


# Impacts of Initial Transformation to a Patient-Centered Medical Home on Diabetes Outcomes in Federally Qualified Health Centers in Florida

Journal of Primary Care & Community Health  
2017, Vol. 8(4) 192–197  
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sagepub.com/journalsPermissions.nav  
DOI: 10.1177/2150131917742300  
journals.sagepub.com/home/jpc  


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## Abstract

**Objective:** Federally qualified health centers (FQHCs) in Florida see large numbers of vulnerable patients with diabetes. Patient-centered medical home (PCMH) models can lead to improvements in health for patients with chronic conditions and cost savings for providers. Therefore, FQHCs are increasingly moving to PCMH models of care. The study objective was to examine the effects of initial transformation to a level 3 National Committee for Quality Assurance (NCQA) certified PCMH in 2011, on clinical diabetes outcomes among 27 clinic sites from a network of FQHCs in Florida. **Methods:** We used de-identified, longitudinal electronic health record (EHR) data from 2010–2012 and multivariate logistic regression to analyze the effects of initial transformation on the odds of having well-controlled HbA1c, body mass index (BMI), and blood pressure (BP) among vulnerable patients with diabetes. Models controlled for clustering by year, patient, and organizational characteristics. **Results:** Overall, transformation to a PCMH was associated with 19% greater odds of having well-controlled HbA1c values with no statistically significant impact on BMI or BP. Subanalyses showed transformation had less of an effect on BP for African American patients and HbA1c control for Medicare enrollees but a greater effect on weight control for patients older than 35 years. **Conclusion:** Transformation to a PCMH in FQHCs appears to improve the health of vulnerable patients with diabetes, with less improvement for subsets of patients. Future research should seek to understand the heterogeneous effects of patient-centered transformation on various subgroups.

## Keywords

community health centers, patient-centeredness, access to care, health outcomes, disease management, impact evaluation, primary care

## Introduction

In 2015, 13% of adult patients seen in federally qualified health centers (FQHCs) nationally had a diagnosis of diabetes, representing 11% of people with diabetes in the United States.<sup>1</sup> Individuals with diabetes have higher medical costs and are at greater risk for co-morbidities such as cardiovascular disease, stroke, and kidney disease.<sup>2–4</sup> Significant disparities in accessibility and receipt of quality diabetes care, are prevalent among those with low incomes.<sup>2</sup> FQHCs are often the main source of primary care in underserved areas where a majority of the patients may be uninsured and have multiple chronic conditions.<sup>5</sup>

FQHCs are increasingly moving toward patient-centered medical home (PCMH) models of care delivery. PCMHs focus on the whole patient and aim to provide accessible,

comprehensive, and quality care with high levels of coordination among providers to improve the health of patients and achieve cost savings.<sup>6,7</sup> Providers may implement a PCMH independently or achieve recognition from a national organization such as the National Center for Quality Assurance (NCQA), which awards PCMH recognition based on a

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particular set of standards and performance metrics.<sup>4</sup> Studies examining PCMH implementation on quality of care and effectiveness, including diabetes measures, reported mixed findings. Moreover, most of the studies were conducted in large integrated health systems, community-based clinics, or focused on specific payers.<sup>2,3,7-26</sup> While the literature in community-based practices and integrated health systems is substantial, little is known about the effects of FQHCs transitioning to a NCQA certified PCMH on clinical outcomes for patients with diabetes.<sup>1</sup>

Gunter et al<sup>24</sup> examined PCMH characteristics and diabetes care quality using the Safety-Net Medical Home Scale and reported inconsistent and mixed findings for 800 patients with diabetes. Shi et al<sup>25</sup> used the Uniform Data System and surveys of Health Resources and Services Administration community health centers (CHCs) to compare clinical performance between PCMH and non-PCMH recognized CHCs. The study concluded that PCMH accredited centers performed better than nonaccredited CHCs for diabetes hemoglobin A1c (HbA1c) control and adult weight screening.<sup>25</sup> Finally, an examination of 800 FQHCs found that postimplementation, 1 of 6 PCMH domains (access/communication), was associated with improved outcomes for patients with diabetes.<sup>26</sup>

Understanding how PCMH transformation influences care for vulnerable populations in FQHCs will provide vital information to improve care delivery for those with chronic illnesses and inform CHCs about successful models of implementation. Therefore, the objective of this study was to investigate the impact of the initial transformation to a level 3 (L3) NCQA certified PCMH on clinical outcomes for patients with diabetes receiving care in a network of FQHCs in Florida. We expect diabetes management to be improved after PCMH transformation given the principles of medical homes, which include providing comprehensive and coordinated care, a commitment to quality, and greater access to services.<sup>6-8</sup> This study adds to the literature by examining how implementation of the PCMH can affect diabetes clinical outcomes for subpopulations of vulnerable patients who visit FQHCs.

