Impact of a Population Health Management Intervention on Disparities in Cardiovascular Disease Control

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BACKGROUND: Healthcare systems use population health management programs to improve the quality of cardiovascular disease care. Adding a dedicated population health coordinator (PHC) who identifies and reaches out to patients not meeting cardiovascular care goals to these programs may help reduce disparities in cardiovascular care.

OBJECTIVE: To determine whether a program that used PHCs decreased racial/ethnic disparities in LDL cholesterol and blood pressure (BP) control.

DESIGN: Retrospective difference-in-difference analysis.

PARTICIPANTS: Twelve thousdand five hundred fifty-five primary care patients with cardiovascular disease (cohort for LDL analysis) and 41,183 with hypertension (cohort for BP analysis).

INTERVENTION: From July 1, 2014–December 31, 2014, 18 practices used an information technology (IT) system to identify patients not meeting LDL and BP goals; 8 practices also received a PHC. We examined whether having the PHC plus IT system, compared with having the IT system alone, decreased racial/ethnic disparities, using difference-in-difference analysis of data collected before and after program implementation.

MAIN MEASURES: Meeting guideline concordant LDL and BP goals.

KEY RESULTS: At baseline, there were racial/ethnic disparities in meeting LDL ($p = 0.007$) and BP ($p = 0.0003$) goals. Comparing practices with and without a PHC, and accounting for pre-intervention LDL control, non-Hispanic white patients in PHC practices had improved odds of LDL control (OR 1.20 95% CI 1.09–1.32) compared with those in non-PHC practices. Non-Hispanic black (OR 1.15 95% CI 0.80–1.65) and Hispanic (OR 1.29 95% CI 0.66–2.53) patients saw similar, but non-significant, improvements in LDL control. For BP control, non-Hispanic white patients in PHC practices (versus non-PHC) improved (OR 1.13 95% CI 1.05–1.22). Non-Hispanic black patients (OR 1.17 95% CI 0.94–1.45) saw similar, but non-statistically significant, improvements in BP control, but Hispanic (OR 0.90 95% CI 0.59–1.36) patients did not. Interaction testing confirmed that disparities did not decrease ($p = 0.73$ for LDL and $p = 0.69$ for BP).

CONCLUSIONS: The population health management intervention did not decrease disparities. Further efforts should explicitly target improving both healthcare equity and quality.

Clinical Trials #: NCT02812303 (ClinicalTrials.gov).

KEY WORDS: population health management; racial and ethnic disparities in care; hypertension; hyperlipidemia; cardiovascular disease.
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Cardiovascular disease is the leading cause of death in men and women of all races, ethnicities, and socioeconomic classes in the USA,[1] but the burden of cardiovascular disease is greater among racial/ethnic minority groups, with 17% of non-Hispanic black and 13% of Hispanic adults having poor cardiovascular health as compared to 11% of non-Hispanic white adults.[2] Hypertension and dyslipidemia are key risk factors for cardiovascular disease, and improving control of these risk factors plays an important role in both primary and secondary prevention of cardiovascular disease.[3] However, the Centers for Disease Control and Prevention report that only 48% of patients with hypertension and 29.5% of patients with dyslipidemia had their conditions controlled.[4,5] Rates of control are often worse among patients who identify as a racial or ethnic minority.[4–6] For example, in 2010, rates of blood pressure control were substantially different among non-Hispanic white adults (56.3%) compared with non-Hispanic black (47.9%) and Hispanic adults with hypertension (40.7%).[6] In this light, reducing racial/ethnic disparities in blood pressure and cholesterol control, along with improving blood pressure and cholesterol control overall, is a national public health priority.[7]

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Population health management includes programs that seek to identify and reach out to patients who are not meeting care goals. They are increasingly being used to improve the quality of chronic disease prevention and management across large healthcare delivery systems.[8–10] These programs vary by institution, but often include a population health information technology system, which helps identify patients not at goal using clinical record data and facilitates outreach to these patients. Additional components may include educational materials and a dedicated population health management workforce, sometimes called population health coordinators, that interfaces with both providers and patients, relieving other clinical staff from some of the population health management work. Supporters have noted that these population health management programs have the potential to reduce disparities through several mechanisms.[11–19] Provider reminders, audit and feedback, and decision support tools could help raise awareness of existing disparities and limit biased decision-making. Support staff, including dedicated personnel, could help to reach out to patients and overcome barriers to care, which may be more common in vulnerable groups, and provide further education. However, if such programs do not directly address disparities, they may allow disparities to persist or even worsen.

