2018

Examining the Relationship Between Operational and Clinical Performances of Federally Qualified Community Health Centers

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EXAMINING THE RELATIONSHIP BETWEEN OPERATIONAL AND CLINICAL PERFORMANCES OF FEDERALLY QUALIFIED COMMUNITY HEALTH CENTERS

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A DISSERTATION

Submitted to the graduate faculty of The University of Alabama at Birmingham,
in partial fulfillment of the requirements for the degree of
Doctor of Philosophy

BIRMINGHAM, ALABAMA

2018

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ABSTRACT

This dissertation studied the role of Health Information Technology (HIT) adoption on clinical performance in Community Health Centers (CHC); the effects of clinical performance on chief executive officer (CEO) compensation; and the association between CHC's financial and clinical performances. Data from the Uniform Data System (UDS) and the Internal Revenue System (IRS) 990 Forms were extracted for the period 2011-2016. Generalized estimating equations models with state and year fixed effects were performed.

To test the relationship between the age and extent of HIT adoption and clinical performance, Resource Based View of the Firm constructs were used. The age of HIT adoption was found to be positively associated with clinical performance. Further, the full adoption of HIT was correlated with better clinical performance compared to CHCs that had not adopted HIT.

Using the constructs of Agency, Social Comparison, and Managerial Power theories, the association between clinical performance and CEO compensation was studied. Clinical performance was not associated with CEO compensation in CHCs. However, highest paid employees' compensation was significantly related to CEO compensation. Moreover, CEO characteristics were all predictive of higher executive compensation. Contrasting previous studies, non-White CEOs earned more than White CEOs in CHCs.

Based on the Deming Chain Reaction model, the mediating effect of patient visits per patient per disease on the association between clinical and financial performances of CHC was explored. Specifically, two common disease types, hypertension and diabetes, were selected to study this association. While the proposed mediator was found to be inadequate, the study found a positive correlation between clinical and financial performance.

Keywords: Community Health Center, clinical performance, financial performance, HIT, CEO compensation

DEDICATION

This dissertation is dedicated to my parents, wife, and two beautiful children for their love, support, and sacrifice

ACKNOWLEDGMENTS

The success of this dissertation depends largely on the encouragement and guidelines of my committee chair, Professor Nancy Borkowski. I take this opportunity to express my gratitude to her for her valuable and constructive suggestions.

I would also like to offer my special thanks to my committee members, Professors Haiyan Qu, Darrell Burke, Janet Bronstein, and Andrew Brickman. Their involvement and willingness to help me improve my dissertation are much appreciated.

I also take immense pleasure in thanking my colleagues and friends, William Opoku-Agyeman, Justin Lord, Soumya Upadhyay, Neeraj Puro, Akbar Ghiasi, Seongwon Choi and others for their support and care throughout the doctoral program.

Finally, an honorable mention goes to my mom for her encouragement and blessings. I also thank my family who have given me the love and support to achieve my goals.

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INTRODUCTION

Due to various factors such as, Medicaid expansion under the Patient Protection and Affordable Care Act (PPACA) and the growing number of baby boomers, there is expected to be higher demand for primary care (Hofer, Abraham, & Moscovice, 2011). By delivering "*comprehensive, culturally competent, high quality primary health care services*" (Health Resources & Services Administration (HRSA), 2017c) to vulnerable populations, Community Health Centers (CHC) are considered an integral part of nation's primary care system. Approximately 25 million patients seek health care at over 1,400 CHCs that operate close to 10,000 service delivery sites in the U.S. (HRSA, 2017a).

CHCs are non-profit organizations, usually funded under Section 330 of the Public Health Service Act, and incentivized by higher Medicare and Medicaid reimbursement rates (Ku, Cunningham, Goldberg, Darnell, Hiller *et al.,* 2012). Founded in the mid-1960s as part of President L. Johnson's "*War on Poverty*" (Johnson, 1964), CHCs mostly serve low incomes, uninsured, and/or members of minority populations (Adashi, Geiger, & Fine, 2010). For example, in 2013, 35 percent of the patients at CHCs were uninsured and 93 percent lived below the federal poverty level (Cole, Galárraga, Wilson, Wright, & Trivedi, 2017).

Although outpatient health care safety net includes health departments, hospital-based clinics, and emergency rooms, only CHCs provide primary care to patients irrespective to the patient's insurance status (Falik, Needleman, Wells, & Korb, 2001;

Wright, 2013). CHCs are legally obligated to charge patients based on an income-based sliding fee scale; be governed by a patient-majority board; and comply with all of the HRSA performance, accountability, and reporting requirements (Shi, Collins, & Aaron, *et al*., 2007; Wright, 2013). Those requirements qualify them to "receive federal funding, Medicaid and Medicare enhanced reimbursement rates, access to the 340B discount program and federal liability coverage for providers" (Wright, Damiano, & Bentler, 2014, p. 2033).

Traditionally seen as "*providers of last resort*" (Pourat & Hadler, 2014), CHCs' role in the U.S. health system is dramatically changing under the PPACA that established an individual insurance mandate, formed private health insurance exchanges, offered government subsidies for low incomes (people whose income ranges between 100% and 400% of federal poverty level), and enabled states to expand Medicaid (Wright, Damiano, & Bentler, 2014). CHCs are expected to be one of the main player in reforming the healthcare delivery system (Adashi, Geiger, & Fine, 2010). To realize the reform, the American Recovery and Reinvestment Act of 2009 and the PPACA of 2010 offered additional funding of $14 billion for CHCs' expansion and restructuring (Adashi, Geiger, & Fine, 2010). Furthermore, several policy changes have been implemented to promote the transformation of CHCs, such as the funding of residency slots at CHCs, the National Health Service Corps program expansion, and so on (Andrulis & Siddiqui, 2011; Damiano, Bentler, Singhal, *et al*., 2013; Katz, Felland, Hill, *et al.,* 2011). CHCs might also see increased revenue as the Medicaid expansion enables previously uninsured people to gain coverage, and there are new federal funding opportunities for CHCs

(Wright, Damiano, & Bentler, 2014). Also, yet not significant enough, Medicare prospective payment system's recent changes will add to CHCs' revenue (Taylor, 2012).

Care Quality

CHCs are known to provide equal or better quality care at lower costs compared to other primary care settings (Richard *et al*., 2015). Furthermore, Rothkopf, Brookler, Wadhwa, and associates (2011) found that CHC Medicaid patients were less likely (one third) to use an emergency department or be readmitted to a hospital within 90 days, compared to their counterparts who did not use CHCs. However, researchers still debate if CHCs lower costs are associated with providing lower quality care to patients (Frick, Shi, & Gaskin, 2007; Ku, 2009; Mundt, 2014; Streeter, 2009). To evaluate how well CHCs perform, there was a need for a balanced and comprehensive set of measures that would address many issues of the population CHCs serve. HRSA adopted evidence-based quality of care and health outcome measures that had already been used by Medicare and Medicaid and required CHCs to report them in the Uniform Data System in 2008 (HRSA, 2017b). These measures, also known as Core Clinical Measures (CCM), were identified by the Institute of Medicine (IOM, 2003) as a call for a national action to improve health care quality. Currently, CHCs' performance is assessed by HRSA based on CCMs that target health care processes and outcomes CHCs provide, as well as their financial viability (HRSA, 2017b). These CCMs are most suitable for CHCs as they target health conditions that are common among vulnerable populations (HRSA, 2011). The purpose of streamlining the performance measures is multifold. First of all, they can be used by CHCs to set organizational quality improvement goals. Since these measures are standardized and in compliance with national quality measures recommended by recognized health care quality organizations such as the National Quality Forum, Ambulatory Care Quality Alliance, and the National Committee for Quality Assurance (HRSA, 2011), HRSA can use them to align clinical performance across all CHCs. Furthermore, HRSA can use the collected data to compare the performance results across CHCs, incentivize the ones with leading practices, and share these practices to other programs. CCMs at CHCs are grouped into two categories:

- *Quality of care* measures are considered as "process measures" since they report the services which are shown to be correlated with positive health outcomes. It is known that preventive care improves health status of an individual. For example, children receive vaccination to prevent certain diseases; women 21-64 years of age receive Pap tests to early detect cervical cancer; likewise, patients 50-75 years of age have screening for colorectal cancer. Two process measures in this study cover cancer screenings as the National Cancer Institute estimates that over 1.6 million people are diagnosed with cancer in 2017 and 36 percent of these are expected to die (Cancer, 2017). Early detection of cancer by screening – Pap test, mammography, and colorectal cancer tests – in its infancy is shown to increase survival rates by up to 35% (Muller & Sonnenberg, 1995; Newcomb, Norfleet, Storer, Surawicz, & Marcus, 1992; Selby, Friedman, Quesenberry, & Weiss, 1992). Therefore, the American Cancer Society recommends that women be administered a Pap test biannually starting at the onset of their sexual lives (Cancer, 2017). Likewise, adults age 50-75 should be screened for colorectal cancer annually (fecal occult blood testing), or every five years (flexible sigmoidoscopy), or every ten years (colonoscopy)

(Calonge, Petitti, DeWitt, Dietrich, Gregory *et al.*, 2008). While current screening rate is about 65 percent (Centers for Disease Control and Prevention, 2013; Liss & Baker, 2014), it is significantly lower among safety net populations (Klabunde, Cronin, Breen, Waldron, Ambs *et al*., 2011; Liss & Baker, 2014; Meissner, Breen, Klabunde, & Vernon, 2006). CHCs are well positioned to address this concern, and are required to report colorectal cancer screening rates to HRSA.

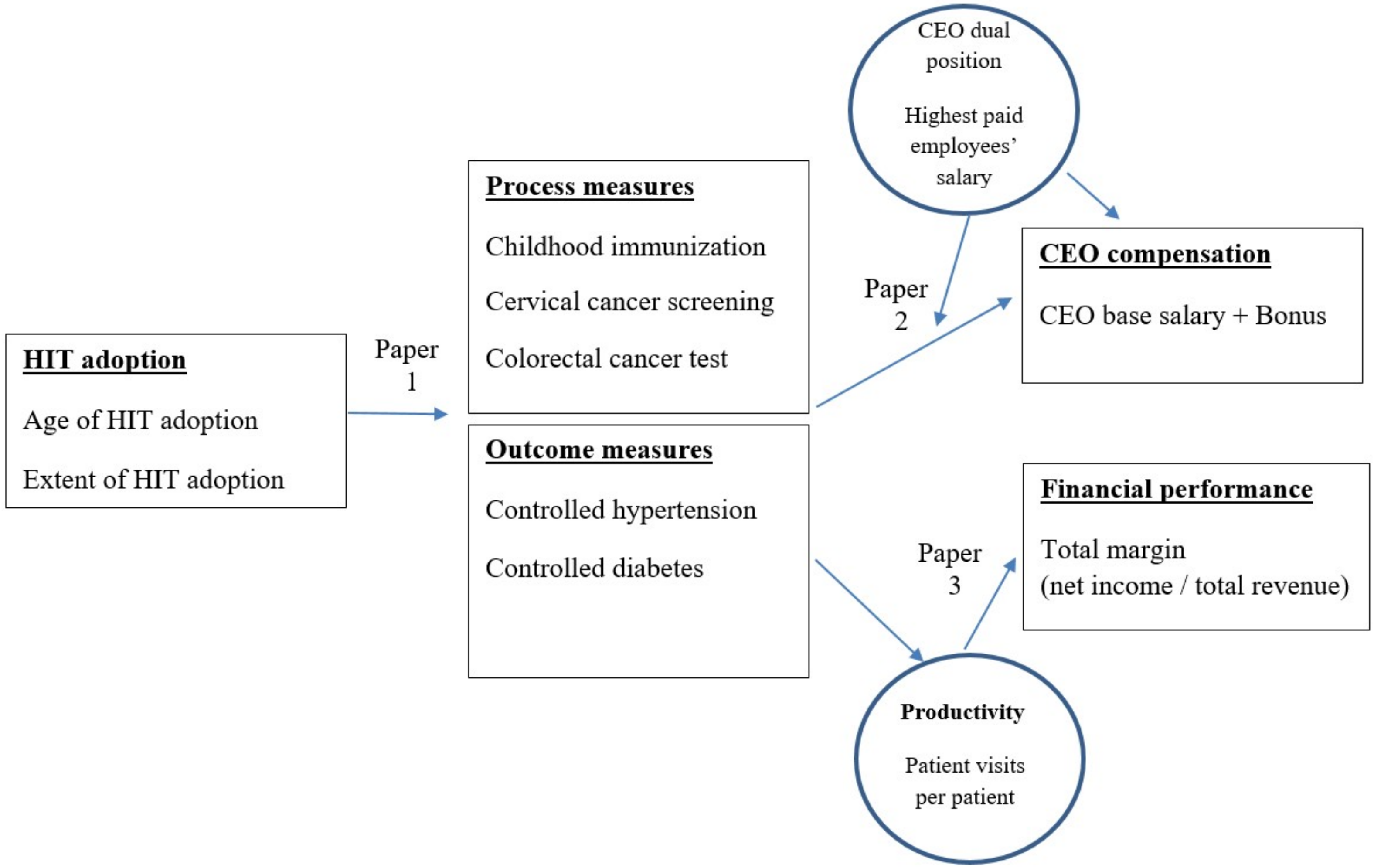
- *Health outcome* measures report the impact of a clinical intervention that health care organization provided. Health outcome measures at CHCs focus on intermediate health outcomes such as how well a patient's hypertension or diabetes is controlled. For example, if higher proportion of CHC's hypertensive patients can control their high blood pressures during the measurement period, it is believed that there will be fewer heart attacks in the long-run. The reason for using hypertension control in this study is that it is considered the most common purpose of outpatient visits (Chobanian, Bakris, Black, Cushman, Green *et al.,* 2003). It is also the predominant risk factor for cardiovascular diseases that can be managed (Shelley, Tseng, Matthews, Wu, Ferrari *et al*., 2011).

Multiple studies have explored the antecedents and outcomes of clinical performance in health care (Beauvais, Richter, & Kim, 2017; Rust, Zahorik, & Keiningham, 1995). Yet, research in CHC settings is limited. Further, most work in those areas depended on cross-sectional data. None, to the best of our knowledge, examined the relationship between clinical performance and CEO compensation in CHCs. The goal of this proposal was to examine the associations between health information technology adoption and clinical performance; clinical performance and executive compensation; and clinical and financial performances using a longitudinal data on a national sample of CHCs.

DISSERTATION PLAN

This dissertation utilized a three-paper format to explore the clinical performance in CHCs. The first paper examined the predictive factors of clinical performance in CHCs, focusing on health information technology adoption. The second paper explored the relationship between clinical performance and CEO compensation while the last paper studied the association between clinical and financial performances. These three papers will help stakeholders better understand the factors that might be associated with better clinical performance, higher financial performance, and higher CEO compensation at CHCs. Figure 1 shows the overall framework that captures all three papers.

Figure 1. Overall framework to explore clinical performance at Community Health Centers



Paper 1: Health Information Technology adoption and Clinical Performance in Community Health Centers

The purpose of this paper was to examine the relationship between HIT adoption and clinical performance in CHCs. The effects of age and extent of HIT adoption on clinical performance was studied using the Resource Based View of the Firm. A national sample of 990 CHCs was utilized in data analysis. CHC data were extracted from the Uniform Data System and the Internal Revenue Service 990 Forms for the period of 2011-2016. Generalized estimating equations model with year and state fixed effects was used to test the hypotheses. Analysis results were reported in beta coefficients.