## Methods

### Data

We used de-identified, longitudinal electronic health record (EHR) data and a pre-post design to examine the impact of initial transformation to NCQA L3 PCMH status in 2011, on clinical outcomes for patients with diabetes receiving care in a network of FQHCs. Health Choice Network (HCN) is one of the largest health center controlled networks in the United States supported by HRSA with member centers that include 30 FQHCs and 2 non-FQHCs. Of those, 5 centers representing 27 clinics in

Florida, sought and were awarded L3 PCMH recognition from NCQA in 2011.

To assess whether transformation to a PCMH improved outcomes for vulnerable patients with diabetes served in FQHCs, we examined 2010, 2011, and 2012, EHR data obtained from the 27 clinic sites. Patients were excluded from the sample if they were younger than 18 years, were pregnant, or had given birth in the previous 12 months. Additionally, observations that had implausible values for the outcome measures were removed from the analytic data set. The final analytic data set had 14 136 observations. The unit of analysis was a person-year, meaning each person could contribute up to 3 observations to the analysis.

### Measures

The main predictor was clinic transformation to a L3 NCQA certified PCMH in 2011, constructed as a bivariate variable (1 = transformation in 2011). Consistent with the American Diabetes Association guidelines, 3 outcome measures were examined; the odds of having well-controlled glucose defined as HbA1c <7.0, the odds of having well-controlled blood pressure (BP) at 2 thresholds, <140/90 mm Hg or 130/80 mm Hg, and the odds of being at a normal weight, defined as body mass index (BMI) between 18.5 and 24.9 kg/m<sup>2</sup>.<sup>4</sup> For patients with multiple lab values or measurements during the year, the last recorded value in the patient's record of the calendar year was used for each outcome variable.

Control variables included indicators for health center, age, gender, race, ethnicity, clinic size, baseline BMI, payer source, and primary language spoken. Age was categorized into 3 groups; 18 to 34 (reference), 35-64, and >65 years. Race was categorized into Caucasian (reference), African American, Asian, and other or unknown race. Ethnicity and primary language spoken were bivariate variables coded as Hispanic or non-Hispanic and English or non-English, respectively. Payer source was categorized into 4 groups, uninsured (reference), Medicaid, Medicare, and private insurance.

### Analyses

Generalized estimating equation (GEE) models, also known as population average logistic regression models were used to estimate the association between an FQHC transforming to a L3 NCQA certified PCMH and diabetes clinical outcomes. The GEE models controlled for clustering by year, by patient, and by health center. All analyses were conducted using STATA 13.0.

Based on initial results from the primary analyses, we decided to test whether African American race, age group, or payer source moderated the effects of PCMH transformation on the outcome measures. We conducted 3 sub-analyses

using an interaction term with PCMH by African American race, age group, and payer source. For the payer source interaction, uninsured, Medicaid, Medicare, and private insurance were used to examine moderating effects. The uninsured category was the most common source of payment.

## Results

### Population Characteristics

Table 1 displays the characteristics of the final analytic data set. The mean age was 59 years and approximately 60% were female. Half of the patients were Caucasian, 42% were African American, 6% were other or unknown race, and 2% were Asian. Forty-six percent of the patients were of Hispanic ethnicity and 58% spoke English as their primary language. In the pre-period, before controlling for other factors, 41% of the patients had HbA1c levels less than 7.0, 62% had BP values <140/90 mm Hg, and 14% had a BMI between 18.5 and 24.9 kg/m<sup>2</sup>.

### Effect of PCMH Transformation

Table 2 shows that transformation to a L3 NCQA PCMH in 2011, was associated with 19% greater odds of having well-controlled HbA1c but had no statistically significant impact on BP control or weight control. While the overall effect of transformation on blood pressure levels was not statistically significant in the primary multivariate analysis, African American patients had significantly worse HbA1c (odds ratio [OR] = 0.78,  $P = .001$ ) and BP values (OR = 0.56,  $P < .001$ ) compared with Caucasian patients after PCMH transformation. Moreover, initial transformation appeared to effect patients within certain age groups and with certain types of payers differently. Sensitivity analyses were conducted to test whether African American race, age, and payer source moderated the impact of PCMH transformation.