To help understand these issues better, we sought to examine the impact of implementing a multifaceted population health intervention on racial/ethnic disparities in blood pressure and cholesterol control. This program used several strategies that had been highlighted in a roadmap to reduce racial/ethnic disparities, including providing reminders and feedback, restructuring the care team, and use of technology.[20] Therefore, we hypothesized that such a program would decrease racial/ethnic disparities in blood pressure and cholesterol control.

METHODS

Study Setting and Sample

The intervention has been previously described in detail.[10] In brief, the study was conducted in a network of 18 primary care practices that used the same population health management information technology system (TopCare, SRG Technology). This system identifies what quality measures a patient is eligible for, whether a patient is meeting their goals, and facilitates outreach to the patient. As previously described, included patients were attributed to a practice using a validated algorithm if they had a visit in the 3 years prior to the start of the study (July 1, 2014) or during the 6 month study period (ending December 31, 2014).[10] Patients included in the low-density lipoprotein (LDL) cholesterol analyses had cardiovascular disease as determined by a previously validated algorithm[21,22] that used diagnosis codes and problem list items from the patient's electronic health record. Patients included in the blood pressure (BP) analyses had hypertension as assessed by a previously validated algorithm[21] using similar data elements. Participants could be included in both analyses if they met criteria for both conditions. Demographic data were obtained from the electronic health record. Participants could self-identify into the following racial/ethnic categories: non-Hispanic white, non-Hispanic black, Hispanic, Asian, Other, or Multi-racial. Due to the small sample size in Asian, Other, and Multi-racial groups, we limited the analysis to non-Hispanic white, non-Hispanic black, and Hispanic participants.

The institutional review board at Partners Healthcare approved this project's use of secondary data collected in routine clinical care.

Intervention

TopCare is a population health management information technology system that has been in use since 2011 in the primary care practices for cancer screening. In conjunction with TopCare, a pilot program began on July 1, 2014, and continued through December 31, 2014. There were two versions of the program. In version one, the intervention group, the population health management information technology system was expanded from being used for cancer screening goals to also being used for cardiovascular care goals (described below). In addition, version one included the assignment of central population health coordinators (PHCs) to individual practices. The PHC proactively identified patients not at goal, without the need for a clinician to order this service. The PHC helped handle administrative issues for patients who were not meeting disease control metrics, such as outreach for appointment scheduling, ordering overdue laboratory testing, chart reviews, and obtaining home blood pressure values and outside tests/laboratories. The PHCs regularly met ("huddled") with physicians to review those patients who required clinical intervention and to develop an action plan. The PHC worked within the organization's commitment to culturally competent care and provided culturally and linguistically appropriate services, including the use of certified medical interpreters when needed. The PHCs were not trained patient navigators or community health workers. There were four PHCs to cover eight clinical sites. In version two of the program, the non-intervention practices without a population health coordinator (non-PHC), the population health management information technology system was still used, but there were no dedicated personnel assigned—the tasks of helping patients meet quality of care goals were handled by usual clinic staff and medical providers in addition to their regular duties.

The two versions of the program were not assigned randomly, but rather in consultation with primary care leadership and with a goal of balancing the type of practice assigned (e.g., community health center, hospital-based clinic) between the two versions of the program, while also achieving buy-in from the practice

leaders. Of the 18 practices, 8 were assigned to version one (PHC practices) and 10 to version two (non-PHC practices).