Paper 2: Pay for Performance: Are Community Health Centers' Executive Compensation related to Performance?

This paper explored the association between clinical performance and executive compensation in CHCs. The constructs of Agency, Managerial Power, and Social Comparison theories were used to generate hypotheses. Uniform Data System and Internal Revenue Service 990 Forms data from a national sample of 984 CHCs were extracted for the period of 2011-2016. In addition to clinical performance, Chief Executive Officer (CEO) compensation was regressed on CEO characteristics and highest paid employees' compensation. Longitudinal data were analyzed using generalized estimating equations model with year and state fixed effects. Study findings were reported in beta coefficients.

Paper 3: How can Care Quality improve Financial Performance in Community Health Centers?

The aim of this paper was to test the relationship between clinical and financial performances using the Deming Chain Reaction model. It was hypothesized that patient visits per patient per disease would mediate the association between clinical and financial performances. The sample consisted of 990 CHCs. Data on clinical and financial performance measures were extracted from the Uniform Data System and Internal Revenue Service 990 Forms for the period of 2011-2016. The Baron and Kenny Model for mediation was used to test the hypotheses.

HEALTH INFORMATION TECHNOLOGY ADOPTION AND CLINICAL PERFORMANCE IN COMMUNITY HEALTH CENTERS

by

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In preparation for Health Care Management Review

Format adapted for dissertation

ABSTRACT

Objective: This study examined the relationship between the age and extent of health information technology (HIT) adoption and clinical performance in Community Health Centers (CHC) using Resource Based View of the Firm perspective.

Data Sources: National sample of CHCs (N=990) that secured section 330 grant funding during 2011-2016 was used. Data on clinical performance and organizational characteristics were obtained from the Uniform Data System. Financial performance information was extracted from the Internal Revenue Service (IRS) 990 forms.

Study Design: Clinical performance indicators were grouped into process and outcome measures that were reported as percentages where higher percent meant better performance. Age of HIT adoption was reported in years and the extent of HIT adoption was an ordered categorical variable with categories reflected as none, partial, and full adoption of HIT. To uncover the average effect of a covariance over the entire sample, generalized estimating equations model was used.

Principal Findings: Average age of HIT adoption was 3 years and over 80 percent of CHCs fully adopted HIT. Each additional year of HIT adoption was associated with an approximate 4 percent increase in both process and outcome measures of clinical performance. Further, CHCs that fully adopted HIT had 7 percent higher hypertension control than those that did not adopt HIT.

Conclusion: This study explored the effect of HIT adoption on clinical performance. The findings of this study can be used by CHC administrators, as well as policymakers and other stakeholders to make informed decisions to achieve sustained competitive advantage.

INTRODUCTION

To achieve "*meaningful use*" of health information technology (HIT) that improves quality of care, the Health Information Technology for Economic and Clinical Health (HITECH) incentives were set into motion in 2009 (Gold, McLaughlin, Devers, Berenson, & Bovbjerg, 2012). The HITECH Act provided financial and technical assistance to health care providers to accelerate the adoption, implementation process and making HIT interoperable across different entities with an ultimate goal of improving care quality (Blumenthal, 2010; Jones & Wittie, 2015). Incentive programs such as the Medicare and Medicaid Electronic Health Record led to high implementation of the HIT (Marcotte, Seidman, Trudel, Berwick, Blumenthal *et al*., 2012); overall, researches showed that the HITECH Act led to a rapid adoption of HIT across the nation's health care organizations (DesRoches, Charles, Furukawa, Joshi, Kralovec *et al*., 2013; Hsiao, Jha, Kig, Patel, Furukawa *et al*., 2013).

Without external support, like federal grants or private contributions, health care organizations located in areas associated with scarce resources, are less likely to adopt robust HIT compared with other health care settings located in resource-rich areas (Bahensky, Jaana, & Ward, 2008; Miller, D'Amato, Oliva, West, & Adelson, 2009). Safety net providers, defined by the Institute of Medicine as "providers that organize and deliver a significant level of health care and other needed services to uninsured, Medicaid and other vulnerable patients" (Altman & Lewin, 2000), typically have insufficient resources thus putting them at greater disadvantage of HIT adoption programs.

Community Health Centers (CHC), also known as Federally Qualified Health Centers, are nonprofit primary health care providers that have been a pivotal part of the health care safety net, offering comprehensive prevention and primary care services to uninsured/underinsured populations, and/or in underserved areas (Falik, Needleman, Wells, & Korb, 2001) and "reducing disparities in health care outcomes" (Anderson & Olayiwola, 2012). The HITECH Act provided CHCs with $1.5 billion for infrastructure investments to assist with the purchase and upgrade of a robust HIT infrastructure (Hawkins & Groves, 2011). In addition, supplemental funding from the U.S. Health Resources and Services Administration (HRSA) and Section 330 grant requirements spurred CHCs to use health IT to improve care quality (Braun, Owens, Bartman, Berkeley, Wineman *et al.,* 2008; Chin, Kirchhoff, Schlotthauer, Graber, Brown *et al.,* 2008; Fiscella & Geiger, 2006; Frimpong, Jackson, Stewart, Singh, Rivers *et al*., 2013). This may explain why CHCs are leading in HIT adoption and use across ambulatory providers (Wittie, Ngo-Metzger, Lebrun-Harris, Shi, & Nair, 2016).

One of the goals of implementing HIT was to address the concerns of low quality of care. Therefore, much of the existing literature has explored the impact of HIT on quality of care and health outcomes. For example, in the health care field, HIT has been shown to help health care providers improve quality of care through better measurement and rewarding quality (Buntin, Jain, & Blumenthal, 2010; Fineberg 2012; Walker & McKethan 2012). Although HIT adoption has seen a rapid increase since the HITECH Act of 2009 across CHCs, there is not sufficient knowledge about the relationship between HIT use and quality improvements within these settings (Frimpong *et al*., 2013).

Therefore, the purpose of this paper was to assess the relationship between HIT adoption and clinical performance of CHCs by utilizing Resource Based View of the Firm.

CONCEPTUAL FRAMEWORK

Donabedian's structure-process-outcome model is commonly used to examine the factors that influence quality of care (Donabedian, 2005). Structure captures the resources an organization inputs to deliver care. Structure elements have been conceptualized as the number of physicians per patient, presence of EHR, and accreditation by Joint Commission on Accreditation of Healthcare Organization (Agency for Healthcare Research and Quality (AHRQ), 2011). Process refers to the activities health care providers carry out to deliver care, such as, prescribing proper medications when needed, providing smoking cessation guidance, and other health related activities (AHRQ, 2011). For instance, children receive vaccination to prevent certain diseases. Outcome is the result of health care provider activities. For example, achieving higher patient satisfaction levels; sustaining HbA1c test results of diabetic patients within normal range; and reducing avoidable complications are considered positive outcomes of care (AHRQ, 2011).

When measuring quality of care, one cannot rely solely on processes or outcomes (AHRQ, 2012). Both are needed to measure health care quality. Moreover, patient characteristics such as age, race, and gender can affect the health care quality (Institute of Medicine, 2001). This study used Donabedian's structure-process-outcome model to examine the relationship among the structure – age and extent of HIT adoption and processes of care (childhood immunization, cervical cancer screening, and colorectal cancer testing), and health outcome (controlled hypertension and diabetes).

CHCs are facing complex challenges due to ongoing health reforms, increasing demand, and national efforts to address quality of care (Short, Palmer, & Ketchen, 2002). HRSA requirement to include CHCs' clinical performance measures in annual grant applications has motivated CHCs to improve clinical performance as to differentiate themselves from other CHCs to secure federal funding. Under such conditions, Resource Based View of the Firm (RBV) is well positioned to examine the key determinants of clinical performance. RBV argues that variations in organizational resources and capabilities enable the organization to outperform its competitors (Barney, 1991). Therefore, clinical performance is "a function of management's ability to acquire and deploy the resources needed to achieve sustained competitive advantage for their organization" (Short, Palmer, & Ketchen, 2002). Resources can be tangible assets that CHCs possess as well as intangible assets, such as, skills and experiences of individual employees (Peteraf, 1993). In an ideal world, CHC management will make every effort to accumulate resources that are considered valuable, rare, and non-imitable in order to differentiate themselves from other organizations and to provide themselves with a competitive advantage (Barney, 1991; Short, Palmer, & Ketchen, 2002). When CHCs incorporate HIT into their existing operations, this allows them to be able to create and develop specific organizational capabilities and competencies (Tarafdar & Gordon, 2007). A competence is usually embedded within the organization's culture and daily operations (Day, 1994). These competencies help organizations achieve superior performance as their distinctiveness making it difficult to be imitated by other organizations.

Intangible assets – employee skills and experiences are gained through using HIT. Organizations spend time to learn and adjust to new technologies before fully implementing them in their daily operations. Early adopters of HIT might face challenges in the short-term due to initial large investment costs; yet, this initial risk will provide the early adopters with a competitive advantage until the rest of the industry adopts the same technology. CHCs that are early adopters will be able to incorporate HIT into routine operations in order to reap the benefits that HIT can offer. Therefore, early adoption of HIT enables CHCs to yield better clinical performance. RBV posits that superior performance is a function of the unique resources and capabilities of an organization. The early adoption of HIT (Figure 1) can provide CHCs with the competitive advantage to outperform other CHCs that have not adopted this technology; therefore, it was hypothesized that:

Hypothesis 1: *Age of HIT adoption is positively associated with CHC clinical performance*

CHCs strive to benefit from the wide range of benefits offered by HIT to gain and sustain a competitive advantage. HIT is adopted by a CHC based on the assumption that the more comprehensive it is, the better clinical performance should be (Figure 1). CHCs can partially or fully implement HIT depending on their financial capabilities and willingness/readiness of their providers. Therefore, it was posited that:

Hypothesis 2: *Extent of HIT adoption is positively associated with CHC clinical performance*

METHOD

Data

This study used administrative secondary data from the Uniform Data System (UDS) and the Internal Revenue Service (IRS) Form 990 for the period 2011-2016. CHCs started submitting HIT data in 2010, and the most recent available UDS data was 2016. CHCs are required to submit annual UDS data. Although most CHCs operate several care delivery sites, UDS data lack individual site information and are submitted as an aggregate data at the organizational level. The UDS is collected by HRSA, and contains data on CHC patient demographics, insurance type, staffing, scope, and volume of services CHCs provide, quality of care, health outcomes and disparities, number of delivery sites, finances, and electronic health record information. The HIT part of UDS has information about whether CHCs have an EHR; whether it is used in all sites; and completeness in the use of HIT functionalities. The second data source was the Internal Revenue Service (IRS) Form 990. It was extracted from Guidestar, an Internet-based nonprofit information source for the period 2011 – 2016. As nonprofit tax-exempt organizations, CHCs do not pay federal taxes. Instead, they file an informational return that is called a Form 990. However, there are some CHCs, such as Seldovia Village Tribe in Alaska owned and operated by the local tribe, and not required to submit 990 Forms to the IRS. Moreover, some CHCs were owned and operated by government agencies, such as Mobile County Health Department; hence, they are not required to file a 990 Form.

In this paper, CHCs are those Federally-Qualified Health Centers that meet both federal requirements and receive grants under Section 330. There were about 100 CHC look-alikes that meet federal requirements but have not received Section 330 grants.

Look-alikes were not included in this study. Moreover, the CHCs located in U.S. territories; CHCs that have solely school-based, mobile, or seasonal sites; and government-owned CHCs were not included in this study.

Variables

Table 1 shows definitions and data sources for all variables used in the analysis. Core Clinical Measures (CCM) served as dependent variables, and they were grouped in two categories: quality of care and health outcome variables. Quality of care variables had three specific variables – percentage of women 21 to 64 years of age who received one or more Pap tests; percentage of adults 50 to 80 years of age who had an appropriate screening for colorectal cancer; and percentage of children 2 years of age receiving appropriate immunizations. Likewise, health outcome variables included percentage of adults (≥18 years) patients, with diagnosed diabetes who had hemoglobin A1c lower than 8 percent and percentage of adult (≥18 years) patients, with diagnosed hypertension whose blood pressure was less than 140/90 (adequate control) during the measurement year.

Independent variables included the age and the extent of HIT adoption. The former referred to the time period a CHC had adopted HIT (hypothesis 1), whereas the latter referred to the extent of HIT adoption which had three ordered categories: all sites and all providers (fully adopted); at some sites or for some providers (partially adopted); or none (hypothesis 2).

The study controlled for poverty, sex, race, and payer mix of patients; organization size, location, accreditation, and financial performance. Due to economies of scale larger practices are more likely to recruit best talent and have robust infrastructure, thus improve quality of care (Casalino, 2006; Crosson, 2005). For example, larger practices are shown to provide better preventive services such as hemoglobin A1c testing and mammography (Pham, Schrag, Hargraves, & Bach, 2005). This study used total patient visits as a proxy for organization size. This variable was log transformed to deal with right-skewed data by bringing extreme values, CHCs with over a million visits a year, closer to the rest of the data. Financially stable organizations can afford to invest in both HIT infrastructure and quality improvement initiatives; that can explain the positive relationship between financial viability and quality of care (Weech-Maldonado, Neff, & Mor, 2003). Total margin was used in this paper as a financial performance measure. Moreover, people living in remote areas are less likely to receive recommended quality care (Bello, Hemmelgarn, Lin, Manns, Klarenbach *et al.*, 2012). Therefore, whether a CHC was located in a rural area, was a binary variable (0 = rural; 1 = urban). However, most CHCs operate multiple sites that can be located in rural or urban areas. The location variable in this paper only referred to the administrative site. As accreditation programs are shown to improve clinical outcomes (Alkhenizan & Shaw, 2011), a binary variable (0 = not accredited; 1 = accredited) was used to control for its impact on the main hypotheses. Furthermore, patient's socioeconomic status is known to affect the quality of care, particularly the disparities in quality of care between insured and uninsured are well documented (IOM, 2001). In the similar vein, racial disparities in the process and outcome of care have been reported in numerous studies, for instance, diabetes self-monitoring (Brown et al., 2003; Nwasuruba, Osuagwu, Bae, Singh, & Egede, 2009), and hemoglobin A1c screening (Hosler & Melnik, 2005; Thackeray, Merrill, & Neiger, 2004).

Analysis

Descriptive statistics with means and standard deviations of the continuous variables, and frequencies and percentages of categorical variables, presented the organizational characteristics as well as core clinical measures of CHCs. Further, the bivariate statistics, Pearson product-moment correlation and ANOVA results of dependent and other variables were conducted to examine the overall associations.

Multivariable regressions with year and state fixed effect were performed for each Core Clinical Measures with age and extent of HIT adoption to test the relationship between HIT adoption and clinical performance. Both age and extent of HIT adoption were used in the same model. Moreover, their interaction was tested as a sensitivity analysis. Robust standard errors were used to account for heteroscedasticity (White, 1980). Stata 13.1 and SAS 9.4 were used for data management and analysis.

