JOURNAL OF HEALTH CARE FINANCE

Spring 2019

Is there an Association between Quality Care and Financial Performance in Community Health Centers?

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Acknowledgements: No funding was received for this research

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ABSTRACT

This study examined the relationship between Community Health Centers' (CHCs) quality of care measures and their financial performance. Using a national sample of 992 CHCs, we also tested the mediating effect of patient visits per patient per disease on the association between clinical and financial performances.

Our study's findings showed that quality of care was related to the CHCs' financial performance. For example, one percent increase in a health outcome variable – controlled hypertension was associated with 0.023 percent increase in their financial performance.

Health care providers need to develop strategies that balance improving their organization's financial performance and providing the best care for their patients. As such, this study's findings can assist CHC administrators and other stakeholders to make informed decisions when considering quality improvement initiatives by understanding that a focus on quality of care can affect not only patients' health but also the fiscal health of provider organizations.

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

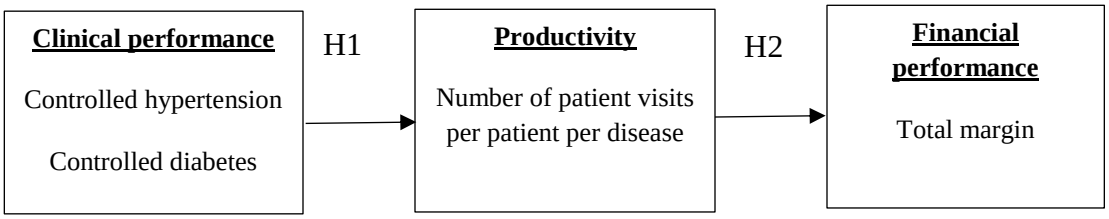
INTRODUCTION

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 trade-offs for today's health care system (Carroll, 2012). If an organization wants to address access and quality, as the PPACA suggests, the third component, cost will most probably increase. However, incentive programs have been introduced to encourage CHCs to adopt quality improvement policies. These programs provide financial rewards for CHCs meeting specific performance and quality goals (Cheung, Moiduddin, Chin, Drum, Brown *et al.*, 2008). These quality programs have demonstrated that CHCs can deliver improved care but not without the appropriate resources (Chien, Walters, & Chin, 2007; Chin, Kirchhoff, Schlotthauer, Graber, Brown, *et al.,* 2008). For example, CHCs may be able to provide timelier diagnostic testing but that requires an investment for infrastructure upgrades (Chin, Kirchhoff, Schlotthauer, *et al*., 2008). Without additional resources or reimbursement payments that encourages and incentivizes quality improvement efforts, CHCs may find themselves in financial distress (Chin, Kirchhoff, Schlotthauer, Graber, Brown, *et al*., 2008; Severens, 2003). As such, CHCs may hesitant with the adoption of quality improvement policies, if those policies require additional funds (Cheung, Moiduddin, Chin, Drum, Brown, *et al.*, 2008). Health care providers need to develop strategies that balance improving their organization's financial performance and providing the best care for its patients. Successfully achieving these goals is difficult in an environment where resources are limited (Epane, Weech-Maldonado, Hearld, Menachemi, Sen *et al.*, 2017). Therefore, some 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 continues to be a gap in our knowledge that link quality and financial performance in health care and the limited research published to date has reported 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 report that their 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).

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



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 and inefficient care (Rust, Zahorik, & Keiningham, 1995). This has the multiple benefits of not only making the organization more efficient by removing waste, improving productivity capabilities, and reducing errors but also improving the patient experience and satisfaction. Increased patient satisfaction allows the organization to 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) thus increasing service revenues. Improved efficiency reduces expenses while increased patient satisfaction attracts new patients and maintains retention of existing patients which results in increased revenues. (i.e., increased revenue),. Thus quality improvement can have a direct effect on an organization's profitability (Beauvais, Richter, & Kim, 2017). Therefore, according to the Deming Chain Reaction model, when healthcare organizations invest in quality improvement initiatives, the organizations can reduce costs while increasing revenues (Rust, Zahorik, & Keiningham, 1995). The authors refer to this conceptual model as "the return on quality approach." This approach conceptualizes quality initiatives as an investment with a resulting a 'payback' (Rust, Zahorik, & Keiningham, 1995). From a conceptual perspective, this payback should result in the combination of improve health care quality and financially stable. 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 gain frees organizational slack, which can allow providers to treat more patients and produce greater revenues. 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 (diabetes and hypertension) were selected for this study.

CHCs' performance is assessed by HRSA based on Core Clinical Measures (CCM) that target health care processes and outcomes CHCs provide, as well as their financial viability (HRSA, 2017). CCMs were grouped into two categories: quality of care and health outcome variables. Our focus was on the health outcome category which includes 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), 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.

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

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 992 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. 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).

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
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

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, the 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.

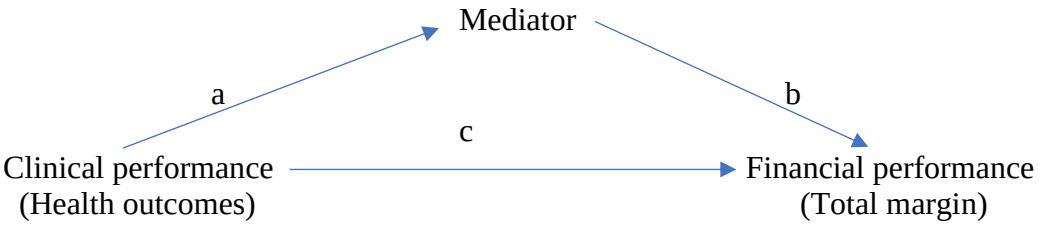
Table 3. Bivariate analysis of variables with total margin as a dependent variable (N=5940 organization-year)

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
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

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.

Figure 2. Baron and Kenny Model for mediation



Percentage of patients with adequately control 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.

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

This study 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 non-significant. 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.

CONCLUSION

Although in our study the proposed mediator was found to be inadequate, 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's findings by understanding that a focus on quality of care can impact not only their patients' health but also the fiscal health of their organizations.

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