care with higher ideal ratings of PEC. Table 5.2 presents the results of the adjusted analyses controlling for a variety of patient and health center covariates that influence patient experience of care and health outcomes.

Chronic Disease Management

Diabetes

As described in Table 5.1, almost one quarter of health center patients under 75 years of age were diabetic. While most patients reported receiving diabetes education, responses varied across other elements of appropriate care; only two thirds of patients reported having routine hemoglobin A1C tests, a diabetes management plan, and an eye exam. Less than half reported receiving a dental exam, a foot exam, or having their diabetes under control. Performance on three of the measures was significantly higher for patients who reported ideal ratings on access and follow up on results.

Table 5.2 shows that after adjusting for patient and organizational factors, diabetes quality of care was positively associated with all domains of PEC. The strongest pattern of association was with reports of ideal access to care. Patients reporting ideal

access to care were more likely to receive diabetes education from a nurse (aOR = 2.4), have their hemoglobin A1C checked more than twice a year (aOR = 1.9), and have a care management plan (aOR = 3.0). Patients reporting ideal provider communication were five times as likely to have received diabetes education via a home visit, while patients who reported that health center staff were helpful and respectful were 2.4 times as likely to have received a dental exam in the last year. Reports of ideal follow up on results were significantly associated (aOR = 2.5) with receipt of a care management plan. Patients who reported the highest overall ratings of their providers were two to three times more likely to receive diabetes education via a nurse visit or telephone compared to patients with lower PEC ratings.

Hypertension

As described in Table 5.1, almost 45% of health center patients under 75 years old had been diagnosed with hypertension. Of these patients, 60% received appropriate counseling on diet, sodium intake, and exercise. Approximately 90% reported receiving medications from their provider and continuing to take the medications as prescribed. More than 85% followed up on their provider's advice and improved healthy behaviors related to diet, sodium, and alcohol, and almost all patients reported having self-confidence in their ability to manage their hypertension. Comparing quality across PEC ratings demonstrated that while access and provider communication were associated, the strongest patterns of association were seen with those reporting ideal follow up on results and overall provider ratings. In two areas, we found higher percentages of quality of care among patients who did not report ideal PEC: receiving diet advice from providers, and patients reducing their alcohol consumption.

Table 5.2 shows the results of our adjusted analyses illustrating that all domains of PEC were associated with quality of hypertension care. Patients with ideal access to care were 1.8 times as likely to receive exercise advice from their provider, as well as 3.8 times as likely to reduce their sodium intake and 2.6 times as likely to increase their exercise. Patients were more likely to report receiving a prescription for medication to manage their hypertension (aOR = 2.3), decreasing their salt intake (aOR = 2.8), and having confidence in their ability to manage their hypertension (aOR = 2.8) if they had ideal provider communications. Ideal interactions with health center staff was positively associated (aOR = 2.4) with patients changing their dietary habits to manage their hypertension. Patients who reported their health center always followed up on results with them were 2.2 times as likely to receive advice to increase exercise, 3.2 times as likely to receive medication, 5.8 times as likely to decrease their sodium intake, and 2.3 times as likely to report confidence in their ability to manage their hypertension. While we saw several positive associations between ideal overall provider ratings and quality of hypertension care, we also found a negative association with receipt of diet advice (aOR = 0.6).

Cholesterol

Table 5.1 shows that 42% of health center patients reported having been told they have high cholesterol. Over 75% of patients with high cholesterol received appropriate care and over 80% followed through on the advice and made behavioral changes. Unadjusted results show a strong pattern of associations between ideal provider communications, follow up on results, and overall provider ratings and higher percentages of patients receiving quality care. Table 5.2 shows the associations between

quality of care and PEC after adjusting for patient and health center factors. Reports of ideal provider communication were associated with higher likelihood of receiving diet advice (aOR = 1.9) and increasing exercise (aOR = 1.9). Patients who reported that health center staff were always helpful and respectful were more likely to report that they tried to lose weight (aOR=2.3) and increased their exercise (aOR=2.0) to help reduce their cholesterol. Ideal reports of follow up on results were associated with receiving advice from providers on weight loss (aOR = 1.9) and increasing exercise (aOR = 2.5) as well as actual patient increases in exercise (aOR = 2.5). Patients who gave their providers the highest overall ratings were 3.0 times as likely to receive diet advice, 2.3 times as likely to receive weight loss advice, and 2.0 times as likely to increase their exercise.

Preventive Care

Obesity Prevention

Table 5.1 shows quality of care with respect to preventive care services. Patients generally reported lower performance on preventive care services compared to chronic disease management services. While only a third of overweight and obese patients reported their providers discussed weight management, more than half reported receiving nutrition/diet counseling and almost 40% received exercise advice. Receipt of nutrition and exercise advice was higher in patients with ideal rating of their providers. Less than 20% of patients reported receiving referrals to registered dieticians; these reports were higher in patients who did not report ideal interactions with health center staff. In response to weight management recommendations, most patients reported changing their diet, half increased their exercise and 22% sought professional (trainers, nutritionist, etc.) support for weight loss.

After adjusting for relevant covariates, additional associations between ideal PEC and obesity prevention efforts emerged (Table 5.2). Patients with ideal access to care were 1.8 times as likely to follow through on provider's advice to increase exercise. Those reporting ideal provider communication were 1.5 times as likely to receive diet counseling from providers. Patients who gave their providers the highest overall provider rating were significantly more likely to receive diet (aOR = 1.7) and exercise advice (aOR = 1.8) from their health center providers. The negative association (aOR = 0.7) between office staff interactions and referrals to registered dieticians persisted.

Cancer Screenings

Patient reports of receiving cancer screenings were generally similar in health centers compared to national surveillance data, with higher reports of cervical cancer screening (73% vs. 64%), lower rates of mammography (62% vs. 67%), and similar rates of colorectal screening (57% vs. 58%).[140] The results of our study show that patients who had ideal interactions with health center staff received cervical and breast cancer screenings at a lower rate than patients who did not (Table 5.1). After controlling for patient and health center factors, only one negative association (aOR = 0.7) persisted: ideal interactions with office staff and receipt of cervical cancer screening (Table 5.2).

Smoking Cessation

Table 5.1 shows that smoking prevalence among health center patients was double the rates in the general US population with a third of patients reporting currently smoking.[136] More than 90% of patients reported receiving tobacco cessation counseling at their health center, with higher percentages among patients who reported ideal interactions with health center staff. After adjusting for various covariates, health center

patients who reported having ideal interactions office staff were 3.4 times as likely to have received cessation counseling (Table 5.2). Patients reporting ideal overall provider rating were also 2.9 times as likely to have received tobacco cessation counseling.

Patient and Health Center Characteristics

Table 5.3 presents a summary of the patient and health center characteristics associated with ideal PEC and quality of care in health centers. Males, African-Americans, bilingual patients, moderately mentally ill patients, and those with a fair or poor health status were more likely to report receiving appropriate chronic disease management and preventive care services. Patients who received appropriate care were more likely to receive care at a health center that used electronic health records and provided enabling services. Among patients reporting ideal PEC, Asian patients and those who did not speak English were more likely to report improving their health behaviors, while those with fair/poor health or who were seen at a health center in an urban location were less likely to have improved their heath behaviors. Patients who were uninsured, bilingual, non-English speakers, and had higher incomes were more likely to report being activated or having confidence in their ability to manage their care. The provision of enabling services was also associated with patient activation. Finally, our results show that patients 65–74 years old, publicly insured patients, and those receiving care in the Midwest or West were more likely to have their blood glucose controlled.