Outcomes

Outcomes were assessed using data from the participants' clinical record. For LDL analyses, participants were considered to have met their goal if they were prescribed a high-dose HMG co-reducatase inhibitor (statin) in the preceding 1 year period or had an LDL level under 100 mg/dl. For BP analyses (see eFigure 1 for flowchart), goals were concordant with JNC 8 Guidelines.[23] Participants who were under 60 years of age met their goal if their systolic blood pressure was < 140 mmHg and their diastolic blood pressure was < 90 mmHg or they were prescribed three or more anti-hypertensive agents. Those aged 60 and older met their goal as long as they had a diastolic blood pressure < 70 mmHg regardless of other factors, owing to the risk associated with further BP lowering in this group.[24] Additionally, if their diastolic blood pressure was ≥ 70 but < 90 mmHg and their systolic blood pressure was < 150 mmHg, or if they were prescribed three or more anti-hypertensive agents from different classes, they were considered to be at goal.[10]

Statistical Analysis

We first performed descriptive statistics. A prior manuscript reported the overall outcomes for this intervention, but did not examine changes in disparities.[10] Our goal for this project was to determine changes in the proportion meeting LDL and BP goals, by race/ethnicity, before (July 1, 2014) and after (December 31, 2014) the intervention periods. To do this, we used a difference-in-difference approach. This involved comparing clinics with the two versions of the population health management program both before and after implementation and examining whether the disparity between racial/ethnic minority groups and non-Hispanic white patients decreased. The primary independent variable was the version of the population health management program the practice used (PHC vs. non-PHC) and we adjusted for age, gender, health insurance, primary language, patient-physician continuity,[25] and whether care was received in a health center in multivariable models. To determine whether there was differential improvement in disparities for those patients in a PHC clinic, we also tested the three-way interaction (PHC vs. non-PHC, before program implementation vs. after, and race/ethnicity) in the models. All analyses were conducted in SAS version 9.4 (SAS Institute, Cary, NC). We used logistic regression with generalized estimating equations to account for repeated measurements within patients. A two-sided *P* value of 0.05 or less was considered statistically significant.

RESULTS

In the LDL analysis, 12,555 participants met the criteria for cardiovascular disease, had self-reported race/ethnicity data available, and were in their practice at the start and end of the study period. Of this cohort, 85.5% identified as non-Hispanic white, 4.8% as non-Hispanic black, and 4.7% as Hispanic. Following similar criteria, 41,183 participants were included in the BP analyses, of whom 79.7% identified as non-Hispanic white, 7.5% as non-Hispanic black, and 6.6% as Hispanic. Compared with non-Hispanic white patients, both non-Hispanic black and Hispanic patients were more likely to have Medicaid insurance and have a primary language other than English. Approximately one third of participants in both the LDL and BP analysis received care in a PHC practice (Table 1).

LDL Control

At baseline, there was a disparity in the proportion of patients at LDL goal by race/ethnicity; 70.3% of non-Hispanic white, 64.2% of non-Hispanic black, and 68.5% of Hispanic patients ($p = 0.007$) were at goal. Over the course of the study period, LDL control improved in all groups (Fig. 1 and Table 2, absolute changes). When examining changes, there are several relevant comparisons. First, we examined LDL control comparing after with before the intervention, stratified by race/ethnicity and whether the practice was a PHC or non-PHC practice. Compared with pre-intervention, non-Hispanic white patients in both the PHC and non-PHC versions of the program made significant improvements in LDL control post-intervention, (adjusted odds ratio [aOR] 1.60 (95% confidence interval [CI] 1.48–1.74 and aOR 1.34, 95% CI 1.27–1.40, respectively). The change among non-Hispanic black (aOR 1.36, 95% CI 0.99–1.85) or Hispanic patients (aOR 1.18, 95% CI 0.98–1.43) was similar in magnitude but not statistically significant, possibly because of the smaller sample sizes (Table 2, relative changes, PHC or non-PHC).

Next, we examined whether, within racial/ethnic groups, changes in LDL control were greater in PHC, compared with non-PHC, practices (Table 2, relative changes, PHC vs. non-PHC). Compared with patients from non-PHC practices, non-Hispanic white patients in the PHC practices were more likely to be at goal for LDL control, (aOR 1.20, 95% CI 1.09–1.32) after intervention. Improvement similar in magnitude, though not statistically significant, was seen among non-Hispanic black (aOR 1.15, 95% CI 0.80–1.65) and Hispanic patients (aOR 1.29, 95% CI 0.66–2.53) in PHC compared with non-PHC practices.