RESULTS

The descriptive statistics of CHC organizational characteristics and core clinical measures are shown in Table 2. According to the UDS data, there were 1367 CHCs in 2016. About 400 of these CHCs were administered by either local tribes or government agencies that are not required to submit IRS 990 Forms. Therefore, after merging UDS data with IRS 990 Forms, there were, on average, 990 CHCs per year without missing data. Moreover, the variable that represented adequate diabetic control had captured only 3 years (2014-2016). Likewise, colorectal test variable had 5 years of data. Average age of HIT adoption was 3.08 years; 82 percent of CHCs completely adopted HIT while approximately 9 percent did not adopt HIT. Close to half of the diabetic and hypertensive patients' conditions were adequately controlled while only 21 percent of patients had colorectal test performed. Child immunization was also low, at 40 percent. Most of the CHCs (67 percent) were not accredited by the Joint Commission on Accreditation of Healthcare Organizations, and majority of the CHCs' administrative sites were located in urban areas (58 percent). Average percent of patients covered by Medicaid was 41 percent; however a further analysis yielded that it increased over time from 35 percent in 2011 to 47 percent in 2016. Percent of Medicare beneficiaries was 8 percent, and it did not vary much between 2011 and 2016. Likewise, patients with private insurance were approximately 15 percent and it only increased by 2 percent over time, 14 percent in 2011 and 16 percent in 2016. However, percentage of uninsured patients had a significant decrease, from 42 percent in 2011 to 27 percent in 2016. Over half of the patients had income below the 100 percent federal poverty level, and two thirds of the patients were minorities. Average number of total patient visits was around 80,000 doubling from 51,000 in 2011 to 100,000 in 2016.

The Pearson product-moment correlations in Table 3 show high correlations between the age of HIT adoption and dependent variables – Core Clinical Measures. Anova results of extent of HIT adoption on dependent variables were also significant.

Those results led way to further multivariable analyses. Table 4 has the results of multivariate regression analysis with state and year fixed effects. As hypothesized (hypothesis 1), age of HIT adoption was significantly associated with Core Clinical Measures but not child immunization. Specifically, each additional year of HIT adoption was associated with 2 percent increase in diabetic control, 5 percent increase in hypertension control, over 3 percent increase in colorectal test, and 4 percent increase in

Pap test. The results of extent of HIT adoption were mixed. CHCs that fully adopted HIT had 7 percent higher hypertension control than the ones that had no HIT at all (hypothesis 2). However, process measures yielded different results. Partial adoption of HIT was negatively associated with Colorectal test (-11 percent), Pap test (-13 percent), and child immunization (-14 percent) compared to the CHCs that had no HIT at all (hypothesis 2). The Joint Commission on Accreditation of Healthcare Organization's accreditation had mostly a positive association with Core Clinical Outcomes where hypertension control (4 percent), colorectal test (2 percent), and child immunization (4 percent) being higher in accredited CHCs than those not accredited. Location was found to be associated with health outcome variables where CHCs that were located in urban areas had lower (-3 percent) diabetic control and (-4 percent) hypertension control than the CHCs that resided in rural areas. Organization size was negatively associated with hypertension control (-2 percent) and child immunization (-5 percent). Financial performance, on the other hand, was positively associated with colorectal test (0.1 percent), child immunization (0.2 percent), and Pap test (0.1 percent). Payer mix of CHC patients was not consistent on its association with Core Clinical Outcomes, and the statistical significant ones had low coefficients. Minority percentage, likewise, had very low coefficients.

DISCUSSION

This paper studied the association of the age and extent of HIT adoption with clinical performance in CHCs from the perspective of Donabedian's structure-process-outcome model utilizing resource based view of the firm (Donabedian, 2005). HIT adoption as a resource is considered a structure that CHCs input to deliver care that would in turn affect processes and outcomes of CHCs. The resource based view suggests that organizations can outperform their competitors by accumulating tangible and intangible resources that are valuable, rare, and non-imitable that would enable the organizations achieve sustained competitive advantage (Short et al., 2002). By utilizing technological advances, HIT is argued to improve care quality, control cost, and promote patient-centeredness (Blumenthal, 2010). Studies have examined the association between HIT and service delivery, and found improvements in cost savings and health outcomes (Garg, Adhikari, McDonald, Rosas-Arellano, Devereaux *et al*., 2005; Hillestad, Bigelow, Bower, Girosi, Meili *et al*., 2005; Kaushal, Shojania, & Bates, 2003). Likewise, HIT adoption/use was shown to be associated with process measure improvements (Bright, Wong, Dhurjati, Bristow, Bastian *et al.*, 2012), as well as quality improvements (Himmelstein, Wright, & Woolhandler, 2010). Buntin and colleagues' systematic review found a strong positive relationship between HIT adoption/use and quality of care (Buntin, Burke, Hoaglin, & Blumenthal, 2011).

While HIT adoption is a tangible asset, employee skills and experiences that are gained through using HIT are considered intangible assets. Early adopters of HIT are in a competitive advantage due to their capability to effectively incorporate HIT into routine operations. This study confirmed that the age of HIT adoption was highly associated with process and outcome variables – Core Clinical Measures. An additional year in HIT adoption was positively associated with all clinical performance measures, except child immunization. The lack of association of child immunization rates with HIT adoption might be explained by the following rationale. Most CHCs do not employ pediatricians due to several reasons: children in poor income families are usually covered through Medicaid or CHIP and can go to other providers to seek care; there are solely school-based CHCs that hire pediatricians where child immunization rates might be higher; however, this study did not include those organizations.

In this study, the association between the extent of HIT adoption and clinical performance was found to be inconclusive. Process measures of clinical performance all showed similar results where partial adoption was associated with lower clinical performance compared to CHCs that did not adopt HIT. It is assumed that there maybe some barriers within organization that prevent the full-adoption of HIT. CHCs that partially adopted may not know how to effectively incorporate HIT into operations or that the providers at CHCs may be unprepared or unwilling to use HIT. Among health outcome measures, rates of controlled hypertension was significantly higher in CHCs that fully implemented HIT, compared to the ones that did not adopt HIT. These findings confirmed previous studies (Bright et al., 2012; Himmelstein, Wright, & Woolhandler, 2010).

Financially stable organizations are able to invest in quality improvement initiatives (Frimpong et al., 2013; Weech-Maldonado et al., 2003). This study confirmed this finding that process measures were higher in financially stable CHCs. Organizations with better access to resources can invest more in their operations and processes. Outcome measures were lower in urban areas compared to the rural ones. This counters previous study (Bello et al., 2012) that found people were less likely to receive quality care in rural areas. In CHC setting, urban sites are usually crowded, and have more homeless and minority patients as compared to rural areas. Furthermore, this study used administrative site's location for analysis while CHCs have multiple (M=9, SD=10) service sites that can be located in both rural and urban areas.

This study has several limitations. First, CHCs operate multiple sites (M=9, SD=10) that can be located nearby the administrative site or as far as 100 miles from it. The UDS is aggregate data, at the organizational level. Therefore, it is impossible to control for patient characteristics, specific site characteristics, as well as community characteristics. Second, UDS was collected for reporting purposes, and one cannot ensure the accuracy of the dataset. Third, the extent of HIT adoption is a very broad definition and may not be able to capture how comprehensive HIT use is. Specific HIT functionalities such as the presence of e-prescribe, electronic exchange of patient summaries, and electronic medication list could be a better proxy to represent the extent of HIT adoption. Yet, those variables have been inconsistent over time adding new ones every year, and there was no variation among the existing ones that reported in UDS. Fourth, CHC employee data, like employee full time equivalent should have been controlled for. However, UDS data lack those variables. Furthermore, operating margin would be a better alternative to represent financial performance. Most CHCs' depend on federal and state funding whereas patient revenue is close to nonexistent. Therefore, a proper operating margin couldn't be calculated.

Nevertheless, most of the studies that have examined the relationship between HIT adoption/use and clinical performance were at hospital or nursing home settings. This study is one of the few that explored this association in CHCs. In addition, it used the most comprehensive data to capture clinical, financial, and organizational characteristics of CHCs.

Future studies should focus on the association between the extent of HIT adoption and clinical performance, maybe by using a different proxy for HIT adoption. Moreover, a qualitative follow-up study could shed light on the results this study found where partial HIT adoption was associated with lower process measures. Further, this study concentrated on HIT adoption while it doesn’t necessarily mean HIT use. Future studies should explore the effect of an actual use of HIT on clinical performance.

The current study showed that early adopters of HIT had better clinical performance measures. Extent of HIT adoption was also related to better hypertension control. Those findings may inform policy makers with respect to policies to incentivize and encourage CHCs to adopt HIT and implement it in full extent. Further, the findings of this study can be used by CHC administrators to make informed decisions to achieve sustained competitive advantage.

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Figure 1. Donabedian's Structure-Process-Outcome Model

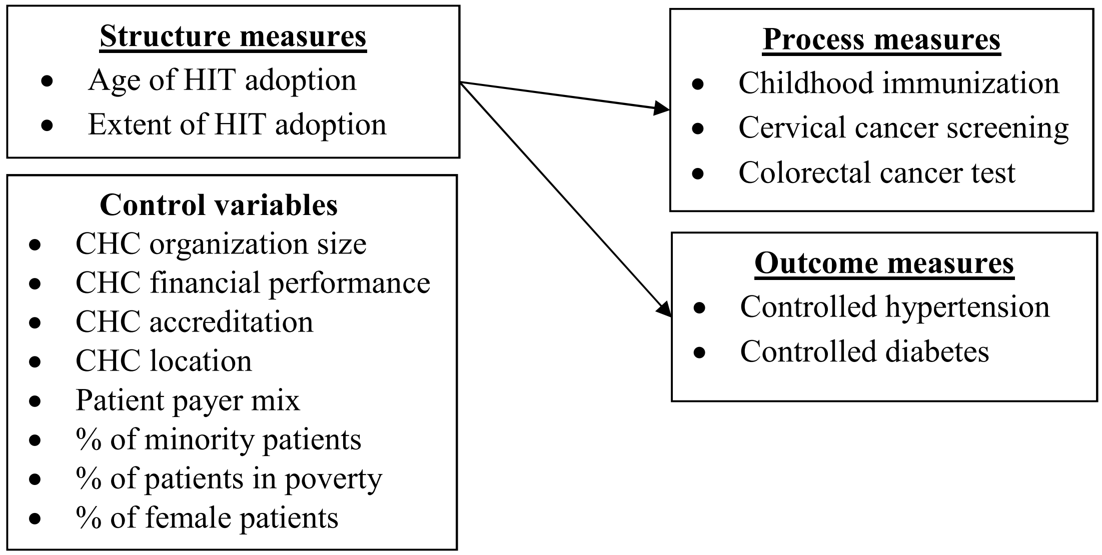

Table 1. Definitions and Sources of Variables

Variable	Definition	Source
Dependent variable		
Process of care variables	- Percentage of women 21 to 64 years of age who received one or more Pap tests - Percentage of adults 50 to 80 years of age who had an appropriate screening for colorectal cancer - Percentage of children 2 years of age with appropriate immunizations	UDS
Health outcome variables	- Percentage of patients, 18 years and older, with diagnosed diabetes who had hemoglobin A1c lower than 8 percent during the measurement year - Percentage of patients, 18 years and older, with diagnosed hypertension whose blood pressure was less than 140/90 (adequate control) during the measurement year	UDS
Independent variables		
Age of HIT adoption	Years HIT has been in place	UDS
Extent of HIT adoption	Ordered categories: fully adopted = all sites and all providers; partially adopted = at some sites or for some providers; or none	UDS
Control variables		
Organization size	Log of total number of patient visits	UDS
Payer mix	Percentages of different payer types	UDS
Location-administrative	Urban (1) vs rural (0)	UDS
Accreditation	Accredited by the Joint Commission on Accreditation of Healthcare Organizations (Yes=1, No=0)	UDS
Financial performance	Total margin (net income/total revenue)	IRS 990 Form
% of minority patients	Percentage of minority patients	UDS

% of patients in poverty	Percentage of patients who live below 100 percent federal poverty level	UDS
% of female patients	Percentage of female patients	UDS

Note: UDS = Uniform Data System; HIT = Health Information Technology; IRS = Internal Revenue Service

Table 2. Descriptive analysis of variables (N=5952 organization-year)

Variable	N	Mean / Percent	Std Dev
Diabetes (controlled)	2955	45.71%	21.06
Hypertension (adequate)	5950	43.85%	27.69
Colorectal test	5048	20.64%	21.30
Child immunization	5952	40.21%	31.36
Pap test	4960	28.66%	27.37
Extent of HIT adoption			
all sites / all providers	4903	82.37%	
at some sites / some providers	538	9.04%	
none	511	8.59%	
Age of HIT adoption	5952	3.08yrs	1.83
Accreditation of organization			
Accredited	1910	32.09%	
Not accredited	4042	67.26%	
Total margin	5932	5.59%	10.18
Location (administrative)			
Urban	3424	57.53%	
Rural	2528	42.47%	
Percentage of patients with Medicaid	5952	41.11%	18.44
Percentage of patients with Medicare	5952	8.14%	5.85
Percentage of patients with private insurance	5952	14.82%	12.03
Percentage of uninsured patients	5952	34.55%	18.66
Percentage of patients in poverty	5952	52.29%	23.20
Percentage of minority patients	5952	66.20%	25.99
Percentage of female patients	5952	57.25	22.38
Total patient visits	5948	80,675.51	104,629.90

Abbreviations: CHC – Community Health Center; HIT – Health Information Exchange; FPL – Federal Poverty level

Table 3. Bivariate analysis of variables

Variable	**Outcome measures**		**Process measures**		
	Diabetes (N=2,955)	Hypertension (N=5,946)	Colorectal test (N=5,045)	Child immunization (N=5,952)	Pap test (N=4,950)
Independent variables					
Age of HIT adoption	0.17***	4.414***	0.365***	0.208***	0.361***
Extent of HIT adoption					
all sites / all providers	23.02	47.96	22.00	43.00	31.65
at some sites / some providers	34.69	24.44	9.80	21.66	13.84
none	46.57	18.50	8.90	30.93	11.41
Control variables					
Accreditation of organization					
Accredited	44.19	45.50	21.84	40.52	31.47
Not accredited	46.66	43.07	20.02	40.01	27.31
Location (administrative)					
Urban	43.22	41.95	21.15	39.48	29.80
Rural	49.17	46.42	19.94	41.18	27.13
Total margin	0.087**	0.088***	0.117***	0.054*	0.102***
Percentage of patients with Medicare	0.146***	0.044***	-0.022	0.041	-0.041
Percentage of patients with Medicaid	-0.011*	0.064***	0.144***	-0.044*	0.100***
Percentage of patients with private insurance	0.131***	0.111***	0.024	0.052*	0.014
Percentage of uninsured patients	-0.065*	-0.289***	-0.149***	-0.001	-0.101***
Percentage of patients in 100% FPL	-0.120***	-0.091**	-0.039	-0.023	-0.013
Percentage of minority patients	-0.061*	-0.006	0.107***	0.003	0.102***
Percentage of female patients	-0.076*	-0.103***	0.022	-0.080***	0.010
Log of total visits	-0.54+	-0.018	0.048***	-0.142***	0.115***
Year					
2011		24.669		24.124	14.285
2012		34.192	9.444	23.663	19.981
2013		42.059	14.182	47.010	24.521
2014	41.251	49.488	19.801	52.468	32.026
2015	47.134	54.099	27.947	59.593	37.437
2016	48.468	56.151	30.886	33.568	41.606