DISCUSSION

The results of our study supported our hypothesis that PEC would be positively associated with receipt of appropriate care, patient adherence, and behavioral changes, as well as patient activation. Our study shows that the global rating of patient experience of

care was associated the most with measures of quality. Six measures of clinical processes/appropriate care for chronic diseases and three for preventive care were significantly associated with ideal overall provider ratings. Ideal follow up on results had the largest number of chronic disease and preventive care clinical process measures associated with it. Ideal global ratings of care and follow up on results were associated with patient adherence to treatment plans and improved health behaviors in patients. Ideal ratings on provider communication and follow up on results were associated with higher reports of patient activation. Results did not demonstrate an association between health outcomes and PEC, contrary to our hypothesis. This finding is likely related to the influence of factors outside of clinical care delivery, namely the social determinants of health.[141] Our findings are consistent with previous studies examining the association between PEC and quality of care and add new insights on this association in health centers and health center patients.[119,120] Results also provide evidence for positive overall or global PEC ratings and patient adherence and activation. Finally, we identified three clinical process measures that were negatively associated with the global rating of providers and ratings of health center staff's helpfulness and respectfulness. Additional research is necessary to understand this finding.

Differences in patient and health center characteristics associated with ideal PEC and quality of care metrics present opportunities to further tailor quality improvement interventions to ensure all patients receive appropriate services and are supported to improve their health behaviors and feel empowered to manage their care. The health center model of care was built on a foundation of cultural sensitivity and patient-centeredness; our findings highlight the importance of looking closely at quality across
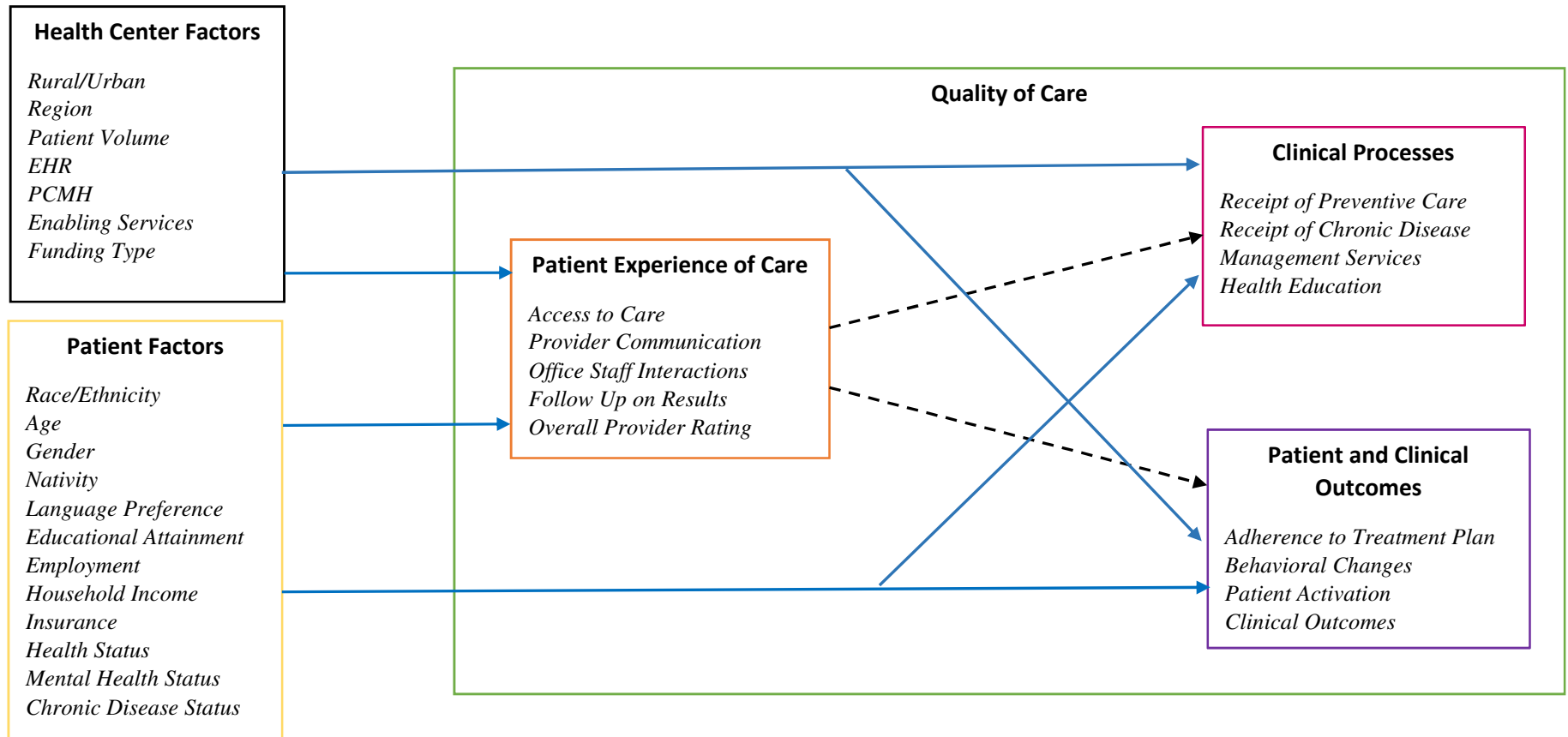
patient subgroups to assure health centers are mitigating disparities and moving towards health equity.

Health centers have a long history of focusing on quality of care and quality improvement; however, most improvement activities have been focused on the health center system level or provider level interventions. Although most health center quality improvement efforts target outcomes, improvement has been focused on clinical outcomes rather than patient outcomes such as behavior change, adherence, or activation.[142] Increasing industry focus on patients' care experiences provides an opportunity to shift the focus to improving PEC ratings. Our study demonstrates that a shift in focus to PEC will not detract from improvements in other domains of care quality; in fact, efforts to improve PEC may improve quality of clinical processes and patient outcomes including adherence and activation. While improving PEC may not improve clinical outcomes directly, extensive research has shown the associations between improved adherence and activation and clinical outcomes.[121,143]

While this is the first nationally representative study of the relationship between PEC and quality of care in health center patients, using survey questions that have been previously validated and have long been used in health services research, there are still a few important limitations to consider with this study. Our study represents a cross-sectional examination of PEC using self-reported data that could have been subject to social acceptability bias, as well as bias inherent in the sample design. In addition, we cannot draw conclusions about causality given this cross-sectional nature of our data. There is also a question of generalizability to the U.S. population given the unique characteristics of health center patients.