### Interaction Effects of Race, Age, and Payer Type

Table 3 shows that medical home transformation had less of an effect for African American patients on BP control at 140/90 mm hg (OR = 0.77,  $P = .015$ ) compared with all other patients. Race did not have a moderating effect on HbA1c values, BP control at 130/80 mm Hg, or BMI within the normal range. Also displayed, patients older than 35 years were more likely to achieve normal weight after PCMH transformation (OR = 2.67,  $P = .010$ ) compared with younger patients. Finally, PCMH transformation had significantly less of an effect on controlling blood glucose for Medicare enrollees (OR = 0.63,  $P = .005$ ) compared to uninsured patients.

**Table 1.** Sample Characteristics (N = 14 136).

Variable	Mean
Age, years	59.0
Gender, %	
Female	59.8
Male	40.2
Race, %	
Caucasian	49.7
African American	42.4
Asian	1.5
Other/Unknown race	6.4
Ethnicity, %	
Hispanic	46.3
Non-Hispanic	53.7
Primary language spoken, %	
English	58.1
Non-English	41.9
Clinic characteristics	
Clinic size, n	485.7
Center 1, %	12.9
Center 2, %	8.0
Center 3, %	40.8
Center 4, %	22.0
Center 5, %	16.3
Payer type, %	
Medicaid	16.9
Medicare	12.5
Private	3.3
Uninsured	67.4
Clinical measures	
Body mass index, kg/m <sup>2</sup>	31.9
HbA1c, %	8.0
Systolic blood pressure, mm Hg	134
Diastolic blood pressure, mm Hg	80
HbA1c <7.0, %	40.7
Blood pressure less than 140/90 mm Hg, %	61.9
Normal weight: BMI between 18.5 and 24.9 kg/m <sup>2</sup> , %	13.6

## Discussion

The study objective was to examine the association between initial transformation to a L3 NCQA PCMH and diabetes outcomes for patients in FQHCs. We expected PCMH transformation to improve clinical outcomes based on the defining elements of medical homes, including patient-centeredness, providing coordinated care, and a focus on quality improvement, among others.<sup>5-8</sup> PCMH implementation in FQHCs appears to have a mixed or varying effect on the health of vulnerable patients with diabetes. Overall, there were significantly greater odds of a patient with diabetes having well-controlled HbA1c after PCMH transformation, likely from increased care utilization and chronic disease management.<sup>14,26</sup> There was also evidence that PCMH

**Table 2.** Multivariate Results on the Effect of FQHC PCMH Transformation on Diabetes Outcomes.

Measure	Odds Ratio	P (95% CI)
HbA1c < 7.0	1.19	.004 (1.05-1.34)
Blood pressure <140/90 mm Hg	1.05	.422 (0.93-1.18)
Blood pressure <130/80 mm Hg	1.06	.338 (0.94-1.20)
Normal weight: BMI between 18.5 and 24.9 kg/m <sup>2</sup>	1.06	.308 (0.94-1.20)

Abbreviations: FQHC, federally qualified health center; PCMH, patient-centered medical home; HbA1c, hemoglobin A1c; BMI, body mass index.

**Table 3.** Interaction Effects of Race, Age, and Payer Source on the Impact of PCMH Transformation on Diabetes Outcomes.

Measure	Odds Ratio	P (95% CI)
HbA1c <7.0		
AA * PCMH	0.84	.114 (0.68-1.04)
Age 35-64 * PCMH	1.75	.420 (0.45-6.86)
Age 65 * PCMH	1.72	.437 (0.44-6.75)
Medicaid * PCMH	0.94	.647 (0.72-1.23)
Medicare * PCMH	0.63	.005 (0.46-0.87)
Private * PCMH	0.81	.576 (0.39-1.68)
Blood pressure <140/90 mm Hg		
AA * PCMH	0.77	.015 (0.62-0.95)
Age 35-64 * PCMH	0.75	.605 (0.25-2.21)
Age 65 * PCMH	0.77	.638 (0.26-2.28)
Medicaid * PCMH	0.91	.502 (0.69-1.20)
Medicare * PCMH	1.19	.337 (0.84-1.68)
Private * PCMH	1.08	.846 (0.50-2.31)
Blood pressure <130/80 mm Hg		
AA * PCMH	0.81	.074 (0.64-1.02)
Age 35-64 * PCMH	1.35	.528 (0.53-3.45)
Age 65 * PCMH	1.41	.481 (0.55-3.62)
Medicaid * PCMH	0.88	.400 (0.66-1.18)
Medicare * PCMH	1.24	.274 (0.84-1.83)
Private * PCMH	1.51	.357 (0.63-3.66)
Normal weight: BMI between 18.5 and 24.9 kg/m <sup>2</sup>		
AA * PCMH	0.97	.774 (0.78-1.21)
Age 35-64 * PCMH	2.67	.010 (1.27-5.62)
Age 65 * PCMH	2.35	.025 (1.11-4.97)
Medicaid * PCMH	0.98	.913 (0.74-1.31)
Medicare * PCMH	1.02	.897 (0.71-1.48)
Private * PCMH	0.56	.132 (0.26-1.19)