Abbreviations: CHC – Community Health Center; HIT – Health Information Exchange; FPL – Federal Poverty level

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

Table 4. Regression results with Core Clinical Measures as dependent variables

Variable	Outcome measures		Process measures		
	Diabetes (N=2,955)	Hypertension (N=5,946)	Colorectal test (N=5,045)	Child immunization (N=5,952)	Pap test (N=4,950)
Independent variables					
Age of HIT adoption	2.266**	5.009***	3.231***	0.202	4.048***
Extent of HIT adoption					
none	reference	reference	reference	reference	reference
at some sites / some providers	-2.304	-5.861	-10.526**	-14.088**	-12.857**
all sites / all providers	6.801	7.434*	-2.888	-0.626	1.007
Control variables					
Accreditation of organization					
Not accredited	reference	reference	reference	reference	reference
Accredited	-0.771	3.727**	2.130+	3.545*	2.063
Location (administrative)					
Rural	reference	reference	reference	reference	reference
Urban	-2.962+	-3.789*	-1.182	-0.038	-0.069
Total margin	0.075	0.090	0.115*	0.181**	0.112+
% of patients with Medicare	0.750*	0.144	0.081		-0.009
% of patients with Medicaid	0.150	0.031	-0.067	-0.463***	-0.140
% of patients with private insurance	0.271	0.017	-0.053	-0.461**	0.181
% of uninsured patients	0.256	0.033	-0.029	-0.247*	0.043
% of patients below 100% FPL	-0.031	0.009	-0.005	0.086*	-0.006
% of minority patients	0.118**	0.090**	0.097***	0.067+	0.130***
% of female patients	0.055	-0.124	0.383***	-0.023	0.412***
Log of total visits	0.151	-2.400***	-0.757	-4.776***	1.000

Abbreviations: CHC – Community Health Center; HIT – Health Information Exchange; FPL – Federal Poverty level
+ p <0.1, * p <0.05, ** p <0.01, *** p <0.001

PAY FOR PERFORMANCE: ARE COMMUNITY HEALTH CENTERS' EXECUTIVE COMPENSATION RELATED TO CLINICAL PERFORMANCE?

by

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In preparation for Medical Care Review and Research

Format adapted for dissertation

ABSTRACT

Objective: This study used agency, social comparison, and managerial power theories to examine the relationship between clinical performance and chief executive officer (CEO) compensation in Community Health Centers (CHC).

Data Sources: This study used a national sample of CHCs (N=984) that secured section 330 grant funding during 2011-2016. Data on clinical performance and organizational characteristics were obtained from the Uniform Data System. Financial performance information was extracted from the Internal Revenue Service 990 forms.

Study Design: CEO base salary and bonus were added to create the CEO compensation variable and regressed on clinical performance indicators. The generalized estimating equations with state and year fixed effects was used in the study. Independent variables were lagged for 1 year.

Principal Findings: There was no association between clinical performance and CEO compensation of CHCs. Further sub-analyses revealed that $1,000 increase in the highest paid employees' compensation was associated with $620 increase in CEO compensation. Moreover, all CEO characteristics were positively associated with CEO compensation. Apart from CEO race, most findings were in line with previous study results. Non-White CEOs were found to make more than White CEOs.

Conclusion: The findings of this study can assist HRSA improve its assessment policies in allocating funding to CHCs, as well as help board members to make informed decisions on setting CEO compensation.

Keywords: CEO compensation, clinical performance, Community health center

INTRODUCTION

Corporate scandals, a recent financial crisis – Great Recession, and the ensuing Emergency Economic Stabilization Act of 2008 (Congress, 2008; Public Broadcasting Service, 2010) have raised public awareness of escalating Chief Executive Officer (CEO) compensation. CEO compensation at healthcare organizations has received increased scrutiny from policymakers because nearly 20% of the nation's gross domestic product (GDP) is spent on healthcare (Olsen, Saunders, & Yong, 2010; Robert Wood Johnson Foundation, 2016). Questions have been raised about the appropriateness and relevance of CEO pay at nonprofit healthcare organizations both from an ethical and pragmatic perspectives (Carreyrou & Martinez, 2008). Case in point, in 2008, Jonathan Dunning, the former CEO of Birmingham Health Care Community Health Center (CHC) saw a $100,000 increase in his salary, totaling $290,000 (Oliver, 2012). However, during that period there was no increase in revenue of the center, no additional grants secured, and no improvement in health care quality (Oliver, 2012). In contrast, other Alabama CHCs' CEOs with greater revenues were compensated lower than Cunning. Birmingham Health Care reported $6.1 million in revenue and a CEO who earned $290,000 as compared to Whatley Health Services in Tuscaloosa that reported $11.4 million in revenue with its CEO earning $151,784 (Oliver, 2012). While this anecdotal data cannot be generalizable, it raises a question as what determines CEO compensation in health care settings, specifically CHCs?

Among determinants of CEO compensation in the health care field, financial performance is the one that has been studied extensively (Brickley & Van Horn, 2002; Reiter, Sandoval, Brown, & Pink, 2009). Financial performance is undeniably important, particularly for safety net providers such as CHCs (Akingbola & Van Den Berg, 2015). However, with the passage of the Patient Protection and Affordable Care Act (PPACA), CHCs received additional funding to increase access to care and improve care quality (Adashi, Geiger, & Fine, 2010). This increase in funding could possibly assist financially struggling CHCs focus on increasing access and improving care quality. One way to improve care quality, theoretically, is to implement performance-based structure focusing on nonfinancial performance. One of the organizational nonfinancial performance indicators is quality of care (Shay & White, 2014). One potential way to accomplish this is to link CEO compensation to quality of care measures and outcomes; however, this is not a new idea. Bertrand and associates found a significant positive relationship between care quality variables – nurses/physicians per patient days and CEO compensation (Bertrand, Hallock, & Arnould, 2005). In the same vein, according to a study in 2006, two-thirds of hospitals stated that 15 percent of CEO variable compensation was based on health care quality (Joshi & Hines, 2006). More recent data on nonprofit health care providers have shown that incentive compensation that is linked to quality of care has increased up to 35 percent (Evans, 2014). The majority of research of CEO compensation in the health care industry has been limited to hospitals, therefore this paper expands our knowledge into non-hospital areas of health care industry. The purpose of this study was to examine the relationship between CHC clinical performance and CEO compensation by applying the constructs of agency, social comparison, and managerial power theories.

BACKGROUND

One of the most debated issues of the 2016 presidential race was the income inequality between the rich and poor (Boak, 2016; Jones, 2016). The disparities with income inequality, specifically relative to CEO pay, has received increased scrutiny from the media, shareholders, and government officials (The U.S. Securities and Exchange Commision, 2015; Starkman, 2015). While middle-class wages have stagnated, CEO pay has continued to rise over the past four decades. In 2015, an average worker made 335 times less than a top CEO (Nicks, 2016). CEO compensation is seen as unfair distribution of wealth (Salazar & Raggiunti, 2016). Many perceive that CEOs are excessively rewarded and that the gap between the CEO and his/her employees is unfair. In the nonprofit health care industry, the average annual increase in CEO compensation was 30% in 2012-2013 (Sandler, 2015). Therefore, in nonprofits (Gosselin & Zitner, 1997; Lublin, 2003), with nonprofit health care in particular (Carreyrou & Martinez, 2008; Firstenberg & Lane, 2011), excess CEO compensation has raised concerns in the press and by regulators.

Proponents for high CEO compensation argue that shareholders usually approve the CEO's compensation package and these packages reflect the financial health of the firm (i.e. share price) (Feloni, 2014). In this argument, CEOs are technically paid for performance, for the value they create. Proponents argue that CEO compensation packages have to be high in order to attract and retain the best talent in the field (Bruce, Buck, & Main, 2005). However, critics counter this argument by claiming that generally there is no association between organizational performance and CEO compensation (Cable & Vermeulen, 2016; Galloro, Vesely, & Zigmond, 2010; Petroff, 2016). What is more, the increase between the average CEO compensation and the average worker has been widening. Exasperating this issue is when non-profit CEOs earn six-figure salaries and bonuses while the organization is in financial distress (Briody, 2013; Carlson, 2009). From an ethical perspective, at a nonprofit organization, every penny spent on the CEO is a penny denied for community benefit, such as, health services for the poor or uninsured. This brings about the important question, what determines CEO compensation?

In healthcare, there have been large amounts of research examining financial performance (Aggarwal, Evans, & Nanda, 2012; Brickley, Van Horn, & Wedig, 2010; Moskowitz, 1999; Oster, 1998; Pink & Leatt, 1990; Stahl, 2000); organization size (Aggarwal et al., 2012; Eichmann & Santerre, 2010; Kramer & Santerre, 2010); hospital type (Eichmann, & Santerre, 2011; Schraa, 2007; Tillman, 2009); market characteristics (Brickley et al., 2010; Eichmann, & Santerre, 2011); human capital (Brickley et al., 2010; Cardinaels, 2009; Sigler, 2003); executive demographics (Brickley et al., 2010; Santerre & Thomas, 1993; Weil & Kimball, 1995); board attributes (Aggarwal et al., 2012; Brickley et al., 2010; Cardinaels, 2009; Moskowitz, 1999); job difficulty (Brickley et al., 2010; T. Eichmann, & Santerre, 2011); as well as nonfinancial performance (Brickley et al., 2010; Kramer & Santerre, 2010; Tillman, 2009) as predictors of CEO compensation. Among nonfinancial performance measures, the effects of care quality on CEO compensation has also been studied in both for-profit and nonprofit hospitals (Evans, 2014; Joshi & Hines, 2006). The findings were not conclusive as previous studies yielded mixed results (Aggarwal et al., 2012; Brickley et al., 2010; Moskowitz, 1999; Oster, 1998; Pink & Leatt, 1990; Stahl, 2000)

There are a few factors that may contribute to high CEO compensation in the nonprofit health care field. Nonprofit board members voluntarily serve on boards without expecting any financial gains. Therefore, they may not be personally or financially affected by the CEO's actions compared to their for-profit counterparts. Not-for-profit boards are usually larger and more diverse. This in turn can negatively affect the not-for-profit board's efficiency and effectiveness compared to the boards of for-profits that is smaller and homogenous (Alexander, Young, Weiner, & Hearld, 2008).

All organizations have to compete in order to recruit and retain the best talent. The market for successful executives is competitive. This places additional burdens on not-for-profit organizations as they must compete against for-profit organizations to hire the best managers. Therefore, boards at nonprofits may try to create CEO compensation packages that are just as good as the for-profit packages. Furthermore, medical professionals, particularly specialists, have relatively high compensation packages. Doctors, on average, earn salaries that are higher as compared to most other professionals. Thus, CEOs at hospitals, both for-profit and nonprofit, can use those figures to justify their own pay (Spitzer, 2005). Lastly, the absence of stock option may lead to inflated CEO pay at nonprofits to match the payment with those in for-profits to attract new managers (Greene, 1992). Therefore, nonprofit hospital CEOs receive higher base salaries compared to for-profits (Tillman, 2009) as for-profit hospitals compensate their CEOs with high bonuses and stock options (Ballou & Weisbrod, 2003).

CONCEPTUAL FRAMEWORK

CHCs are expected to meet multiple goals – increase access to health care, improve quality of care, and control costs while being able to manage a sustainable business (Morgan, Everett, & Hing, 2014). From both legal and moral perspectives, the CEO of a CHC is responsible that patients receive high quality care and that the organization does everything within their effort to improve the delivery of care (Parand, Dopson, Renz, & Vincent, 2014). The CEO is often credited for setting the tone and culture of the organization. Although all medical staff have an important role in shaping quality performance, the CEO's role is considered critical as he/she sets the priorities; hires clinical leadership, and makes major investment decisions (Joynt, Le, Oray, & Jka, 2014). Therefore, CEOs play a vital role in addressing quality of health care (Berwick, 2007; Kizer, 2001a, 2001b).

Likewise, CHC boards are pressed to take quality of care into consideration when setting policies for their organization (Gosfield & Reinertsen, 2005; IOM, 2001). Furthermore, boards have legal and financial duties such as approving the budget, hiring and monitoring the executive director/CEO, as well as, to set other CHC policies (Wright & Martin, 2014). To examine the relationship between the board and CEO, agency theory is appropriate. Based on the logic of the theory, CEO compensation is a function of fixed payment and compensation for past and current performance (Ahn, 2016; Boschen & Smith, 1995).

Conceptually, agency theory arises when the owner – principal, in this case the board of the CHC delegates another person – agent, here CEO, to act on the board's behalf. The CEO might have differing goals and risk preferences than the board

(Eisenhardt, 1989). In order to reduce the risk of an opportunistic agent from behaving in his/her own interest, there are two solutions agency theory offers (Eisenhardt, 1989). First, boards must actively monitor their CEO's performance. If the board finds this solution difficult to implement, a second option requires the formation of performance-based contracts to align the CEO's behavior with the board's goals (Eisenhardt, 1989). Linking CEO compensation to organizational goals via quantifiable performance indicators is considered one of the useful tools that can mitigate the agency theory problem. The establishment of quantifiable goals, helps keep the CEO on track and accountable to the board, while providing the CEO with a document to justify his/her compensation. These CEO compensation/performance metric tools have been found to also improve the organization's performance (Dunbar, 2001). This is accomplished by aligning the board's and the CEO's goals through optimal contracting. The theory assumes that the board can set and change CEO compensation periodically based on performance indicators. However, board members have little interaction with the CEO on daily basis, thus instead of intensive monitoring, they rely on outcome-based measures such as clinical and financial measures, to evaluate CHC's performance (Eisenhardt, 1989). The U.S. Health Resources and Services Administration (HRSA) began requiring CHCs to measure and report core clinical measures in 2008 using standardized performance indicators. In this study, with a focus on clinical performance, and based on the agency theory logic, it was hypothesized that:

<u>Hypothesis 1</u>: *CHCs reporting higher levels of clinical performance are positively associated with higher CEO compensation*

Ideally, CHC boards need to have an independent compensation committee that evaluates CEO performance and sets certain compensation package after assessing data on CEO packages of other organizations with similar size and capacity (McKinney, 2015). However, boards at CHCs usually don't have that luxury, and there is no useful point of reference to set their CEO compensation. Thus, when facing uncertainty, one's worth is usually assessed by comparing him/her to his/her supervisors and/or subordinates. Social comparison theory, developed by Festinger in 1954, states that boards assess CEO's worth based on how he/she stands relative to others who are similar on certain important dimensions (Festinger, 1954). In addition, heuristics may influence CEO compensation decisions. Heuristic techniques are mental shortcuts – educated guesses – that may help board members simplify their decision-making (Kahneman, Slovic, & Tversky, 1982; Tversky & Kahneman, 1974). A "rule of thumb" decision to a complex task usually relies on the decision maker's previous knowledge and experience. One of the common types of heuristics techniques used in setting compensation is anchoring (Borkowski, 2015). The CEO's salary is set either close to the previous CEO's salary or the salaries of the subordinates which may be used as the anchor.