This national study examining the relationship between in patient perceptions of care and quality of care in health centers lends strong support for the importance of measuring patient experience of care as a key determinant of quality. Health centers should measure patient experiences of care and use results in concert with other quality data to improve care quality and outcomes. Given the history of the health center program and its focus on increasing access to high quality, culturally competent care; transforming care delivery and systems to support positive patient care experiences should be a top quality improvement priority for health centers. In addition, as the health care landscape continues to shift towards value-based payment, and many programs include patient experience measures as a part of the value calculation, health centers must actively engage in improving patient experience. Furthermore, given the strong associations with patient activation, positive behavioral changes and adherence with provider guidance, improving PEC could have a significant impact on improving health and reducing total cost of care.

Figure 5.1. Conceptual model depicting proposed pathways by which health center and patient factors impacts various elements of health center quality of care.

Health Center Factors

Rural/Urban
Region
Patient Volume
EHR
PCMH
Enabling Services
Funding Type

Patient Factors

Race/Ethnicity
Age
Gender
Nativity
Language Preference
Educational Attainment
Employment
Household Income
Insurance
Health Status
Mental Health Status
Chronic Disease Status

Quality of Care

Patient Experience of Care

Access to Care
Provider Communication
Office Staff Interactions
Follow Up on Results
Overall Provider Rating

Clinical Processes

Receipt of Preventive Care
Receipt of Chronic Disease Management Services
Health Education

Patient and Clinical Outcomes

Adherence to Treatment Plan
Behavioral Changes
Patient Activation
Clinical Outcomes

Source: Adapted from Donabedian, Coyle & Battles, and Price et al.

Table 5.1. Patient Experience of Care and Receipt of Care, Patient Adherence, Patient Activation and Clinical Outcomes

	N#	% of Patients	SE	Ideal Access to Care		Ideal Provider Communication		Ideal Office Staff Interactions		Ideal Follow Up on Results		Ideal Overall Provider Rating	
				% of Patients Reporting									
				Y	N	Y	N	Y	N	Y	N	Y	N
Diabetic Patients (<74yrs old)	5174	22%	(.02)										
Received Education via Telephone in Past 6 Months	1169	18%	(.03)	**29%***	14%	20%	15%	19%	15%	19%	20%	21%	10%
Received Education via Home Visit in Past 6 Months	1170	3%	(.01)	4%	3%	4%	2%	3%	4%	3%	1%	3%	2%
Received Education via Nurse Appointment in Past 6 Months	1170	39%	(.04)	**52%****	32%	41%	34%	41%	27%	43%	30%	41%	29%
Received Education via Specialist Referral in Past 6 Months	1170	16%	(.03)	19%	15%	18%	13%	17%	11%	18%	13%	18%	10%
Received a Retinal Exam in Past Year	1049	67%	(.03)	75%	63%	70%	61%	65%	74%	67%	67%	68%	64%
Received a Dental Exam in Past Year	1049	46%	(.05)	48%	45%	48%	42%	49%	33%	50%	36%	48%	41%
Received a Foot Exam in Past Year	1049	39%	(.05)	48%	36%	40%	39%	38%	45%	43%	30%	41%	36%
With A1C Checked More than Twice in Past Year	1049	67%	(.05)	74%	65%	71%	60%	67%	69%	72%	59%	71%	57%
Received a Plan to Manage Care	1049	65%	(.04)	**78%****	69%	57%	60%	66%	60%	**70%***	53%	66%	63%
Controlled Blood Glucose	1188	39%	(.04)	41%	38%	42%	34%	37%	47%	36%	44%	42%	29%
Hypertensive Patients (<74yrs old)	5174	43%	(.02)										
Receiving Diet Advice	2125	63%	(.02)	64%	62%	64%	61%	64%	57%	65%	60%	60%	**72%***
Receiving Salt Intake Advice	2125	79%	(.02)	84%	77%	82%	75%	80%	77%	82%	75%	**81%***	73%
Receiving Exercise Advice	2125	77%	(.02)	83%	74%	80%	73%	79%	71%	**83%*****	72%	77%	77%
Receiving Alcohol Consumption Advice	2125	36%	(.04)	42%	33%	39%	32%	36%	36%	38%	38%	36%	38%
Receiving Medication Prescription	2125	91%	(.01)	92%	90%	93%	87%	92%	89%	**96%****	86%	**93%***	84%
That Changed Their Diet	1346	88%	(.04)	89%	84%	84%	90%	88%	79%	87%	89%	87%	83%
That Decreased Salt Intake	1624	96%	(.02)	**98%****	94%	**97%***	92%	95%	96%	**98%*****	90%	**96%***	92%
That Increased Exercise	1547	79%	(.05)	83%	72%	79%	71%	75%	80%	75%	82%	**80%***	64%
That Decreased Alcohol Consumption	884	94%	(.03)	95%	95%	94%	97%	96%	92%	94%	**99%****	94%	98%
That are Still Taking Medication	1877	94%	(.02)	91%	89%	90%	88%	89%	90%	92%	90%	89%	92%
Have Confidence in Ability to Control and Manage Hypertension	2183	96%	(.02)	97%	95%	**97%***	93%	**97%***	92%	**97%***	92%	96%	94%

	N	%	(SE)										
Patients with High Cholesterol	4480	42%	(.02)										
Receiving Diet Advice	1671	84%	(.03)	86%	84%	**87%***	80%	85%	81%	87%	81%	**88%***	74%
Receiving Weight Reduction Advice	1737	66%	(.03)	72%	64%	69%	62%	68%	60%	**72%***	62%	**69%***	56%
Receiving Exercise Advice	1698	74%	(.02)	70%	76%	73%	75%	75%	72%	**79%***	67%	75%	72%
Receiving Medication Prescription	1728	75%	(.03)	80%	73%	**80%***	69%	**79%****	65%	81%	71%	**79%****	63%
That Changed Their Diet	1645	92%	(.02)	89%	88%	**91%***	83%	90%	84%	**92%***	84%	89%	86%
That Tried to Lose Weight	1327	89%	(.02)	88%	90%	91%	86%	90%	86%	91%	85%	90%	84%
That Increased Exercise	1528	83%	(.03)	82%	83%	**84%***	77%	85%	76%	**86%***	76%	84%	79%
That are Taking Prescribed Medication	1476	94%	(.02)	90%	88%	90%	87%	88%	92%	90%	90%	88%	92%
Overweight/Obese Patients	5104	78%	(.02)										
Provider Discussed Weight Concerns	3562	31%	(.02)	34%	30%	32%	30%	30%	36%	34%	34%	32%	29%
Received Nutrition/Diet Counselling	3382	55%	(.02)	55%	54%	57%	51%	55%	53%	59%	55%	**57%***	47%
Receiving Exercise Advice	3516	38%	(.02)	39%	37%	40%	34%	39%	34%	42%	37%	**41%***	29%
Referred to a Registered Dietician	3641	19%	(.02)	18%	20%	18%	22%	17%	**25%****	22%	21%	20%	19%
Changed Their Diet	2356	83%	(.02)	85%	82%	83%	83%	82%	85%	84%	85%	82%	86%
Increased Exercise	1678	52%	(.03)	58%	49%	51%	52%	49%	59%	52%	57%	51%	54%
Sought Professional Support for Weight Loss	1678	22%	(.02)	21%	22%	21%	22%	20%	26%	24%	22%	21%	26%
Cancer Screening													
Received Pap Test in Last 3 Years, Female, Age 18+	3344	73%	(.02)	71%	74%	75%	71%	71%	**79%***	74%	72%	72%	77%
Received Mammogram in Last 2 Years, Female, Age 50-74	1384	62%	(.05)	63%	61%	62%	61%	58%	**77%****	62%	59%	60%	71%
Received Appropriate Colorectal Screening, Age 50-74	2405	57%	(.04)	54%	59%	57%	57%	57%	59%	58%	53%	58%	55%
Current Smokers	5293	28%	(.02)										
Received Tobacco Cessation Counselling	1298	92%	(.02)	91%	93%	93%	90%	**94%***	84%	91%	96%	94%	87%