Finally, we compared, across racial/ethnic groups, whether the change for racial/ethnic minority groups was different from that of non-Hispanic white patients (Table 2, comparing changes across racial/ethnic groups). We found no evidence of differential improvement in meeting LDL goals, as would be needed to reduce disparities, in patients from PHC, compared with non-PHC, practices (p for 3-way interaction = 0.73). Both non-Hispanic black patients (aOR 0.98, 95% CI 0.67–1.43) and Hispanic patients (aOR 1.05, 95%CI 0.54–2.06) had odds of improvement similar to non-Hispanic white patients in PHC vs. non-PHC practices.

Table 1 Demographic Characteristics of Participants

	Non-Hispanic black		Hispanic		Non-Hispanic white	
	NON-PHC	PHC	NON-PHC	PHC	NON-PHC	PHC
	LDL population					
N	416	191	479	112	7230	3507
Age (SD)	68.3 (12.1)	63.8 (12.5)	65.2 (13.3)	63.8 (13.8)	72.6 (11.9)	70.7 (12.0)
Female (%)	53.8	51.8	48.9	51.8	35.7	40.1
Non-English primary language (%)	11.5	8.9	73.5	58.9	3.2	2.3
Insurance (%)						
Private	29.1	46.6	33.2	31.3	32.1	35.9
Medicaid	14.7	14.7	23.2	17.9	4.8	5.6
Medicare	54.8	38.2	42.0	49.1	62.7	58.1
Uninsured	1.4	0.5	1.7	1.8	0.5	0.4
Receive care in health center (%)	11.1	19.4	61.2	58.0	15.6	37.4
Patient-physician connected	86.3	92.1	92.5	89.3	92.9	95.6
Comorbidity (%)						
Diabetes mellitus	50.5	48.2	51.2	40.2	27.3	27.4
Obesity	48.3	51.8	48.9	50.9	39.3	40.8
Congestive heart failure	20.9	21.5	21.7	18.8	17.9	18.0
Charlson score (SD)	5.4 (2.9)	4.7 (2.5)	5.3 (2.9)	5.2 (2.8)	5.3 (2.9)	5.1 (2.9)
BP population						
N	2018	1079	2190	544	21,001	11,828
Age (SD)	61.5 (13.4)	58.4 (12.4)	58.1 (13.8)	55.9 (13.3)	67.2 (13.4)	64.6 (13.0)
Female (%)	56.5	61.5	55.7	54.8	47.0	53.7
Non-English primary language (%)	13.8	8.1	71.1	51.5	3.2	1.9
Insurance (%)						
Private	48.7	59.5	46.0	46.3	46.3	52.7
Medicaid	17.2	16.6	27.9	26.5	5.6	6.0
Medicare	31.9	21.8	24.1	25.7	47.4	40.6
Uninsured	2.2	2.1	2.0	1.5	0.7	0.7
Receive care in health center (%)	15.7	20.7	68.2	60.3	14.4	30.7
Patient-physician continuity*	89.1	91.8	93.3	90.1	93.3	95.3
Comorbidity (%)						
Diabetes mellitus	34.7	34.1	38.5	35.1	19.8	19.1
Obesity	51.6	54.1	54.2	59.0	43.4	46.9
Congestive heart failure	6.5	6.0	5.8	3.1	7.1	6.4
Charlson score (SD)	3.2 (2.4)	2.9 (2.2)	3.3 (2.4)	3.2 (2.3)	3.7 (2.6)	3.4 (2.5)

PHC population health coordinator
**Patient-physician continuity represents the proportion of patients who can be attributed to a specific continuity physician as opposed to being seen at the practice without being clearly empaneled with a particular, based on a validated algorithm*[25]

BP Control

Our analyses for BP control followed the same order as reported for LDL analyses. At baseline, a small disparity was present in the proportion of patients at BP goal by race/ethnicity; 76.4% of non-Hispanic white, 73.4% of non-Hispanic black, and 74.8% of Hispanic patients ($p = 0.0003$). Over the course of the study period, BP control improved in non-Hispanic white patients in both the PHC (aOR 1.23, 95% CI 1.16–1.31) and non-PHC (aOR 1.09, 95% CI 1.04–1.14) practices (Fig. 2, Table 2, relative changes). When compared with non-PHC practices, non-Hispanic white patients from PHC practices demonstrated improved BP control (aOR 1.13, 95% CI 1.05–1.22) after intervention. The improvement in PHC practices compared with non-PHC practices for non-Hispanic black patients (aOR 1.17, 95% CI 0.94–1.45) was similar in magnitude, but not statistically significant (Table 2). The changes for Hispanic patients were qualitatively different (aOR 0.90, 95% CI 0.59–1.36).