Abbreviations: PCMH, patient-centered medical home; AA, African American; BMI, body mass index.

transformation in FQHCs has varying effects among different patient subgroups. For instance, after transformation patients with diabetes who were older than 35 years were more likely to achieve normal weight. However, there was less of an impact on blood pressure control for African

American patients and less of an impact on glucose levels for Medicare patients. It is possible the results for achieving normal weight and controlling blood pressure in this study were because of the fact that producing changes in these outcomes can take more time compared to changes in glucose levels. The mixed findings reported in this study are consistent with the previous literature.<sup>3,7-26</sup>

Given the differential effects of PCMH transformation among certain groups of patients, it is essential to further examine the impact of care delivery models on patient outcomes, particularly for patients with chronic illnesses. If differences in the impact of PCMH transformation among subgroups are affirmed in future studies, then FQHCs may want to consider how to tailor PCMH components to better meet the needs of particular subgroups of patients.

FQHCs are an essential part of our health care delivery system and will continue to have an increasing role in the provision of primary care services for those with limited resources who are often sicker, uninsured, and who may have otherwise sought care in hospital emergency departments or not at all.<sup>5,27</sup> For instance, a recent national study observed that FQHCs had 5% more visits for diabetes than other private community primary care providers.<sup>5</sup>

Thus, FQHCs can play an important role in improving the health of vulnerable populations with diabetes and help to reduce disparities in health outcomes.<sup>5,27,28</sup> As delivery systems continue to move toward care that is patient-centered, future research is needed to investigate whether specific aspects of PCMH transformations can have differential effects on health outcomes.

Our study has several strengths, including analyzing clinical outcomes extracted from the EHR data stored in HCN's data warehouse. Moreover, all adults older than 18 years who met the inclusion criteria, as well as all payer sources utilized by this sample of patients were included in the sample, as opposed to limiting the analyses to a single payer source or relying solely on process measures.

This study has a few limitations. With any observational study, there is the possibility of unmeasured confounding. Unmeasured time variant factors could potentially affect the results given the pre-post design without a control group. However, all analyses controlled for patient and clinic characteristics and included center fixed effects to minimize potential confounding. Because, the participating FQHCs were all from HCN of Florida, generalizability may be limited. However, Florida's diverse population strengthens the generalizability of the study.

Despite these limitations, it appears that PCMH transformation might be associated with improved outcomes for vulnerable patients living with diabetes. Calman et al<sup>29</sup> assessed utilization among patients with diabetes in FQHCs that transitioned to an NCQA L3 PCMH and observed increased use of support services but lower utilization of primary care services among all patients with diabetes. The

Centers for Medicare and Medicaid Services FQHC Advanced Primary Care Practice Demonstration revealed that for Medicare beneficiaries with diabetes, transition to a PCMH resulted in more HbA1c tests, eye examinations, and nephropathy tests.<sup>30</sup> In the current analysis we looked at PCMH transformation as a singular event, when in actuality it is the composite of multiple practice changes. Thus, future research should examine the components of certification that may drive change. Our findings track with similar studies, help contribute to the evidence supporting transformation to a PCMH, and fills an important gap by examining patient-level clinical outcomes in a diverse safety-net population with multiple payer sources served in FQHCs that achieved NCQA L3 PCMH accreditation.

### Authors' Note

Preliminary results were presented at the Health Choice Network's 22nd Annual Educational Conference, June 24-26, 2016 in Miami, Florida and at the AcademyHealth Annual Research Meeting, June 25-27, 2017 in New Orleans, Louisiana.

### Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

### Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

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