Note: #Analysis conducted using survey weights, results are nationally representative. The N column represent the sample size, but all other results are adjust for analytical weights and therefore reflect a population size of approx. 23 million health center patients.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5.2. Adjusted Odds Ratios for Receipt of Care, Patient Adherence, Patient Activation and Clinical Outcomes by Care Experience Domain

	Ideal Access to Care	Ideal Provider Communication	Ideal Office Staff Interactions	Ideal Follow Up on Results	Ideal Overall Provider Rating
Diabetic Patients ($\leq$74 years old)					
Received Education via Telephone in Past 6 Months	2.07	1.24	1.61	0.65	**2.86**[*]
Received Education via Home Visit in Past 6 Months	1.86	**5.11**[*]	0.74	---	4.56
Received Education via Nurse Appointment in Past 6 Months	**2.38**[*]	1.51	2.04	1.91	**1.98**[*]
Received Education via Specialist Referral in Past 6 Months	1.99	1.49	1.84	1.51	1.84
Received a Retinal Exam in Past Year	2.04	1.12	0.89	1.18	1.12
Received a Dental Exam in Past Year	0.89	0.81	**2.43**[*]	1.35	1.24
Received a Foot Exam in Past Year	1.17	0.70	0.54	1.77	1.26
With A1C Checked More than Twice in Past Year	**1.94**[*]	1.40	0.58	1.69	1.74
Received a Plan to Manage Care	**3.04**[**]	1.32	1.73	**2.49**[**]	0.93
Controlled Blood Glucose	1.20	1.54	0.53	0.80	1.97
Hypertensive Patients ($\leq$74 years old)					
Receiving Diet Advice	1.04	1.11	1.41	1.04	**0.57**[*]
Receiving Salt Intake Advice	1.68	1.60	1.32	1.33	**1.80**[*]
Receiving Exercise Advice	**1.84**[*]	1.52	1.60	**2.23**[**]	1.05
Receiving Alcohol Consumption Advice	1.46	1.48	0.89	1.11	1.11
Receiving Medication Prescription	0.93	**2.29**[*]	1.29	**3.21**[*]	**2.13**[**]
That Changed Their Diet	1.25	0.58	**2.44**[*]	0.61	1.37
That Decreased Salt Intake	**3.82**[*]	**2.85**[*]	0.95	**5.81**[***]	**2.68**[**]
That Increased Exercise	**2.61**[**]	1.59	1.34	0.95	**2.19**[*]
That Decreased Alcohol Consumption	0.37	0.88	2.76	0.09	0.32
That are Still Taking Medication	0.91	1.95	1.43	2.08	0.85
Have Confidence in Ability to Control and Manage Hypertension	1.62	**2.76**[**]	1.72	**2.29**[*]	1.92
Patients with High Cholesterol					

Receiving Diet Advice	1.36	**1.88***	1.43	2.18	**3.16*****
Receiving Weight Reduction Advice	1.50	1.41	1.55	**1.92****	**2.29****
Receiving Exercise Advice	0.87	0.79	1.38	**2.50****	1.13
Receiving Medication Prescription	1.59	1.64	1.71	1.47	1.80
That Changed Their Diet	0.75	1.64	1.33	2.01	1.93
That Tried to Lose Weight	0.91	2.05	**2.31***	2.73	2.18
That Increased Exercise	0.87	**1.93***	**2.03***	**2.51****	**1.97***
That are Taking Prescribed Medication	0.72	0.73	0.39	0.63	0.44
Overweight/Obese Patients					
Provider Discussed Weight Concerns	1.37	1.14	0.78	0.93	1.27
Received Nutrition/Diet Counselling	1.31	**1.45***	1.34	1.25	**1.74****
Receiving Exercise Advice	1.18	1.43	1.34	1.16	**1.83***
Referred to a Registered Dietician	1.02	0.81	**0.67***	1.16	1.12
Changed Their Diet	1.36	0.92	0.82	1.01	0.80
Increased Exercise	**1.82***	1.01	0.71	1.01	0.91
Sought Professional Support for Weight Loss	1.08	0.99	0.94	1.16	0.69
Cancer Screening					
Received Pap Test in Last 3 Years, Female, Age 18+	0.95	1.35	**0.66***	1.01	0.80
Received Mammogram in Last 2 Years, Female, Age 50-74	2.03	0.90	0.60	1.23	0.82
Received Appropriate Colorectal Screening, Age 50-74	1.00	1.09	1.29	1.26	1.01
Tobacco Users					
Received Cessation Counselling	0.95	1.82	**3.42****	0.45	**2.90****

Note: Analysis conducted using survey weights, results are nationally representative.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5.3. Patient and Health Center Factors Associated with PEC and Receipt of Care, Adherence, Activation and Clinical Outcomes

	Ideal Patient Experience of Care Ratings	
	Positive Association	**Negative Association**
Hypertensive Patients (<74 years old)		
Receiving Diet Advice	NH/PI, 300% FPL, South	Homeless
Receiving Salt Intake Advice	South	NA/AN, Uninsured, Born in the US, Homeless
Receiving Exercise Advice	300% FPL, Non-English Speaker, Bilingual, Moderate Mental Illness, Not in Labor Force	Hispanic, Homeless
Receiving Alcohol Consumption Advice	Male, 300% FPL, Homeless	Lower Health Status, Born in US
Receiving Medication Prescription	45-64 yr. olds, 300% FPL, Lower Health Status, Not in Labor Force	Asian, Hispanic, NA/AN
That Changed Their Diet	--	Public Insurance, 300% FPL, Bilingual, Not in Labor Force, EHR
That Decreased Salt Intake	Asian, Not in Labor Force, EHR	45-64 yr. olds, Medicaid, Medicare, Public Insurance, Lower Health Status, Enabling Service, Urban
That Increased Exercise	Asian, Public Insurance, West	300% FPL, Lower Health Status
That Decreased Alcohol Consumption	Hispanic, Uninsured, 200% FPL, Agricultural Worker	Male, Bilingual, Lower Health Status, Midwest
That are Still Taking Prescribed Medication	Asian, 45-64 yr olds, 65-74 yr olds, Lower Health Status, Public Housing Resident	Non-English Speaker, Born in the US, PCMH, Agricultural Worker, Urban
Have Confidence in Ability to Control and Manage Hypertension	Uninsured, 300% FPL, Midwest, Enabling Services	Hispanic, 45-64 yr olds, 65-74 yr olds, 139% FPL, Lower Health Status, Mental Illness, EHR,