In the context of CHC, next in line for high compensation are medical directors, financial officers, operating officer, and practicing physicians. Therefore, boards can use the salaries of those employees to justify the CEO's pay package. Hence, it was posited that:

Hypothesis 2a: *Salaries of the next highest paid employees are positively associated with higher CEO compensation*

In CHC setting, if CEO compensation is set relative to his/her subordinates, instead of performance, it was predicted that:

Hypothesis 2b: *Salaries of the next highest paid employees moderate the relationship between clinical performance and CEO compensation*

However, unlike for-profit organizations, where shareholders have strong monitoring incentives, CHCs, as a nonprofit, operate with less oversight (Dhole, Khumawala, Mishra, & Ranasinghe, 2015). That can lead to abusive compensation practices and expropriation of organization assets (Dhole, Khumawala, Mishra, & Ranasinghe, 2015). Managerial power theory (Bebchuk, Fried, & Walker, 2002) suggests that the CEO has a certain level of power over the board, or maybe socially tied to them and that the compensation decisions made by the board will be favorable to the CEO. Many CEOs in the U.S. hold dual position; they also serve as the Chairman of the Board (Wiggenhorn, Pissaris, & Gleason, 2014). These relationships may hinder the board's monitoring of CEO actions and allowing the CEO to implement policies that are not in line with stakeholder interests. In other word, the distinction between "*decision management and decision control*" ceases to exist (Fama & Jensen, 1983). This in turn may give CEOs conclusive authority within CHCs (Pissaris, Jeffus, & Gleason, 2010) and CEOs may exploit the situation and extract "rents" by overcompensating themselves (Cardinaels, 2009). This led to the following hypothesis:

Hypothesis 3a: *CEO's with dual position have higher compensation compared to CEOs without dual position*

CEOs, holding dual position, may literally set their own compensation and implement wasteful incentive schemes (Bebchuk & Fried, 2003; Dhole, Khumawala, Mishra, & Ranasinghe, 2015) that can affect CHCs' performance negatively. For example, in one study the CEO's dual position was shown to affect pay-for-performance sensitivity by 37 percent (Fahlenbrach, 2008). Therefore, it was predicted that:

<u>Hypothesis 3b</u>: *CEO's dual position moderates the relationship between clinical performance and CEO compensation*

METHODOLOGY

Data

The Uniform Data System (UDS) and the Internal Revenue Service (IRS) Forms 990 data were extracted from a national sample of 984 CHCs for the period of 2011-2016. CHCs began submitting clinical performance data in 2008, and the most recent available UDS data was 2016. UDS, secondary annual data, is reported to HRSA by CHCs. Majority of the CHCs operate several care delivery sites; however, UDS data are submitted at the administrative level. The UDS is comprised of CHC patient demographics, insurance type, staffing, scope, and volume of services CHCs provide, quality of care, health outcomes and disparities, number of delivery sites, finances, and electronic health record information. Financial performance data were extracted from IRS Form 990.

The sample for this study consisted of the CHCs that meet both federal requirements and receive grants under Section 330. The CHC look-alikes; the CHCs located in U.S. territories; that have solely school-based, mobile, or seasonal sites; and government-owned CHCs were not included in this study. Moreover, the CHCs that are owned and operated by local tribes or government agencies were not included as they do not submit 990 Forms to the IRS. Observations with CEO compensation that were ±5 standard deviations from the mean per year were dropped ($n = 6$). This left an analytical sample of 984 CHCs per year.

Variables

The list of variables used in this study is presented in Table 1. CEO compensation, as a continuous variable reported in USD, was the dependent variable. There are myriad of ways to measure CEO compensation, yet the base salary and bonus are commonly used to represent total CEO pay (Tosi, Werner, Katz, &Gomez-Mejia, 2000). The variable for CEO compensation was the sum of the basic salary and bonus. This variable was then normalized by identifying and deleting the outliers.

Core Clinical Measures (CCM) – indicators of clinical performance – served as independent variables, and they were grouped in two categories: quality of care and health outcome variables. Quality of care variables had three specific variables – percentage of women 21 to 64 years of age who received one or more Pap tests; percentage of adults 50 to 80 years of age who had an appropriate screening for colorectal cancer; and percentage of children 2 years of age with appropriate immunizations. Likewise, health outcome variables included percentage of patients, 18 years and older, with diagnosed diabetes who had hemoglobin A1c lower than 8 percent and percentage of patients, 18 years and older, with diagnosed hypertension whose blood pressure was less than 140/90 (adequate control) during the measurement year. All those variables were used with 1-year lag. The reason for using the lag was to mitigate reverse causality so that it could be assumed clinical performance influenced CEO compensation, but not the reverse. Other independent/moderator variables were CEO dual position which was reported as a binary variable (0=no, 1=yes), and highest paid employees which is the average of next four highest paid employees' salaries.

The study controlled for CHC organizational characteristics and CEO characteristics. Organizational characteristics included size, financial performance, location, board size, grant size, and patient aggregate characteristics. Multiple studies have shown that CEO compensation is directly linked to organization size (Gabaix & Landier, 2008; Gayle & Miller, 2009; Oi & Idson, 1999). For example, large organization CEOs make as much as 2.7 times as CEOs in smaller organizations (Gayle, Golan, & Miller, 2015). In this study, annual total patient visits were used as a proxy for size. This variable was converted to natural log to avoid heteroscedasticity (Wiggenhorn et al., 2014). Likewise, prior financial performance has been indicated to affect CEO compensation (Deckop, Merriman, & Gupta, 2006; McGuire, Dow, & Argheyd, 2003; Tosi, Werner, Katz, & Gomez-Mejia, 2000). Following similar studies (Makni, Francoeur, & Bellavance, 2009; Wiggenhorn et al., 2014), this study utilized total margin (net income / total revenue) to represent financial performance. Previous studies found that CEO pay was higher in urban areas (Ballou & Weisbrod, 2003), as such a binary variable was used to reflect location (1=urban, 0 =rural). Large boards are less likely to reach a consensus as coordination among members is difficult (Ozdemir & Upneja, 2012). So the total number of governing board members was used to depict board size. Uninsured people comprise the largest patient base of CHCs. Therefore, CHCs rely on federal and state grants to be able to serve the uninsured (Hansen & Tobler, 2009). Government grants carry strict restrictions on how funds may be used, therefore, it was assumed CEO compensation would be lower in CHCs that rely more highly on grants compared to the ones that secure funding from other sources (Gaver & Im, 2014). Grant size was created by dividing total grant amount to total revenue.

CEO characteristics included the individual's gender, race, degree, tenure, promotion, and job difficulty. Male CEOs have been found to be compensated significantly higher than female CEOs (Santerre & Thomas, 1993). In this study, CEO gender is a binary variable (1=male, 0=female). Studies that explored the effect of race on CEO pay yielded mixed results. To examine its impact on CEO pay at CHCs, CEO race was coded as a binary variable (1=White, 0=non-White). As physicians are among the highest paid professionals, a CEO with an MD degree can make significantly more than a non-physician one. CEO degree was created as a binary variable (1=MD, 0=non-MD). CEO's tenure has been positively linked to CEO pay in a few studies (Brickley et al., 2010; Moskowitz, 1999; Santerre & Thomas, 1993; Sigler, 2003). The number of years the CEO has worked at the current organization represented CEO tenure. Promotion was a binary variable where 1 would mean he/she was internal promoted, and 0 referred to external hired. CEO job difficulty can also explain the variation in CEO pay (Eldenburg & Krishnan, 2003). In this study, number of sites was used as a proxy for job complexity.

Analysis

Descriptive and bivariate statistics presented the CHC organizational characteristics and CEO characteristics, and tested the overall associations.

Generalized estimating equation model with year and state fixed effect was performed with process of care and health outcome variables separately. Year fixed effects were included to control for any temporal effects, and state fixed effects to control for different state funding sources and governance structures (Gaver & Im, 2014). Robust standard errors were used to account for heteroscedasticity (White, 1980). Hypotheses 2b and 3b were tested using interaction terms. To mitigate reverse causality, 1-year lag of independent variables was used in the model. Significance level of 0.05 was used in evaluating the statistical tests. Stata 13.1 and SAS 9.4 were used for data management and statistical analyses.

Generalized Estimating Equations Model

$$\left\{\begin{array}{l} \text{CEO Compensation}_{2011} \\ \text{CEO Compensation}_{2012} \\ \text{CEO Compensation}_{2013} \\ \text{CEO Compensation}_{2014} \\ \text{CEO Compensation}_{2015} \\ \text{CEO Compensation}_{2016} \end{array}\right\} = L.\beta_0 + L.\beta_1 \left\{\begin{array}{l} \text{Clinical performance}_{2011} \\ \text{Clinical performance}_{2012} \\ \text{Clinical performance}_{2013} \\ \text{Clinical performance}_{2014} \\ \text{Clinical performance}_{2015} \\ \text{Clinical performance}_{2016} \end{array}\right\} + \text{CORR} + \text{Error}$$

RESULTS

The descriptive statistics of all variables is given in Table 2. On average, 984 CHCs per year were examined. As shown in Table 2, average CEO compensation was $207,554 which was an increase from $180,000 in 2011 to $243,700 in 2016. Likewise, average salaries of the next highest employees were $106,421 increasing from $96,700 in 2011 to $121,964 in 2016. Further, only 3 percent of CEOs hold dual positions in which they served as both CEOs and members of their organizations' governing boards.

Average CEO tenure was over 10 years, with one fifth of CEOs internally promoted (19 percent) versus externally hired. The majority of CEOs were White (66 percent) and gender was evenly divided. CEOs' degrees had greater variation from those without high school degrees to Ph.D. Those that had a medical degree were 8 percent.

Regarding the CHCs' clinical performance measures, close to half of the diabetic and hypertensive patients' conditions were adequately controlled while only 21 percent of patients had colorectal test performed. Child immunization was low, at 40 percent.

CHCs' financial performance reflected an average total margin of 5.6 percent which increased from 5 percent in 2011 to 7 percent in 2016. Governing boards, on average, had 12 members. Ratio of federal and state grants to total revenue was 34 percent and remained consistent from 2011 to 2016. Average percent of patients covered by Medicaid was 41 percent, however, a further analysis yielded that it increased over time from 35 percent in 2011 to 47 percent in 2016. This could be due to PPACA Medicaid expansion that went into effect in 2014. Eight percent were Medicare beneficiaries with little variation between 2011 and 2016. Likewise, patients with private insurance represented 15 percent and it only increased by 2 percent over time, 14 percent in 2011 to 16 percent in 2016. However, percentage of uninsured patients had a significant decrease, from 42 percent in 2011 to 27 percent in 2016. Over half of the patients had income below the 100 percent of the federal poverty level, and two thirds of the patients were minorities. The average number of total patient visits was around 80,000 doubling from 51,000 in 2011 to 100,000 in 2016.

The Pearson product-moment correlations in Table 3 show correlations between the CEO compensation and independent variables – Core Clinical Measures; and highest paid employees' compensation. The latter is highly correlated with CEO compensation while Core Clinical Measures yielded inconclusive result. Colorectal test and Pap test were positively correlated whereas child immunization was negatively correlated with CEO compensation. Further, independent samples t-tests results of CEO dual position on CEO compensation was not significant. CEO characteristics all were significantly associated with CEO compensation. Similarly, total CHC sites, a proxy for job difficulty, was also highly correlated with CEO compensation. Furthermore, total margin, an indicator of financial performance, also showed statistically significant correlation with CEO compensation. Regarding patient payer mix, apart from Medicaid percentage which was positively correlated, Medicare, private, and uninsured all were negatively correlated with the dependent variable – CEO compensation.

Table 4 shows two regression models, one with processes of care – colorectal test screening, Pap test, and child immunization, and the other with health outcomes – controlled diabetes and hypertension as main independent variables. Apart from Pap test's partial significance, none showed any association with CEO compensation (hypothesis 1). Also, CEO dual position had no association with CEO compensation (hypothesis 3a). However, highest paid employees' compensation was significantly related to CEO compensation (hypothesis 2a). Specifically, $1,000 increase in highest paid employees' salary was associated with $620 increase in CEO compensation. Further, all CEO characteristics yielded significant results. In the first model, for instance, one year in CEO tenure was associated with an increase of average $2,339 in CEO compensation. Non-White CEOs had a significantly higher compensation ($31,136) compared to their White CEO counterparts. Male CEOs earned, on average, $32,459 more than female CEOs. CEOs with a medical degree earned $43,906 more than CEOs without a medical degree. Promotion was only partially associated with CEO compensation. With respect to CHC organizational characteristics, CEOs whose CHCs' administrative sites were located in urban areas earned $23,014 more than the ones that were located in rural areas. A one percent increase in total margin was associated with $1,803 increase in CEO compensation. Grant size, on the other hand, was negatively associated with the dependent variable, and one percent increase in grant size was associated with $780 decrease in CEO compensation.

In the second model, when processes of care were the main independent variables, CEO and CHC characteristics yielded similar results to the first model. Clinical performance was, again, not related to CEO compensation. Only CEO dual position was partially associated with CEO compensation, and CEO internal promotion was significantly related to CEO compensation.

To test the moderating effect of highest paid employees' compensation on the association between core clinical measures and CEO compensation, hypothesis 2b was tested using interaction term. As shown in Table 5, among core clinical measures, colorectal test screening and Pap test were negatively associated with CEO compensation. Although the beta coefficients were small, colorectal test screening and Pap test showed significant association with CEO compensation when that association was moderated by the highest paid employees' compensation (hypothesis 2b). Moderating effect of CEO dual position was not performed as CEO dual position showed no association to CEO compensation (Table 3).

DISCUSSION

The purpose of this study was to determine the predictors of CEO compensation at CHCs, specifically exploring the association between CEO compensation and one of the common nonfinancial performance indicators – clinical performance. In this paper, predictors of CEO compensation was studied from multiple perspectives using Agency, Managerial Power, and Social Comparison theories. Traditionally, CEO compensation has been linked to organizational characteristics, mostly to financial performance of a firm (Aggarwal et al., 2012; Brickley et al., 2010; Moskowitz, 1999; Oster, 1998; Pink & Leatt, 1990; Stahl, 2000). Another domain that was examined to predict CEO compensation were the individual's characteristics including CEO age, gender, degree and job complexity (Brickley et al., 2010; Cardinaels, 2009; Sigler, 2003). Non-financial performance measures has rarely been explored (Brickley et al., 2010; Kramer & Santerre, 2010; Tillman, 2009). In some cases, the association between quality of care and CEO compensation was found to be significant in for-profit hospitals (Evans, 2014; Joshi & Hines, 2006). However, other studies found inconclusive results (Aggarwal et al., 2012; Brickley et al., 2010; Oster, 1998; Pink & Leatt, 1990; Stahl, 2000). This paper was the first that attempted to examine the predictors of CEO compensation in non-for-profit primary care settings, namely CHCs. Moreover, this study tested the validity of the common cliché, pay-for-performance, in non-profit settings where financial performance is not the only measure of success. CHCs' report to HRSA captures financial as well as clinical performance (HRSA, 2017b). Those metrics are then used by HRSA to assess CHCs' overall performance. Therefore, CEOs are required to improve their organizations' both financial and clinical performances in order to secure federal funding.