We found no evidence of differential improvement in meeting BP goals, as would be needed to reduce disparities, in patients from PHC compared with non-PHC practices (p for 3-way interaction = 0.69). Neither non-Hispanic black patients (aOR 1.05, 95% CI 0.83–1.31) nor Hispanic patients (aOR 0.82, 95%CI 0.53–1.25) had significantly different odds of improvement in PHC, vs. non-PHC practices, compared with non-Hispanic white patients.

DISCUSSION

In this study, the overall implementation of a population health management program showed statistically significant improvement in LDL and BP control.[10] For non-Hispanic white patients, improvements were greater for patients in practices with a central population health coordinator. Changes were generally similar in magnitude, but not statistically significant, for non-Hispanic black and Hispanic patients, except for BP control in Hispanic patients. Interaction testing revealed that the PHCs did not help 'close the gap' in BP or LDL control for non-Hispanic black or Hispanic patients.

There is a growing body of literature on the overall effectiveness of population health management programs at improving healthcare screening and chronic disease management.[8–10] Less is known about the impact these programs have on health disparities. Two population health management programs have demonstrated narrowing of health disparities in chronic disease care,[13,14] but many others have not.[15–19]

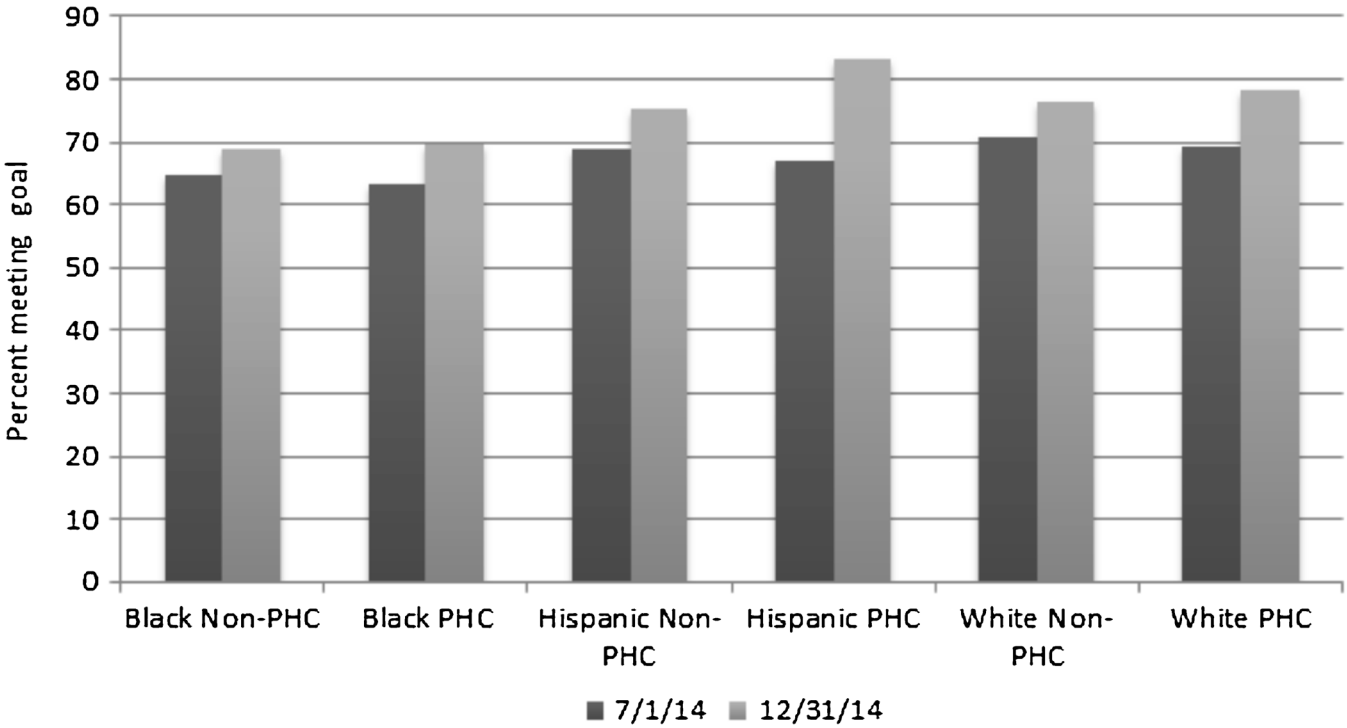

Figure 1 Percentage of participants meeting LDL cholesterol goal by time, intervention group, and race/ethnicity