		Public Housing Resident, Agricultural Worker, Urban
Diabetic Patients (<74 years old)		
Received Education via Telephone in Past 6 Months	Bilingual, 300% FPL, Urban	Medicare, Medicaid, Uninsured, 200% FPL, PCMH
Received Education via Home Visit in Past 6 Months	Black, Hispanic, NA/AN, Moderate Mental Illness, Born in the US, Midwest, West	65-74 yr olds, Enabling Services, Total Patients
Received Education via Nurse Appointment in Past 6 Months	Male, 300% FPL, Enabling Services	65-74 yr olds, Medicaid, Uninsured, PCMH
Received Education via Specialist Referral in Past 6 Months	Black, Hispanic, NA/AN, Lower Health Status, PCMH, Enabling Services	--
Received a Retinal Exam in Past Year	101% FPL, 400% FPL	Hispanic, Public Insurance
Received a Dental Exam in Past Year	300% FPL, Midwest	Medicare, Public Insurance, Uninsured, Non-English Speaker, Bilingual, 139% FPL, Lower Health Status, Born in the US, Public Housing Resident
Received a Foot Exam in Past Year	45-64 yr olds, Midwest	Uninsured, 200% FPL, 400% FPL, Severe Mental Illness, Public Housing Resident
With A1C Checked More than Twice in Past Year	Bilingual, Very Good Health, EHR, Enabling Services	Asian, Hispanic, NA/AN, 139% FPL, 200% FPL, Homeless
Received a Plan to Manage Care	Very Good Health, Poor Health, Unemployed	Hispanic, 139% FPL
Controlled Blood Glucose	65-74 yr olds, Public Insurance, Midwest, West	Lower Health Status, EHR, Enabling Services
Patients with High Cholesterol		
Receiving Diet Advice	NH/PI, Non-English Speaker, Bilingual, Unemployed, Enabling Services	Hispanic, 75 yrs and older, Medicare, Homeless

Receiving Weight Reduction Advice	139% FPL, Lower Health Status	75 yrs and older, Medicaid, Medicare, Uninsured, Homeless
Receiving Exercise Advice	Moderate Mental Illness, EHR, Enabling Services	75 yrs and older, Medicaid, 139% FPL, 300% FPL, Homeless, South
Receiving Medication Prescription	Male, 45-64 yr olds, 65-74 yr olds, Non-English Speaker, 139% FPL	Asian, 200% FPL, Good Health, Total Patients, Urban
That Changed Their Diet	Asians	Lower Health Status, Homeless
That Tried to Lose Weight	Black, Male, Non-English Speaker, Lower Health Status, 400% FPL, PCMH, South	65-74 yr olds, 75 yrs and older, 139% FPL
That Increased Exercise	Non-English Speakers, 300% FPL	75 yrs and older, Lower Health Status, Enabling Services
That are Taking Prescribed Medication	Black, NA/AN, Lower Health Status	Unemployed, Born in the US, Total Patients, West
Overweight/Obese Patients		
Provider Discussed Weight Concerns	Lower Health Status, Unemployed, Agricultural Worker	Hispanic, 139% FPL, Homeless
Received Nutrition/Diet Counselling	NH/PI, 101% FPL, Lower Health Status, Moderate Mental Illness, Enabling Services, Total Patients	Male, 75 yrs and older, Homeless
Receiving Exercise Advice	65-74 yr olds, 101% FPL, Lower Health Status	Hispanic, Severe Mental Illness, Born in the US
Referred to a Registered Dietician	Poor Health	Hispanic, 75 yrs and older, Born in the US, Homeless, Midwest, West, South
Changed Their Diet	--	Homeless

Increased Exercise	Non-English Speakers, 200% FPL, Moderate Mental Illness, PCMH	--
Sought Professional Support for Weight Loss	Non-English Speakers, Bilingual, 400% FPL	Asian, Hispanic, 75 yrs and older, Midwest, South
Cancer Screening		
Received Pap Test in Last 3 Years, Female, Age 18+	Black, Total Patients, South	Asian, 45 yrs and older
Received Mammogram in Last 2 Years, Female, Age 50-74	Black, 101% FPL, 400% FPL, Lower Health Status	Uninsured, 300% FPL, Homeless
Received Appropriate Colorectal Screening, Age 50-74	Lower Health Status, Not in Labor Force	NH/PI, Bilingual, Uninsured, Born in the US, Agricultural Worker
Tobacco Users		
Received Cessation Counselling	Asian, Male, 200% FPL, 300% FPL, Good Health, Fair Health, Public Housing Resident	45-64 yr olds, Homeless

Note: NH/PI = Native Hawaiian/Pacific Islander   NA/AN=Native American/Alaska Native
Reference characteristics: Non-Hispanic Whites, English Speakers, 18-44 year olds, Private Insurance, Female, Less Than High School Education, 100% FPL, Excellent Health Status, No Mental Distress, Foreign Born, Employed, Rural, Northeast

CHAPTER 6: CONCLUSION

One in thirteen people living in the United States is served by a health center, while one in three individuals living in poverty are served at health centers.[1] Nearly 1,400 health centers comprise a critical safety-net primary care network that cares for over 24 million patients across more than 10,000 service delivery sites. As health center services become an increasing percentage of all primary care services delivered in the United States, their success is vital to national efforts to improve care, advance health and manage costs.

The purpose of this dissertation is to improve our understanding of health center quality of care, as well as identify additional quality improvement avenues to accelerate health center performance toward achieving its mission of providing high quality, cultural competent primary care to improve the health of the Nation's underserved communities and vulnerable populations. The dissertation is comprised of three novel studies that examined various aspects of health center quality. The studies, each the first to my knowledge to use nationally representative health center data to examine these dimensions of quality, are a significant contribution towards advancing our understanding of health center quality and provide a launching point for future research. The results of this research also provide benchmarking data for health centers as they work to improve patient experiences of care. In concluding my dissertation, I will briefly summarize each study, discuss summary conclusions from my research, and present health center quality improvement and health policy implications.

This body of work began with an assessment of health center quality improvement literature to better understand recent quality improvement activities and identify gaps in

knowledge. The review demonstrated the growth in peer-reviewed quality improvement studies in health centers, highlighting the diversity of focus areas, as well as an increase in the number and types of interventions utilized. Between 2006 and 2015, most quality improvement efforts centered on clinical process and clinical outcome improvement, and the majority of interventions were implemented at the health center or provider levels. The review did not identify studies focused on improving patient satisfaction or patient care experiences or that examined the impact of quality improvement programs such as ambulatory care accreditation or patient centered medical home on quality.

The first study examined the relationship between ambulatory care accreditation and quality of care in 1,198 health centers. After controlling for health center and patient characteristics, I found that accredited health centers achieved higher performance on adult weight screening and follow-up, tobacco cessation intervention, and use of lipid lowering therapy. Universal accreditation could result in an additional 552,087 patients receiving weight screening and follow up, 157,434 patients receiving tobacco cessation interventions, and 25,289 patients receiving lipid lowering therapy. This is the first national study to examine the impact of accreditation on health center quality of care and the findings suggest that federal support for accreditation has the potential to improve quality of care and, as a result, reduce health disparities in underserved communities across the United States.