This study found no direct relationship between clinical performance and CEO compensation. The rationale could be that the board's compensation committee may put more emphasis on financial performance. Further, as a majority of CHC board members are patients that reside in those areas, their priorities may be different, such as opening new sites in poor neighborhoods; targeting patients with a particular disease; or modernizing the existing infrastructure. From the administrator's perspective, when a health center is financially stressed, quality of care would not be a top priority. Another reason could be the miscommunication between the funding agency – HRSA and CHCs' compensation committee. Board members could be unaware of the HRSA funding requirements that quality of care is one of the main metrics used to justify continuing funding. Further studies that qualitatively explore the missing link that how CHCs' compensation committee set and change CEO compensation periodically would help shed light on this paper's findings.

CEO dual position was not related to CEO compensation either. First, the study depended on the reported cases of this variable in IRS 990 forms. There were only 29 out of 990 CEOs that hold dual positions. More CEOs may still serve on the board, though unofficially. Moreover, board members include CHC employees that directly report to CEOs. Without knowing the exact number of internal versus external members, and their position in the board, it is hard to determine whether CEOs exploited the situation.

Highest paid employees' compensation, on the other hand, was significantly associated with CEO compensation. According to the Social Comparison theory, CEO compensation is set relative to others who are similar on certain important dimensions (Festinger, 1954). At CHC setting, CEO compensation increased in line with his/her subordinates' salaries. One of the main players of CHCs, physicians, are among the highest paid professionals, whose salaries can be used by CEO to justify own pay package. When board members are making those decisions, they may be using an anchoring technique of the heuristics approach in setting CEO compensation.

CEO characteristics were all related to CEO compensation. This confirmed previous studies (Brickley et al., 2010; Cardinaels, 2009; Sigler, 2003). One exception was CEO race where non-White CEOs were found to be earning more than Whites. Only one third of CHC CEOs were non-White whereas two third of their patients were non-White. To be culturally compatible and earn a community's trust, CHCs that have majority non-White patients may be more willing to hire non-White CEOs thus increasing the demand for non-White executives. However, there is a shortage of minority executives. Even at hospitals, only 9 percent of executive positions are held by minorities (Selvam, 2013). Since most CEOs are externally hired (81%), they are expected to have significant managerial experience. This can explain higher compensation that existing minority CEOs demand. The effect of race on CEO compensation was exaggerated by gender. It was found that female White CEOs were earning significantly less than male White, male and female non-White CEOs. This, again, might be due to gender-based wage gap and shortage of minority executives. This study's findings are in line with a recent report of Guidestar that examined the CEO compensation in all non-for-profit organizations (Coffman, 2017). This pattern, however, may change over the next decade due to policies that assist and encourage minorities to pursue graduate degrees (Symonds, 2015). A follow-up qualitative study that concentrates on the CEO hiring process of CHCs would be valuable to explain this study’s findings. Moreover, other characteristics of CEOs, such as the type of degree, CEO age, and leadership styles should be explored.

Another interesting finding was the association between the size of grant and CEO compensation. CHCs’ grant ratio to total revenue ranged from 0 to 99 percent. CEOs that rely on internal sources, such as patient revenue can be flexible in their operations, as well as expenditures. Governmental grant, on the other hand, carry strict restrictions on how funding can be used. Therefore, the higher the grant size, the lower CEO compensation was. This confirmed a previous study that examined the relationship between funding sources and CEO compensation in all non-for-profit organizations (Gaver & Im, 2014).

There are a few limitations with this study. First, CHCs operate multiple sites (M=9, SD=10, ranging from 1 to 116) that can be located near the administrative site or as far as 100 miles from it. The UDS is aggregate data, at the organizational level. Therefore, it is impossible to control for patient characteristics, specific site characteristics, as well as specific community characteristics. Second, UDS was collected for reporting purposes, and one cannot ensure the accuracy of the dataset. Third, a detailed information about the board composition – percentage of insiders versus outsiders; degrees of board members; and so on would be helpful. Fourth, CHC employee data, like employee full time equivalent should have been controlled for. However, UDS data lack those variables. Furthermore, operating margin would be a better alternative to represent financial performance. Most CHCs’ depend on federal and state funding whereas patient revenue is close to nonexistent. Therefore, a proper operating margin couldn’t be calculated.

Nonetheless, this was the first study that explored the predictors of CEO compensation in CHCs. Further, this empirical study used national level data for the period 2011-2016. This study findings may inform HRSA with respect to their assessment policies regarding the allocation of funding to CHCs. Additionally, the findings can be used by board members to make informed decisions while setting CEO compensation.

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Figure 1. Predictive factors of CEO Compensation

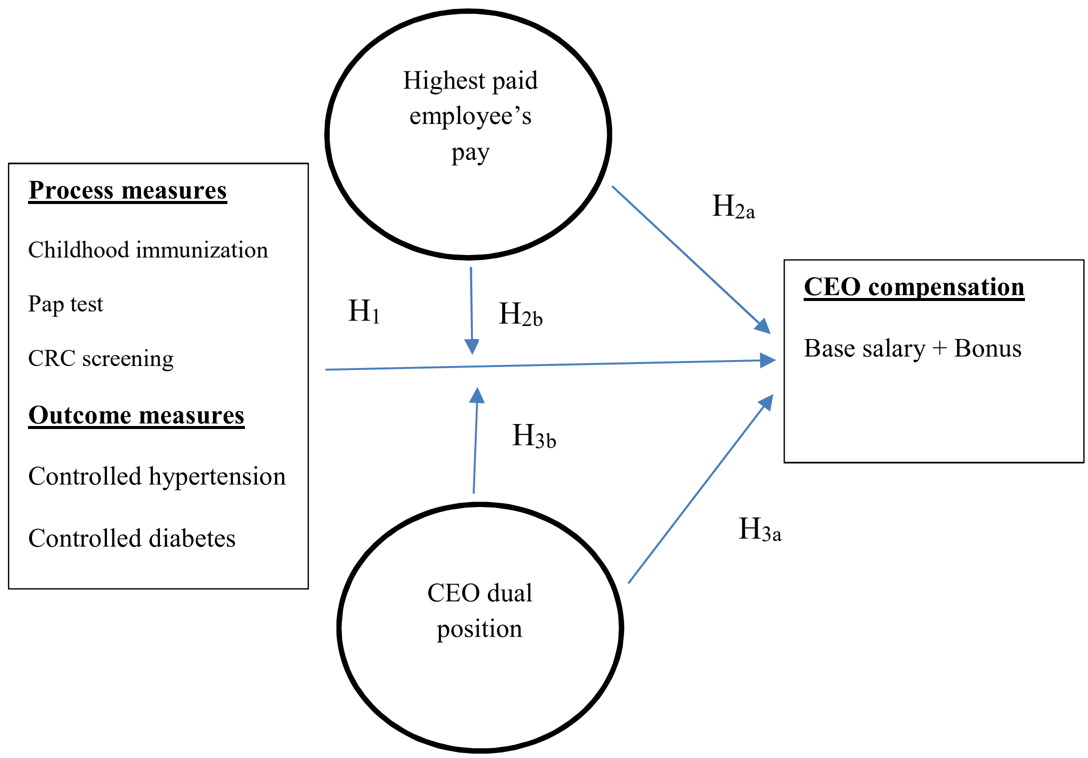

Table 1. Definitions and Sources of Variables

Variable	Definition	Source
Dependent variable		
CEO compensation	CEO base salary and bonus	IRS 990 Form
Independent variables		
Process of care variables	- Percentage of women 21 to 64 years of age who received one or more Pap tests - Percentage of adults 50 to 80 years of age who had an appropriate screening for colorectal cancer - Percentage of children 2 years of age with appropriate immunizations	UDS
Health outcome variables	- Percentage of patients, 18 years and older, with diagnosed diabetes who had hemoglobin A1c lower than 8 percent during the measurement year - Percentage of patients, 18 years and older, with diagnosed hypertension whose blood pressure was less than 140/90 (adequate control) during the measurement year	UDS
CEO dual position	If CEO holds both managerial and board member positions, it is recorded as yes (1), else, no (0)	IRS 990 Form
Highest paid employees' compensation	Average salaries of next highest paid employees	IRS 990 Form
CEO characteristics		
Race	Race of CEOs recorded as White (1), versus non-White (0)	Social network
Gender	Gender of CEO recorded as Male (1), versus Female (0)	Social network
Degree	CEO degree recorded as MD (1), versus non-MD (0)	Social network
Tenure	Number of years CEO has worked at current CHC	IRS 990 Form
Promotion	CEO promotion recorded as promoted (1), versus externally hired (0)	IRS 990 Form
Job difficulty	Total number of sites CHC operates	UDS
CHC organizational characteristics		
% of minority patients	Percentage of non-White patients at CHCs	UDS
% of patients in poverty	Percentage of patients below 100% federal poverty level	UDS
Patient payer mix	Percentages of Medicare, Medicaid, Private, and uninsured patients	UDS
Organization size	Log of total number of patient visits in a year	UDS

Financial performance	Total margin (net income / total revenue)	IRS 990 Form
Location-administrative	Location of the administrative site, recorded as Urban (1) versus rural (0)	UDS
Board size	Number of total governing board members	IRS 990 Form
Grant size	Ratio of federal and state grants to total revenue	UDS

Note: CHC = Community Health Center; UDS = Uniform Data System; CEO = Chief Executive Officer; Social network = LinkedIn, Facebook, etc.

Table 2. Descriptive analysis of variables (N=5952 organization-year)

Variable	N	Mean / Percent	Std Dev
CEO compensation ($)	5946	207,554.4	127,282.5
Highest paid employees' compensation ($)	5946	106,421.3	55,222.41
CEO dual position			
No	5768	96.92	
Yes	184	3.08	
Diabetes (controlled) (%)	2955	45.71	21.06
Hypertension (adequate) (%)	5950	43.85	27.69
Colorectal test screening (%)	5948	20.64	21.30
Child immunization (%)	5952	40.21	31.36
Pap test (%)	4960	28.66	27.37
CEO tenure (years)	5952	10.56	9.04
CEO race			
Non-White	2022	33.98	
White	3930	66.02	
CEO gender			
Female	3000	50.41	
Male	2952	49.59	
CEO degree			
Non-MD	5449	91.55	
MD	503	8.45	
CEO promotion			
Externally hired	4832	81.18	
Promoted	1120	18.82	
Total CHC sites	5952	9.26	10.48
Location (administrative)			
Rural	2528	42.47	
Urban	3424	57.53	
Total margin (%)	5932	5.59	10.18

CHC board size	5952	11.99	3.27
CHC grant size (%)	5932	33.59	18.89
Patients with Medicaid (%)	5952	41.11	18.44
Patients with Medicare (%)	5952	8.14	5.85
Patients with Private insurance (%)	5952	14.82	12.03
Uninsured patients (%)	5952	34.55	18.66
Patients in poverty (%)	5952	52.29	23.20
Minority patients (%)	5952	66.20	25.99
Total patient visits	5948	80,675.51	104,629.90

Abbreviations: CHC – Community Health Center; CEO – Chief Executive Officer; MD – medical doctor

Table 3. Bivariate analysis of variables with CEO compensation as a dependent variable (N=5904 organization-year)

Variable	Coefficient	P-value
Highest paid employees' compensation	0.6009***	<0.001
CEO dual position		
No	208,303	
Yes	183,047	0.136
Diabetes (controlled)	-0.027	0.391
Hypertension (adequate)	0.018	0.434
Colorectal test screening	0.124***	<0.001
Child immunization	-0.046*	0.047
Pap test	0.107***	<0.001
CEO tenure	0.317***	<0.001
CEO race		
Non-White	243,838	
White	190,423	<0.001
CEO gender		
Female	175,882	
Male	240,683	<0.001
CEO degree		
Non-Medical degree	200,852	
Medical degree	279,783	<0.001
CEO promotion		
External hired	199,541	
Internal promoted	240,767	<0.001
Total CHC sites	0.477***	<0.001
Location (administrative)		
Rural	168,985	
Urban	234,954	<0.001
Total margin	0.084***	<0.001

CHC board size	0.121***	<0.001
CHC grant size	-0.196***	<0.001
% of patients with Medicaid	0.327***	<0.001
% of patients with Medicare	-0.156***	<0.001
% of patients with Private insurance	-0.138***	<0.001
% of uninsured patients	-0.173***	<0.001
% of patients in poverty	0.127***	<0.001
% of minority patients	0.269***	<0.001
Log of total visits	0.512***	<0.001
Year		
2011	180,043	
2012	190,821	1.00
2013	199,675	0.71
2014	208,468	0.06
2015	223,771***	<0.001
2016	243,700***	<0.001

Abbreviations: CHC – Community Health Center; CEO – Chief Executive Officer; EHR – Electronic Health Record; MD – medical doctor
* p <0.05, ** p <0.01, *** p <0.001

Table 4. Regression results with CEO compensation as a dependent variable (N=5904 organization-year)

Variable	Model 1	Model 2
Health outcome variables		
Diabetes (controlled)	266.20	
Hypertension (controlled)	-267.71	
Process of care variables		
Colorectal test screening		73.98
Child immunization		-59.64
Pap test		232.93+
Control variables		
Highest paid employees' compensation	0.62***	0.62***
CEO dual position		
No	reference	reference
Yes	-32145.97	-31161.38+
Individual characteristics		
CEO tenure	2339.01***	2108.64***
CEO race		
Non-White	reference	reference
White	-31136.14**	-33443.9***
CEO gender		
Female	reference	reference
Male	32459.18***	29439.53***
CEO degree		
Non-MD	reference	reference
MD	43906.74**	36880.07**
CEO promotion		
Externally hired	reference	reference
Promoted	19215.21+	29348.59***
Total CHC sites	3729.46***	2887.51***

Organizational characteristics		
Location (administrative)		
Rural	reference	reference
Urban	23014.11*	21638.52**
Total margin	1803.80***	1097.29***
CHC board size	-2663.04+	-890.27
CHC grant size	-780.07**	-727.65***
% of patients with Medicaid	-1250.73	1524.90**
% of patients with Private insurance	1577.39	2200.54**
% of uninsured patients	295.46	819.66*
% of patients in poverty	183.55	237.64
% of minority patients	397.26	355.64*
Log of total visits	11433.53	9696.09*

Abbreviations: CHC – Community Health Center; CEO – Chief Executive Officer; MD – medical doctor
+ p <0.1, * p <0.05, ** p <0.01, *** p <0.001

Table 5. Regression results with CEO compensation as a dependent variable and highest paid employees' compensation as a moderator (N=5904 organization-year)

Variable	Beta coefficients				
Diabetes (controlled)	410.55				
Hypertension (controlled)		527.64			
Colorectal test screening			3773.98		
Child immunization				799.14	
Pap test					5521.23*
Highest paid employees' compensation	33831.40**	41972.56***	34070.45***	41614.93***	40410.54***
Highest paid employees' compensation # core clinical measures	2557.64	-3765.81	11490.98***	-3810.51	13361.39***
CEO dual position					
No	reference	reference	reference	reference	reference
Yes	-30684.69	-21803.88	-30092.85+	-18865.89	-18502
Individual characteristics					
CEO tenure	2354.92***	2094.04***	2079.47***	2046.22***	2126.73***
CEO race					
Non-White	reference	reference	reference	reference	reference
White	-30273.92**	-31921.13***	-31645.9***	-32649.37***	-30628.79***
CEO gender					
Female	reference	reference	reference	reference	reference
Male	32609.17***	27227.39***	28225.47***	27661.29***	27687.21***
CEO degree					
Non-MD	reference	reference	reference	reference	reference
MD	43223.32**	37797.87***	33208.66**	37053.02***	41702.95***
CEO promotion					
Externally hired	reference	reference	reference	reference	reference
Promoted	20109.06+	29387.94***	27903.86***	27984.27***	29157.34***
Total CHC sites	3747.90***	2686.10***	2898.22***	2667.14***	2759.83***
Organizational characteristics					
Location (administrative)					
Rural	reference	reference	reference	reference	reference
Urban	24514.52*	23298.01**	23032.19**	22571.72**	21040.85**
Total margin	1823.17***	908.81***	1084.69***	966.54***	933.21***

CHC board size	-2584.91+	-1077.00	-1081.68	-1157.03	-1214.93
CHC grant size	-770.22**	-662.13***	-716.75***	-627.66**	-670.33***
% of patients with Medicaid	-1134.56	-1410.65**	-2102.92**	-2064.80**	-1934.63**
% of patients with Private insurance	1702.35	2113.37**	801.82*	870.01*	808.92*
% of uninsured patients	185.34	863.01+	-701.07**	-534.29*	-572.27*
% of patients in poverty	367.18+	190.70	199.12	195.03	209.60
% of minority patients	395.09	335.80*	289.27+	333.85*	332.06*
Log of total visits	11612.4	7195.84	12398.3**	8723.35+	7675.80+

Abbreviations: CHC – Community Health Center; CEO – Chief Executive Officer; MD – medical doctor

+ p <0.1, * p <0.05, ** p <0.01, *** p <0.001

IS THERE AN ASSOCIATION BETWEEN QUALITY CARE AND FINANCIAL PERFORMANCE IN COMMUNITY HEALTH CENTERS?

by

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In preparation for Journal of Ambulatory Care Management

Format adapted for dissertation

ABSTRACT

Objective: This study examined the relationship between quality of care measures and financial performance in Community Health Centers (CHC) using Deming Chain Reaction model.