The second study transitions from the system-level, structural intervention of accreditation to examining the patients' experiences as a result of their interactions with the health center, and its providers and staff. Using the first nationally representative dataset on patient experience of care (PEC) in health centers, I examined the association between five measures of PEC (access to care, provider communication, office staff interactions, follow up on

results and overall provider rating) and patient and organizational characteristics. Study results found that health center patients reported positive primary care experiences in similar or slightly lower proportions as the 2014 CAHPS database respondents and that responses were generally positive overall. Less educated patients, those with higher income levels, and non-English speaking patients were more likely to report ideal PEC, while homeless patients reported better access to care, but lower overall ratings of care. Use of electronic health records was positively associated with PEC. This finding demonstrates that the health center model of care, focused on overcoming traditional barriers to care and providing culturally competent care, is achieving its mission of providing high quality care.

Notably, our study results did not demonstrate a disparity in patient experience of care across racial/ethnic groups, except among Asian patients. Researchers have attributed these differences to cultural norms of the minority group, providing additional evidence for patient-mix adjustment of PEC ratings. Our study revealed opportunities for improvement as well. Patients with lower self-rated health or mental health status were less likely to report ideal PEC across all measures, and overall patients rated access to care lowest among the PEC domains. While the PCMH model of care holds promise for improving PEC, I did not find a significant association between PCMH recognition and ideal PEC ratings.

The final study continued to explore patient experience of care in health centers, examining the association between ideal PEC and health center quality of care metrics such as receipt of appropriate care, health behaviors, patient activation, and health outcomes. Results showed that PEC ratings were associated with receipt of chronic disease management and preventive care, as well as patient adherence and activation and highlighted differences in quality of care across various patient and health center characteristics. The findings support the

importance of measuring PEC as a key determinant of quality, as well improving PEC as a means to improve other aspects of care quality.

Taken together the results of the studies and the literature review show the significant impacts of health center quality improvement efforts to date and illuminate additional areas for health centers to focus on moving forward to advance quality and maximize the value of the health center program to the patients and communities they serve, as well as the health care system overall. In addition, the findings highlight broader health policy implications that should be considered as we continue to reach for the aims of the National Quality Strategy.

Health Center Quality Improvement Opportunities

Continue Enhancing Quality Infrastructure and Optimizing the Care Delivery

Significant investments have been made in health center quality infrastructure over the past ten years starting with efforts to increase the adoption and use of health information technology as well as efforts to support patient centered medical home transformation. These efforts build upon a strong foundation of quality assurance/improvement activities mandated by Health Center Program requirements and long-standing support for ambulatory care accreditation. Given ambulatory care accreditation's focus on implementing systems and processes to ensure patient safety and improve quality of care, it is not surprising that health centers participating in this rigorous quality improvement initiative and review process perform better on selected clinical process measures. Improvement on outcome measures is often a combined result of health care interventions, patient education and engagement, and lifestyle and behavioral changes. Consequently, patient health outcomes are often more challenging than process measures for health care organizations to improve. Patient health outcomes are often less

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sensitive to improvement based solely on clinic-based interventions, which could explain the lack of association between accreditation and patient health outcomes, and provides additional justification for coupling accreditation standards with the PCMH care model to support optimal outcomes.

Despite almost 70% of health centers having received PCMH recognition and almost all health centers having adopted electronic health records, the lack of a strong positive association with PEC and structural elements such as PCMH and EHR highlight opportunities to further improve these areas so they have the intended impact on patient care experiences and quality overall. Health centers with PCMH recognition should continue to optimize their workflows and scheduling, support the development of high-functioning, interdisciplinary care teams and strengthen patient engagement and care coordination efforts. PEC ratings can provide important insights to inform PCMH optimization efforts.[122,123] Patient advisory councils can also provide valuable feedback and insights regarding the impact of care transformation and improvement efforts on patient experience.[144,145] Health centers that have not gone through the PCMH transformation process should learn from their peers' experiences to maximize their potential for effective care delivery transformation. Finally, health center quality improvement efforts should consider partnerships and collaborations that extend beyond the health care system to other public health and community/social service organizations that address the social determinants of health.

Health centers should use health information technology (HIT) to complement their care delivery transformation efforts and facilitate quality improvement. Much of the effort to date has focused on implementing EHR systems, supporting providers and care teams with meaningful use of the systems, and retrieving and using data to measure and improve quality. Study results

demonstrated an association between EHR use and ideal overall ratings of providers; however, there are opportunities to leverage HIT to improve patient reports on access to care, provider communication and follow up on results. For example, given patient experience of care ratings for access to care were the lowest, health centers should considered leveraging technology to increase patients' ability to access care according to their preferences.[146] In addition to maximizing the use of electronic health records, health centers should consider the use of electronic health tools such as secure patient portals, personal health records, secure messaging between patients and providers, personal monitoring devices, mobile health applications and internet-based health education and peer support resources to increase patient engagement and empowerment.[147]

Increase Focus on Patient Engagement and Addressing the Social Determinants of Health

As described the literature review, most health centers quality improvement efforts have been focused on system and provider level interventions, and clinical outcomes. This combined with the findings from my PEC studies, present an opportunity to increase focus on quality improvement interventions aimed at patient experience and patient engagement to improve quality and manage total cost of care. A review of health center clinical performance shows improving trends for most process measures, with slower improvement or steady performance across outcome measures such as blood glucose and blood pressure control. As previously described these outcomes require a multifaceted approach to improve. Health centers should increase quality improvement efforts aimed at increasing patient engagement and activation, including leveraging all of the recent infrastructure improvement and expansion efforts. The PEC studies highlight the importance of cultural competent in designing care delivery and quality improvement strategies that address the specific needs of the diverse populations health

centers serve. Health centers should evaluate subgroup differences across quality metrics, including PEC, to provide insights into areas ripe for quality improvement and assess differences in patients' experience of previous transformation or quality improvement efforts.

Patient and family engagement is the active partnership between patients, families, their representatives, and health care providers to improve health. The partnership takes place across multiple levels of the health care delivery system starting at the direct care level, moving up to organizational design and governance, to policy-making. Patient engagement can be described on a continuum with the lower end representing low power and shared decision-making to the high end representing a true partnership with shared power and decision-making.[145] At the patient care level, health center patients and providers work together to ensure shared decision-making that includes patient preferences, medical evidence and clinical judgment. At the organizational design and governance level, patient advisory boards are a part of the governance process and participate in quality improvement committees. At the policy making level, patients provide feedback on the patient health needs, research and quality improvement priorities and how to allocate resources to various health programs in response to patient/community needs. Health centers could use this framework to strengthen existing patient education and activation efforts.

The founders of the first health centers had a vision of creating a health care delivery model, focused on a holistic understanding and treatment of patients that addressed the links between poverty, race and poor health.[5,6] The original community health center model of care was founded on a core set of guiding principles including addressing the needs of poor, uninsured and disease-burdened populations by removing barriers to accessing care; targeting interventions to both the individual and the community; addressing the social determinants of

health; empowering patients and communities; developing data-driven public health and clinical

interventions based on community data; and the use of multidisciplinary teams of clinical and

public health professionals to reduce health disparities in underserved communities.[5] While the

model has evolved over time as a result of shifting national priorities and healthcare dynamics,

adherence to these core principles remains vital to achieving health equity.

The Department of Health and Human Services (HHS)'s Healthy People 2020 goals

include a focus on increasing interventions to address social determinants of health. They

describe social determinants of health as conditions in the environments in which people are

born, live, learn, work, play, worship, and age that affect a wide range of health, functioning, and

quality-of-life outcomes and risks.[148] A large body of evidence points to the significant role

social factors play in health and highlights that medical care has less of an influence on health

than previously believed. In a recent literature review, Walker and colleagues concluded that

social determinants have an impact on glycemic control, LDL, and blood pressure to varying

degrees. They found that social determinants may influence diabetes outcomes through an

impact on glycemic control, in addition to contributing to diabetes prevalence and progression.[141]

Health center providers understand that the pursuit of health and wellness requires a

multifaceted approach that included interventions outside of the health care system. My studies

showed the impact of quality improvement interventions on the structure and processes of care;

however when it came to improving patient clinical outcomes, I did not see significant

associations. Our dataset included some variables that are typically considered part of the socio-

demographic determinant of health and in many cases these variables (e.g. race/ethnicity,

poverty, educational level, nativity, and language preference) were controlled for. The findings

lend support for the presence of environmental and contextual factors influence on health

outcomes. Factor such as community resources, food security, literacy levels, violence, and the built environment may be impacting health. So to truly improve health and manage health care costs health centers need to understand and address the social determinants of health.[141,149,150]

Braveman and Gottlieb suggest clinicians should extend beyond medical care and assess patients' social determinants of health and link patients to appropriate services. Health care should be focused on health promotion and go beyond individual services to impact the broader community and influence living and working conditions. Health centers should be involved in research to better understand the impact of social determinants of health on patients and evidence based interventions to address them.[149]

Health center quality improvement efforts that showed the most improvement typically employed a multilevel approach – targeting efforts at the health center, provider and patient levels. As health centers prioritize quality improvement initiatives in the future, they should consider multilevel approaches, especially those focused on improving patient experiences as a means to improving adherence and activation, as well as interventions that take place outside of the health center medical home and in the larger "health neighborhood" that includes social service, education, employment and financial sectors. Health centers should partner with community based organizations and other social service sectors to develop coordinated, comprehensive approaches to respond to the social determinants of health faced by their patients and communities. Health centers have made significant strides in understanding the social determinants of health faced by their target populations using standardized, electronic health record based tool to screen patients and develop treatment plans/prescriptions for community resources to address identified concerns.[151] A growing number of health centers and communities are working together in a community centered health home approach to identify

and address. This model not only acknowledges that factors outside the health care system affect patient health outcomes, but also actively participates in improving those factors in order to improve health and safety for all residents. Community centered health homes translate high-priority medical conditions into active involvement in community advocacy and change.[152,153]

Build a Continuously Learning and Improving Health Center System

Continued progress towards achieving the health center mission and eliminating health disparities will require a strong, continuously learning health center system. This idea of a learning health center system is comes from the Institute of Medicine's "Best Care at Lower Costs: The Path to Continuously Learning Health Care in America" which describes the ideal attributes of a health care system that effectively addresses the paradoxes that face today's health care system – one that is simultaneously exploding with innovation and data, yet is not maximizing the use of this innovation and data to improve quality and manage complexity and costs. Continuously learning health care systems have the ability to capture care delivery data in real time from a variety of sources, ensure that clinical decision-makers have access to the best data and evidence to support their decisions, foster strong patient-clinician relationships, empowering patients and families to be partners in care, incentivize the delivery of high value care and continuous improve, share safety, quality and cost data transparently, and have system capacities to support a culture of continuous learning and improvement. [97]

Building a health center learning system that supports data-driven quality improvement, and employs evidence based strategies that have been proven to work in health center settings is also central to advancing and sustaining health center quality improvement into the future. This requires continued support at the individual health center level to build the digital and data capacity, support for technology use to improve care, use of evidence-based practices and

provision of patient-centered care, coordination of care across settings and linkages with community partners addressing the social determinants of health.[97,154] As experience from the Health Disparities Collaboratives, recent progress on PCMH transformation and EHR adoption demonstrates, health centers perform better when supported by a robust network of organizations focused on supporting their quality improvement efforts. National partners with specific subject matter expertise collaborating with state/regional organizations which understand the state and local health care landscapes and entities with health information technology and informatics expertise have been successful in working together to support health center quality improvement. While these organizations have not fully realized the vision of a learning health care system, they have the capacity to leverage existing relationships, infrastructure and expertise to develop a learning system for safety-net providers. Consequently, support for these technical assistance and quality improvement partners is essential in building a learning health center system. These partners can identify and disseminate insights and innovations from both inside and outside of the health center system. A strong network could reduce waste and duplication of efforts, and accelerate efforts to scale up innovation and best practices. This learning health center system can also facilitate health center participation in quality improvement research and generation of new knowledge related to the most effective care delivery methods and improvement interventions within underserved communities and vulnerable populations.

High quality research and data is central to the development of a high functioning, learning health center system that actively pursues innovation and spreads evidence based interventions to improve quality. All three studies in this dissertation were the first to utilize nationally representative health center data to examine a specific facet of quality or quality improvement intervention. Given the significance of the health centers to low-income, underserved

communities, it is imperative that adequate investment and support are present to continue to improve our understanding of health center quality of care, generally and among sub-populations, as well as the effectiveness of various quality improvement interventions. While there has been notable growth in health center research studies and research capacity, untapped opportunities to maximize health center participation in the development of quality improvement interventions remain. While the majority of health centers are interested in participating in research, concerns regarding lack of dedicated staff time, concerns about drops in productivity or incomes and funding availability are barriers to participation. [155,156] Despite these barriers more and more health centers are participating in research as a result of federal efforts to increase health center representation in research. In the past five years there has been an increase in federal support for practice based research, including a specific focus on underserved populations and community health centers. These investments have extended health center research capacity, provided valuable contributions to health services research as well as provides a roadmap for health centers interested in engaging in research. [157,158] With health center progress in the adoption of health information technology and data warehousing there are additional opportunities to leverage these investments and the growing data health centers have to increase the number of health centers and health center patients who are represented in research. Increasing the volume and diversity of underserved and vulnerable patients included research could support progress in understanding and addressing health inequities.

Health Policy Implications

Health centers do not operate in isolation, they are an integral part of the local health care systems they operate within. National, state and local policies impact quality of care and quality improvements in health centers, therefore efforts to advance health center quality need to

consider the impact of health policy. The last few years have heralded significant changes in the health policy landscape that promise to continue to change into the foreseeable future. The following policy considerations are essential to facilitate health center improvement efforts and advance individual and population health in underserved communities.