Data Sources: A national sample of 990 CHCs was used in this study. Data on CHCs' organizational characteristics and patient quality of care measures were extracted from the Uniform Data System (UDS). CHC financial performance data were extracted from Internal Revenue Service 990 Forms for the period of 2011-2016.

Study Design: Baron and Kenny model for mediation was used to test the mediating effect of patient visits per patient per disease on the association between clinical and financial performances of CHCs. Specifically, percentages of controlled hypertension and diabetes served as independent variables while total margin was a dependent variable. Generalized estimating equations model, with state and year fixed effects, was used in this study.

Principal Findings: One percent increase in a health outcome variable – controlled hypertension was associated with 0.023 percent increase in financial performance. The mediator, on the other hand, was found to be inadequate.

Conclusion: This study's findings showed that quality of care was related with financial performance of CHCs. These findings may help CHC administrators to make informed decisions while considering quality improvement initiatives.

Keywords: quality of care, community health center, financial performance, return on quality approach

INTRODUCTION

Community Health Centers (CHC) are an integral part of the safety net provider network in the U.S. healthcare system. CHCs are expected to pursue the triple aims: 1) improving the care experience; 2) improving population health and, 3) reducing the cost of care while balancing operational concerns and issues (Berwick, Nolan, & Whittington, 2008; Morgan, Everett, & Hing, 2014). Several proposals (Institute of Medicine, 2001) and regulations such as the Patient Protection and Affordable Care Act (PPACA) have addressed the issues of the quality of and access to care. However, the components of the iron triangle – access, quality, and cost – represent the trade-offs of today's health care system (Carroll, 2012). If an organization wants to address access and care quality, as the PPACA suggests, the third component, cost, will be increased. However, incentive programs have been introduced to encourage CHC executives to adopt quality improvement policies, because these programs provide financial rewards for CHCs that meet specific performance and quality goals (Cheung, Moiduddin, Chin, Drum, Brown *et al.,* 2008). These quality programs have demonstrated that CHCs can deliver improved care. However, it is a challenge without the appropriate resources. For example, CHCs may be able to provide timelier diagnostic testing but that requires an investment of funds for infrastructure upgrades (Chin, Kirchhoff, Schlotthauer, *et al*., 2008). Without additional resources or reimbursement payments that encourages and incentivizes quality improvement efforts, CHCs may face financial hardships (Chin, Kirchhoff, Schlotthauer, Graber, Brown, *et al*., 2008). If CHCs engage in spending to improve the quality of care, yet, they do not have the resources to do so, this may place the organization in a potentially perilous financial situation. The implementation of high-cost quality improvement initiatives has the potential to negatively affect safety net providers' financial stability (Severens, 2003). CHC executives may be hesitant in the adoption of quality improvement policies, if it is believed that those policies will require additional funds (Cheung, Moiduddin, Chin, Drum, Brown, *et al.*, 2008). One reason for this hesitancy is that the CHC executive may simply lack the funds to invest in these projects. Furthermore, quantifying the payback for quality improvement initiatives can be difficult, especially when the CHC executive must justify the project to his/her board. Health care providers should find strategies that not only improve their organization's overall financial performance but that can also provide the best care possible for its patients. Successfully achieving these multiple goals is difficult in an environment where resources are limited (Epane, Weech-Maldonado, Hearld, Menachemi, Sen *et al.*, 2017). Therefore, some individuals have suggested making quality improvement efforts more financially attractive and sustainable (Hwang & Christensen, 2008). In non-healthcare industries, improvements in product and service quality have been associated with better financial performance and organizational stability (Angelini & Bianchi, 2015; Haines, 2016; Mellat-Parast, Golmohammadi, McFadden, & Miller, 2015). However, there is little known that explored the link between quality and financial performance in health care and the limited research available has mixed findings (Beauvais, Richter, & Kim, 2017). For example, Aaker and Jacobson (1994) found no relationship between quality of care and financial performance, yet more recent studies indicated positive relationship between broad quality improvement programs and the financial wellbeing of an organization (Alexander, Weiner, & Griffith, 2006; Vélez-González, Pradhan, & Weech-Maldonado, 2011). Other researchers concluded that the results were not conclusive (Bai & Anderson, 2016; Holt, Clark, DelliFraine, & Brannon, 2011). It is obvious that care quality directly impacts patients, yet the extent to which care quality impacts a health care provider's financial performance is not well understood (Beauvais, Richter, & Kim, 2017). The purpose of this paper is to examine the relationship between improved quality of care and financial performance using the Deming Chain Reaction model.

CONCEPTUAL FRAMEWORK

The Deming Chain Reaction model has been used to study the pathways of product and service quality and the association with financial performance (Wayhan, Khumawala, & Balderson, 2010). Rust and colleagues adopted the Deming Chain pathway and modified it for use in the health care field (Rust, Zahorik, & Keiningham, 1995). Other studies have also used the Deming Chain Reaction model within the healthcare industry and found a positive relationship between patient safety and hospital financial performance (Beauvais *et al*., 2017).

The Deming Chain Reaction model suggests that quality improvement efforts will lead to improved quality of care, which in turn, will reduce the cost of care delivery and increase patient satisfaction. In another words, improvements in quality of care will reduce the cost associated with unnecessary or inefficient care (Rust, Zahorik, & Keiningham, 1995). This has the dual benefit of not only making the organization more efficient and less wasteful but it will also improve the patient experience as they are not subject to unnecessary treatment. Increased patient satisfaction will assist the organization as well. The organization will gain a more positive reputation and satisfied patients are more likely to refer friends and family through positive "word-of-mouth" advertising (Beauvais, Richter, & Kim, 2017). The increases in efficiency will help reduce expenses while increased patient satisfaction may help attract new patients (i.e., increased revenue), thus quality improvement can have a direct effect on an organization's profitability (Beauvais, Richter, & Kim, 2017). According to the Deming Chain Reaction model, when healthcare organizations invest in quality improvement initiatives, the organizations can reduce costs while increasing revenues by attracting new patients (Rust, Zahorik, & Keiningham, 1995). The authors called this conceptual model "the return on quality approach." This approach conceptualizes quality initiatives as an investment. Another important tenet of this model, is that any quality improvement should have a pay-back (Rust, Zahorik, & Keiningham, 1995). This goes against the notion that organizations should only focus on health care quality if there is additional funding or penalty for those that forgo quality improvement initiatives. That model, when properly utilized, would help organizations remain financially stable by taking proactive steps to improve health care quality. From a conceptual perspective, quality improvement helps organizations reduce duplicate laboratory tests, overtreatment of patients, medical errors, and care complications; thereby, organizations can efficiently utilize their technology and human capital (Beauvais, Richter, & Kim, 2017). This efficiency improves organization's productivity by reducing waste and improving coordination among the staff. This efficiency gained may free up some organizational slack which can allow providers to treat more patients. Following the logic of this model, one could argue that quality improvement will yield higher productivity.

Hypothesis 1: *CHCs reporting higher levels of clinical performance are positively associated with higher productivity*

More patients seen within an organization provides the opportunities to increase revenue. Unlike hospitals, where serving the uninsured is considered a charity care, CHCs are reimbursed for the uninsured care provided to the population through U.S. Health Resources and Services Administration (HRSA) grants at Medicaid rate. Moreover, insurers will compensate CHCs for the services rendered to private and public insured patients. Therefore, it is posited that:

Hypothesis 2: CHCs reporting higher p*roductivity are associated with better financial performance*

METHODOLOGY

Data

This study utilized two different secondary data sources: the Uniform Data System (UDS) and the Internal Revenue Service (IRS) Forms 990 from 2011 through 2016. CHCs usually operate multiple sites (mean=9, ranging from 1 to 116), however, as UDS data is submitted at the organizational level, it is considered administrative data and lacks specific site information. Collected by HRSA annually, UDS contains data on CHC patient and organization characteristics. Since CHC financial performance data in UDS is considered proprietary information, this study used another data source – the IRS Forms 990. The CHCs that are owned/operated by either local tribes or government agencies are not required to submit IRS Form 990, hence, they were not included in this study. This study's sample included only those CHCs that met both federal requirements and received grants under Section 330 and had non-missing data on both UDS and IRS Forms 990.

Variables

The definitions and data sources of all variables used in this study are reflected in Table 1. Total margin, an indicator of financial performance, was generated by dividing net income to total revenue. The productivity variable was calculated as patient visits per total patients per disease, and two of the most common disease types were selected to study in this paper.

Core Clinical Measures (CCM) were grouped into two categories: quality of care and health outcome variables. The former had three specific variables – percentage of women 21 to 64 years of age who received one or more Pap tests; percentage of adults 50 to 80 years of age who had an appropriate screening for colorectal cancer; and percentage of children 2 years of age with appropriate immunizations. The latter included percentage of patients, 18 years and older, with diagnosed diabetes who had hemoglobin A1c lower than 8 percent and percentage of patients, 18 years and older, with diagnosed hypertension whose blood pressure was less than 140/90 (adequate control) during the measurement year. Control variables were organizational characteristics and aggregate patient characteristics. Organizational characteristics were CHC location as a binary variable (1=urban, 0=rural), size (White, Reschovsky, & Bond, 2014), extent of HIT adoption, and total number of services, sites, and employees. The patient characteristics were comprised of patient payer mix, percentages of minority patients, and patients who live below the 100% federal poverty level.

Analysis

The Baron and Kenny method for mediation (Baron & Kenny, 1986) was performed to test the pathway among clinical performance, productivity, and financial performance (Figure 2). Year fixed effects were included to control for any temporal effects, and state fixed effects to control for different state funding sources and governance structures (Gaver & Im, 2014). Stata 13.1 and SAS 9.4 were used for data management and analysis.

RESULTS

Table 2 shows the complete list of variables and their descriptive statistics. On average, there were 990 national sample of CHCs per year. Average total margin was 5.6 percent which increased from 5.5 percent in 2011 to 7.2 percent in 2016 (Table 3). About half of diabetic and hypertensive patients' conditions were adequately controlled (46 and 44 percent, respectively). On average, a diabetic patient made 3 visits while annual average number of visits of a hypertensive patient was over 2. Eighty two percent of CHCs fully adopted HIT and around 10 percent reported partial adoption of HIT. Over half of CHC administrative sites were located in urban areas (58 percent). Types of services CHCs provider such as mental health, dental services, and diagnostic procedures, varied, and ranged from 5 to 21 different service types. On average, CHCs had 10 sites (median=6). The number of people CHCs employed ranged from 142 in 2011 to 200 in 2016. Majority of CHC patients were covered by Medicaid (41 percent) while one third were uninsured (35 percent). Half of the patients lived below the 100 percent federal poverty level and two third of the patients were of minority groups (66 percent).

The bivariate analysis (Table 3) examined the overall associations between total margin and independent variables. Number of patient visits per patient per disease were found to be lacking any association with total margin. However, the health outcome variables, percentages of patients that could adequately control their conditions – diabetes and hypertension, were significantly correlated with total margin. Moreover, total number of CHC employees was significantly associated with total margin. While percentage of patients with Medicaid had a positive correlation with total margin, percentage of uninsured patients was negatively correlated.

As per Baron and Kenny model for mediation, four steps of analyses were conducted (Figure 2). In the first step (path c in Figure 2), the association between the health outcome variables and total margin was examined (Table 4). The second step (path a in Figure 2) was to test the relationship between a potential mediator – number of patient visits per patient per disease and health outcome variables (Table 5). Further, next step (step 3, path b in Figure 2) explored if the mediator was correlated with the total margin (Table 6). In the last step (step 4), the effect of the health outcome variables on total margin was tested controlling for the mediator (Table 7). Steps 1 to 3 should report a significant relationship in order to test the effect of a mediator on the association between the independent and dependent variables. Then, in the last step, this association should disappear when controlled for the mediator. In each step, two separate models were analyzed for each health outcome variable – diabetes and hypertension.

Percentage of patients that could adequately control their diabetes was not related to total margin (Table 4). Percentage of patients with controlled hypertension, however, was significantly correlated to total margin. One percent increase in controlled hypertension was associated with 0.02 percent increase in total margin. Moreover, as seen in Table 4, one percent increase in Medicaid beneficiaries was related to about 0.3 percent increase in total margin in both models. Percentage of patients with private insurance was also correlated with total margin (0.3 and 0.2 percent in Model 1 and 2, respectively). Step 1 of the mediation model showed a significant relationship between the main independent variable (i.e., hypertension) and dependent variable (i.e., total margin). The next step, however, reported no significant relationship between health outcome variables and mediator (Table 5). Likewise, the mediator was not correlated with total margin (Table 6). In the full model, percentage of controlled hypertension and number of patient visits per patient per hypertension were associated with total margin. Nonetheless, the requirements of Baron and Kenny model for mediation were not met.