Investing in Quality and Health System Improvement

Over the past 50 years health centers have successfully navigated significant changes in the health care delivery system and reimbursement policies.[5] Health centers have increased in size and scope, and are active participants in quality improvement and value based payment programs. In many cases, heath centers are called upon as leaders and role models for delivery high quality, patient centered care to support other health care providers in transforming care delivery and improving quality. To continue this progress, national health policy must continue to place an effort on supporting initiatives aimed at supporting the improvement of the health center model of care. Health centers, particularly small, geographically isolated health centers, need continued support to remain steadfast in their focus on quality. As payment methodologies are developed and refined, and as increasing flexibility is provided to states, it will be important to ensure adequate national support remains for continued innovation and improvement. It is imperative that new health policies consider the disadvantaged nature of health center patients and acknowledge the differences in the health center model of care (and associated costs) that give rise to quality outcomes. Investments in ambulatory care accreditation, patient centered medical home, and health information technology have improved quality of care in health centers and should be continued moving forward. Health centers have long provided accessible, affordable care that is sensitive to the cultural and community preferences of its patients; however, reimbursement policies have not shifted to include the non-medical types of providers

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and services necessary to sustain these efforts. Current reimbursement policy and funding limitations pose significant barriers to the high-touch, time intensive efforts required to improve PEC ratings and health outcomes in underserved communities and vulnerable populations.

Current reimbursement systems are often cited as barriers to innovation and limit health centers from optimizing their care delivery model to include services tailored to individual patient and community needs. For example, community health workers are recognized as important members of the health care workforce. Extensive evidence shows that they can help improve health care access and outcomes, strengthen health care teams, and improve quality of care and patient activation and empowerment for people in poor, underserved, and diverse communities.[159] While a progress has been made on the training and credentialing of community health workers, reimbursement continues to be a barrier limiting the widespread use of these care team members. Similarly, with the significant prevalence of behavioral health issues among health center patients, many health centers have focused on integrating behavioral health and primary care services by supporting active care coordination, use of interdisciplinary teams, co-locating services, and engaging in warm hand-offs between providers in the same setting. This integration increases access for patients and often includes introduction of new behavioral health staff into care teams, efforts that both increase quality and satisfaction for patients and providers alike. However, antiquated reimbursement rules are a significant barrier to expanding these services to health center patients nationwide. Without access to same day billing, the ability for providers to be reimbursed for different services on the same day to improve behavioral and medical health care coordination, health centers are limited in their ability to improve care via patient-centered approaches and interdisciplinary team-based care that would involve mental health providers. It is estimated that more than half of all Medicaid enrollees are impacted by

these reimbursement challenges.[160] Health center efforts to address the social determinants of health are also limited by reimbursement challenges. Medicaid managed care organizations report employing innovative strategies such as waivers, grants and community partnerships to support services targeting social determinants of health; however, a lack of financial incentives, misaligned federal and state funding and regulations are unlikely to be sustainable part of care delivery into the future.[161]

Value/Quality Based Payment or Rating Programs

While the health care system recognizes the benefits of the health center model – improved individual and community health and savings in the total cost of care, current shifts towards value based payment methods may have unintended consequences on health center care. For example, as noted in our study examining health center patient experiences of care, careful consideration of the impact on patient mix and the related medical and social complexity of patient populations must be considered when evaluating and paying for quality. There appears to be interest in this area; however it remains to be seen how risk adjustment efforts will impact health centers.[162] Appropriate risk adjustment strategies must be carefully considered to balance the need to account for differences in patient and community characteristics that are outside of the control of the health care delivery system without unintentionally creating a lower standard for systems and providers caring for underserved, vulnerable populations.

Payment or quality rating policies that unintentionally penalize health centers for caring for some of our nation's most disadvantaged and vulnerable populations could exacerbate health disparities and rising health care costs. For example, our study shows that Asian patients served by health centers systematically respond with lower ratings of PEC and previous literature attributes these differences to cultural norms rather than differences in actual care delivery. In

this scenario, health centers that provide culturally and linguistically tailored primary care services, drawing large populations of Asian patients, may be negatively impacted by lower PEC ratings even though they are potentially delivery higher quality care than other providers. Similarly as value based methodologies continue to expand, it will be important to ensure the cost savings realized by health centers services are invested back into those centers to support continued quality improvement and cost savings.

Health centers are central to advancing the Healthy People 2020 vision of a society in which all people live long, healthy lives and the related goals of attaining high-quality, longer lives free of preventable disease, disability, injury, and premature death and achieving health equity, eliminate disparities, and improve the health of all groups.[163] While health centers have made significant progress in advancing these goals on behalf of the underserved communities and vulnerable populations they serve, continued focus on quality improvement and support for developing a system to support rapid cycle quality improvement are vital to sustained progress into the future.

APPENDIX 1:   DEFINITION OF MEASURES OF QUALITY OF CARE AND PATIENT HEALTH OUTCOMES

Eleven Measures on Quality of Care:

- Entry to Prenatal Care - Percentage of prenatal care patients who entered care during their first trimester

- Childhood Immunizations- Percentage of children who were fully immunized by their third birthday

- Weight Assessment and Counseling for Children and Adolescents - Percentage of patients aged 2 through 17 years of age who had evidence of body mass index (BMI) percentile documentation and documentation of counseling for nutrition and physical activity during the measurement year

- Asthma Pharmacologic Therapy - Percentage of patients aged 5 through 40 with a diagnosis of mild, moderate, or severe persistent asthma who received or were prescribed accepted pharmacologic therapy

- Cervical Cancer Screening – Percentage of women 21 - 64 years of age who received one or more Pap tests to screen for cervical cancer

- Colorectal Cancer Screening - Percentage of patients aged 50 to 75 who had appropriate screening for colorectal cancer

- Tobacco Use Assessment - Percentage of patients aged 18 and older who were queried about any and all forms of tobacco use at least once within 24 months

- Tobacco Cessation Intervention - Percentage of patients aged 18 and older who were identified as users of tobacco during the year or prior year who received a tobacco use intervention

- Adult Weight Screening and Follow Up – Percentage of patients 18 years and older who had documentation of a calculated BMI during the most recent visit or within the six months prior to that visit, and BMI was outside parameters, a follow-up plan was documented

- Lipid Lowering Therapy for Coronary Artery Disease (CAD) - Percentage of patients aged 18 years and older with a diagnosis of CAD who were prescribed a lipid-lowering therapy

- Use of Aspirin or Another Antithrombotic for Ischemic Vascular Disease (IVD) - Percentage of patients aged 18 years and older who were discharged alive for acute myocardial

infarction or coronary artery bypass graft or percutaneous transluminal coronary angioplasty or who had a diagnosis of IVD with documented use of aspirin or another antithrombotic

Performance on each measure indicates the percentage of eligible patients across the entire

health center organization that received the services in a timeframe and manner consistent with

the measure specifications. A detailed review of each clinical measure, including measure

specifications, is available in the 2013 UDS manual*.

Three Measures of Patient Health Outcomes:

- Low Birth Weight - Percentage of babies born to health center patients whose birthweight was below normal (less than 2500 grams)

- Diabetes Control - Percentage of adult patients 18 to 75 years old with a diagnosis of Type I or Type II diabetes, whose hemoglobin A1c was less than or equal to 9% at the time of the last reading

- Blood Pressure Control - Percentage of patients 18 to 85 years old with diagnosed hypertension whose blood pressure was less than 140/90 (adequate control) at the time of the last reading

* Uniform Data System. 2013; http://bphc.hrsa.gov/uds/datacenter.aspx?q=d. Accessed 10/12, 2014.

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