DISCUSSION

This paper explored the association between quality of care and financial performance in CHCs. More specifically, a mediating effect of the number of patient visits per patient per condition on the association between health outcome variables and financial performance was examined using the Deming Chain Reaction model. An increase in controlled hypertension was found to be associated with better financial performance. Further, percentages of patients with Medicaid and private insurance had a positive correlation with financial performance. According to the Deming Chain Reaction model, it was proposed that CHCs could improve their productivity by investing in quality improvement initiatives; and subsequently being efficient and treating more patients (Beauvais, Richter, & Kim, 2017). Therefore, the mediating effect of the number of patient visits per patient per disease on the association between quality of care and financial performance was examined. However, the mediating effect was found to be nonsignificant. This could be due to several reasons. First, the number of patient visits per patient per disease may not be a proper proxy measure to represent productivity. Second, care for hypertension and diabetes are a small portion of services CHCs provide. Although the improvement in those services may contribute to overall financial performance, their relative significance may be small. Further, a financial performance indicator – total margin is comprised of not only patient-related revenue, but also non-patient revenue. Additionally, reimbursement rates of services may vary, and some services, although necessary and common, can be a financial drain on the organizations because of the resources needed and low reimbursement rates.

There are a few potential limitations in this study. There can be other factors that affect both quality of care and financial performance in CHCs that were not controlled in this study. Further, this study examined the correlation, not causal relationship, between quality of care and financial performance. Fiscally healthy organizations may be more likely to invest in quality improvement initiatives. Another limitation is the lack of patient severity measures.

While the proposed mediator was found to be inadequate in this analysis, the connection between quality improvement and profitability was found to be significant. This shows that quality improvement initiatives can be considered as an investment that have a positive financial pay-back (Rust, Zahorik, & Keiningham, 1995). CHC administrators may benefit from this study findings by understanding that a focus on quality of care can impact the fiscal health of their organizations. Furthermore, the findings may help initiate a discussion about the feasibility of return on quality approach in CHCs.

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Figure 1. The relationship between quality care and financial performance using the Deming Chain Model

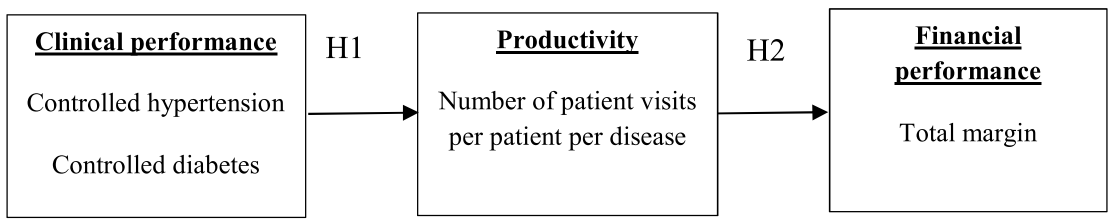

Figure 2. Baron and Kenny Model for mediation

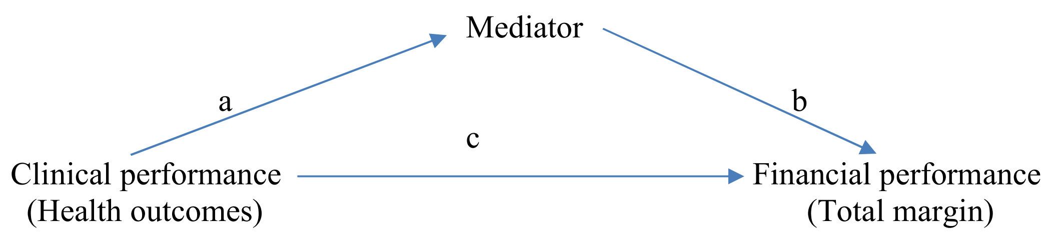

Table 1. Definitions and Sources of Variables

Variable	Definition	Source
Dependent variable		
Productivity	Number of patient visits per patient per disease	UDS
Financial performance	Total margin (net income / total revenue)	IRS 990 Form
Independent variables		
Health outcome variables	- Percentage of patients, 18 years and older, with diagnosed diabetes who had hemoglobin A1c lower than 8 percent during the measurement year - Percentage of patients, 18 years and older, with diagnosed hypertension whose blood pressure was less than 140/90 (adequate control) during the measurement year	UDS
Control variables		
Location-administrative	Location of the administrative office, recorded as Urban (1) versus rural (0)	UDS
% of minority patients	Percentage of non-White patients at CHCs	UDS
% of patients in poverty	Percentage of patients below 100% federal poverty level	UDS
Payer mix	Percentages of Medicare, Medicaid, Private, and uninsured patients	UDS
HIT use	HIT use is recorded as three ordered categories: all sites and all providers (2); at some sites or for some providers (1); or none (0)	UDS
# of services at CHC	Total number of services	UDS
# of CHC sites	Total number of sites CHC operates	UDS
# of CHC employees	Total number of employees	IRS 990 Form

Note: UDS = Uniform Data System; HIT = Health Information Technology; IRS = Internal Revenue Service

Table 2. Descriptive analysis of variables (N=5952 organization-year)

Variable	N	Mean / Percent	Std Dev
Total margin (%)	5932	5.59	10.18
Diabetes (controlled) (%)	2955	45.71	21.06
Hypertension (adequate) (%)	5950	43.85	27.69
Ratio of total patient visits to total patients			
Diabetes	2955	3.26	0.88
Hypertension	5950	2.47	0.64
Extent of HIT use			
all sites / all providers	4903	82.37	
at some sites / some providers	538	9.04	
none	511	8.59	
Location (administrative)			
Urban	3424	57.53	
Rural	2528	42.47	
Total patient visits	5948	80,675.51	104,629.90
Total CHC services	5930	20.28	2.22
Total CHC sites	5952	9.26	10.48
Total CHC employees	5931	273.13	342.73
Patients with Medicaid (%)	5952	41.11	18.44
Patients with Medicare (%)	5952	8.14	5.85
Patients with Private insurance (%)	5952	14.82	12.03
Uninsured patients (%)	5952	34.55	18.66
Patients in poverty (%)	5952	52.29	23.20
Minority patients (%)	5952	66.20	25.99

Note: CHC – Community Health Center; HIT – Health Information Technology

Table 3. Bivariate analysis of variables with total margin as a dependent variable (N=5940 organization-year)

Variable	Coefficient	P-value
Ratio of patient visits to total patients		
Diabetes	0.042	0.077
Hypertension	0.015	0.515
Diabetes (controlled)	0.087**	0.006
Hypertension (adequate)	0.088***	<0.001
Extent of HIT use		
all sites / all providers	5.957	10.318
at some sites / some providers	2.711	7.760
none	3.846	10.220
Location (administrative)		
Urban	5.736	10.425
Rural	5.379	9.824
Log of total visits	0.012	0.619
# of CHC services	0.037	0.119
# of CHC sites	0.001	0.977
# of CHC employees	0.047*	0.048
% of patients with Medicaid	0.099***	<0.001
% of patients with Medicare	0.001	0.969
% of patients with Private insurance	0.022	0.344
% of uninsured patients	-0.103***	<0.001
% of patients in poverty	-0.042	0.077
% of minority patients	0.029	0.220
Year		
2016	7.188	8.597
2015	6.572	10.233
2014	5.081	9.838
2013	4.141	9.742

2012	5.109	11.839
2011	5.496	10.190

Note: CHC – Community Health Center; HIT – Health Information Technology
p <0.05, ** p <0.01, *** p <0.001

Table 4. Regression results with total margin as a dependent variable – Step 1

Variable	Model 1 (N=2,955)	Model 2 (5,940)
Health outcome variables		
Diabetes (controlled)	0.016	
Hypertension (controlled)		0.023*
Control variables		
Total CHC sites	0.005	0.024
Total CHC services	0.107	0.148
Total CHC employees	-0.0004	-0.001
Location (administrative)		
Rural	reference	reference
Urban	-0.404	0.615
Patients with Medicaid (%)	0.355*	0.227**
Patients with Medicare (%)	0.280	0.177
Patients with Private insurance (%)	0.324*	0.176*
Uninsured patients (%)	0.283	0.128
Patients in poverty (%)	-0.021	-0.008
Minority patients (%)	0.028	0.019

Abbreviations: CHC = Community Health Center; HIT = Health Information Technology
* p <0.05, ** p <0.01, *** p <0.001

Table 5. Regression results with mediators as dependent variables – Step 2

Variable	Number of Diabetic patient visits per patient (N=2,955)	Number of Hypertensive patient visits per patient (N=5,940)
Health outcome variables		
Diabetes (controlled) (%)	0.002	
Hypertension (controlled) (%)		-0.001
Control variables		
Total patient visits (log)	0.206***	0.162***
Location (administrative)		
Rural	reference	reference
Urban	-0.116	-0.079
HIT adoption		
None	reference	reference
Partially adopted	0.343	-0.057
Fully adopted	0.309	-0.017
Patients with Medicaid (%)	0.018	0.002
Patients with Medicare (%)	0.033*	0.011*
Patients with Private insurance (%)	0.017	0.006
Uninsured patients (%)	0.019	0.004
Patients in poverty (%)	-0.0003	0.001
Minority patients (%)	0.002	0.004***

Abbreviations: CHC = Community Health Center; HIT = Health Information Technology
* p <0.05, ** p <0.01, *** p <0.001

Table 6. Regression results with total margin as a dependent variable and mediators as independent variables – Step 3

Variable	Model 1 (N=2,955)	Model 2 (N=5,940)
Ratio of patient visits to total patients		
Diabetes	0.263	
Hypertension		0.103
Control variables		
Total CHC sites	0.016	0.018
Total CHC services	0.148	0.150
Total CHC employees	-0.001	-0.001
Location (administrative)		
Rural	reference	reference
Urban	0.556	0.530
Patients with Medicaid (%)	0.225**	0.224**
Patients with Medicare (%)	0.173	0.175
Patients with Private insurance (%)	0.177*	0.175*
Uninsured patients (%)	0.128	0.126
Patients in poverty (%)	-0.008	-0.008
Minority patients (%)	0.020	0.020

Abbreviations: CHC = Community Health Center; HIT = Health Information Technology
* p <0.05, ** p <0.01, *** p <0.001

Table 7. Regression results with full model – Step 4

Variable	Model 1 (N=2,955)	Model 2 (N=5,940)
Health outcome variables		
Diabetes (controlled) (%)	0.017	
Hypertension (controlled) (%)		0.024*
Ratio of patient visits to total patients		
Diabetes	0.020	
Hypertension		0.019*
Control variables		
Total CHC sites	-0.002	0.013
Total CHC services	0.088	0.153
Total CHC employees	-0.0001	-0.0008
Location (administrative)		
Rural	reference	reference
Urban	-0.443	0.600
Patients with Medicaid (%)	0.342*	0.218**
Patients with Medicare (%)	0.256	0.137
Patients with Private insurance (%)	0.313	0.168*
Uninsured patients (%)	0.270	0.116
Patients in poverty (%)	-0.022	-0.010
Minority patients (%)	0.027	0.019

Abbreviations: CHC = Community Health Center; HIT = Health Information Technology
* p <0.05, ** p <0.01, *** p <0.001

DISCUSSION AND CONCLUSIONS

The purpose of this dissertation was to expand the current knowledge with respect to clinical performance in the context of CHCs. This was the first study that used longitudinal data on a national sample of CHCs where it examined the predictors and outcomes of clinical performance in CHCs. Specifically, the first paper was to explore the association between the age and extent of HIT adoption and clinical performance. The goal of HIT adoption and use was to address the concerns of low quality of care at ambulatory care settings (Buntin, Jain, & Blumenthal, 2010). As HIT adoption has been increasing among CHCs since the implementation of HITECH Act of 2009 (Frimpong, Jackson, Stewart, Singh, Rivers *et al.*, 2013), it was imperative to assess the relationship of HIT adoption and clinical performance in CHCs. Hypotheses were generated using the constructs of Resource Based View of the Firm, and fitted into Donabedian's structure-process-outcome model. This study utilized the Uniform Data System and the Internal Revenue Service 990 Form data from a national sample of 990 CHCs for the period of 2011-2016. Generalized estimating equations model was used to test the hypotheses. The results showed that the age of HIT adoption was significantly related to clinical performance. This meant that the early adopters of HIT had a better competitive advantage in improving quality of care over late HIT adopters. Further, a full-extent adoption of HIT was positively related to better clinical performance compared to CHCs that had not adopted HIT. The findings of this study were important because of their potential for policy implication. The information obtained from this study can help policy makers and CHC administrators to formulate strategies to accelerate the adoption and use of HIT; as well as its implementation in full extent.

The second paper regressed executive compensation on clinical performance. Executive compensation has been escalating rapidly over the past few decades (Carreyrou & Martinez, 2008; Public Broadcasting Service, 2010). Questions about the appropriateness and relevance of executive compensation have been raised, particularly at nonprofit health care organizations. Since most studies on this field have focused on the financial performance metrics in determining executive compensation (Aggarwal, Evans, & Nanda, 2012; Brickley, Van Horn, & Wedig 2010; Moskowitz, 1999; Oster, 1998; Pink & Leatt, 1990; Stahl, 2000), this paper took a different approach: to test whether non-financial measure – clinical performance was related to executive compensation. The constructs of Agency, Managerial Power, and Social Comparison theories were used to test the proposed association. After analyzing the longitudinal data of 2011-2016 on a national sample of 984 CHCs, the study findings were in conjunction with the results of previous studies (Brickley, Van Horn, & Wedig, 2010; Cardinaels, 2009; Sigler, 2003), that executive characteristics such as gender, race, degree, tenure, and job difficulty were among the most predominant predictors of executive compensation. Moreover, highest paid employees' salaries were highly correlated with executive compensation. However, there was no relationship between quality of care CHCs provide and their executive compensations. This study, being the first that explored the predictors of executive compensation at CHCs, contributes to the existing body of literature, and helps broaden our knowledge on executive compensation at CHCs.

The findings can inform policy makers and CHCs' board members to make informed decisions while setting executive compensation.

The goal of the last paper was to examine the relationship between clinical and financial performances at CHCs. Traditionally, quality improvement initiatives have been introduced with proper incentive programs to encourage their adoption (Cheung, Moiduddin, Marshall, et al., 2008). However, a new approach – return on quality – was proposed to make quality improvement efforts financially attractive (Hwang & Christensen, 2008). Recent studies found a positive relationship between quality improvement programs and organization's financial wellbeing (Vélez-González, Pradhan, & Weech-Maldonado, 2011). This paper tested this approach utilizing Deming Chain Reaction model. Longitudinal data (2011-2016) from a national sample of 990 CHCs were extracted from Uniform Data System and Internal Revenue Service 990 Forms. The analysis reported a significant relationship between clinical and financial performances. CHC administrators can use the findings to formulate strategies to make quality improvement efforts financially sustainable.

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APPENDIX

INSTITUTIONAL REVIEW BOARD APPROVAL FORM

THE UNIVERSITY OF ALABAMA AT BIRMINGHAM
Office of the Institutional Review Board for Human Use

470 Administration Building
701 20th Street South
Birmingham, AL 35294-0104
205.934.3789 | Fax 205.934.1301 | irb@uab.edu

NHSR DETERMINATION

TO: Davlyatov, Ganisher K.

FROM: University of Alabama at Birmingham Institutional Review Board
Federalwide Assurance Number FWA00005960

DATE: 17-Aug-2017

RE: IRB-300000252
Examining the Relationship between Operational and Clinical Performances of Federally Qualified Community Health Centers

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The Office of the IRB has reviewed your Application for Not Human Subjects Research Designation for the above referenced project.

The reviewer has determined this project is not subject to FDA regulations and is not Human Subjects Research. Note that any changes to the project should be resubmitted to the Office of the IRB for determination.

If you have questions or concerns, please contact the Office of the IRB at 205-934-3789.