Our results are consistent with the latter. The Veterans Health Administration and a large urban health system implemented population health management programs using reminders and clinical decision tools. Both programs improved overall quality in several chronic disease measures including blood pressure and cholesterol control, but racial and ethnic disparities

Table 2 Absolute and Relative Changes in Meeting Goal, by Time, Group, and Race/Ethnicity

Absolute changes: change in proportion meeting goal by time, group, and race/ethnicity									
	Non-Hispanic black			Hispanic			Non-Hispanic white		
	7/1/14	12/31/14	Improvement	7/1/14	12/31/14	Improvement	7/1/14	12/31/14	Improvement
LDL goal									
PHC	63.4	69.8	6.4	67.0	83.3	16.3	69.3	78.2	8.9
Non-PHC	64.9	68.8	3.9	68.9	75.3	6.4	70.7	76.4	5.7
Difference	1.5	−1.0	2.5	−1.9	8	9.9	−1.4	1.8	3.2
BP goal									
PHC	72.7	74.3	1.6	75.0	70.6	−5.6	74.4	78.4	4
Non-PHC	73.8	72.6	−1.2	74.7	73.4	−1.3	70.6	77.5	6.9
Difference	−1.1	1.7	2.8	0.3	−2.8	4.3	3.8	0.9	−2.9
Relative changes: adjusted odds of meeting goal at end of intervention period, compared with before, by race/ethnicity									
	Non-Hispanic black			Hispanic			Non-Hispanic white		
	aOR (95% CI)			aOR (95% CI)			aOR (95% CI)		
LDL goal									
PHC	1.36 (0.99–1.85)			1.75 (0.97–3.17)			1.60 (1.48–1.74)		
Non-PHC	1.18 (0.98–1.43)			1.36 (0.98–1.87)			1.34 (1.27–1.40)		
PHC vs. Non-PHC	1.15 (0.80–1.65)			1.29 (0.66–2.53)			1.20 (1.09–1.32)		
BP goal									
PHC	1.05 (0.88–1.25)			0.76 (0.52–1.10)			1.23 (1.16–1.31)		
Non-PHC	0.90 (0.79–1.03)			0.85 (0.70–1.02)			1.09 (1.04–1.14)		
PHC vs. Non-PHC	1.17 (0.94–1.45)			0.90 (0.59–1.36)			1.13 (1.05–1.22)		
Comparing changes across racial/ethnic groups: Adjusted odds ratios comparing improvement between PHC and non-PHC practices, by non-Hispanic black and Hispanic participants, relative to non-Hispanic white participants*									
	Non-Hispanic Black			Hispanic					
	aOR (95% CI)			aOR (95% CI)					
LDL goal	0.98 (0.67–1.43)			1.05 (0.54–2.06)					
BP goal	1.05 (0.83–1.31)			0.82 (0.53–1.25)					

PHC population health coordinator, aOR adjusted odds ratio, 95% CI, 95% confidence interval. Adjusted for age, gender, primary language, health insurance, connection to clinic, and receipt of care in a health center

**This comparison is analogous to a three-way interaction with terms for time (before vs. after intervention), type of intervention (PHC vs. non-PHC practice), and race/ethnicity (non-Hispanic black, Hispanic, non-Hispanic white (the reference category)]. The odds ratio quantifies how the odds of being at goal for non-Hispanic black or Hispanic patients in PHC practices after the intervention relates the odds of being at goal for non-Hispanic white patients in PHC practices after the intervention. For disparities to improve, the odds would need to be significantly greater for racial/ethnical minority patients (odds ration > 1.0) because at baseline non-Hispanic white patients were more likely to be at goal*

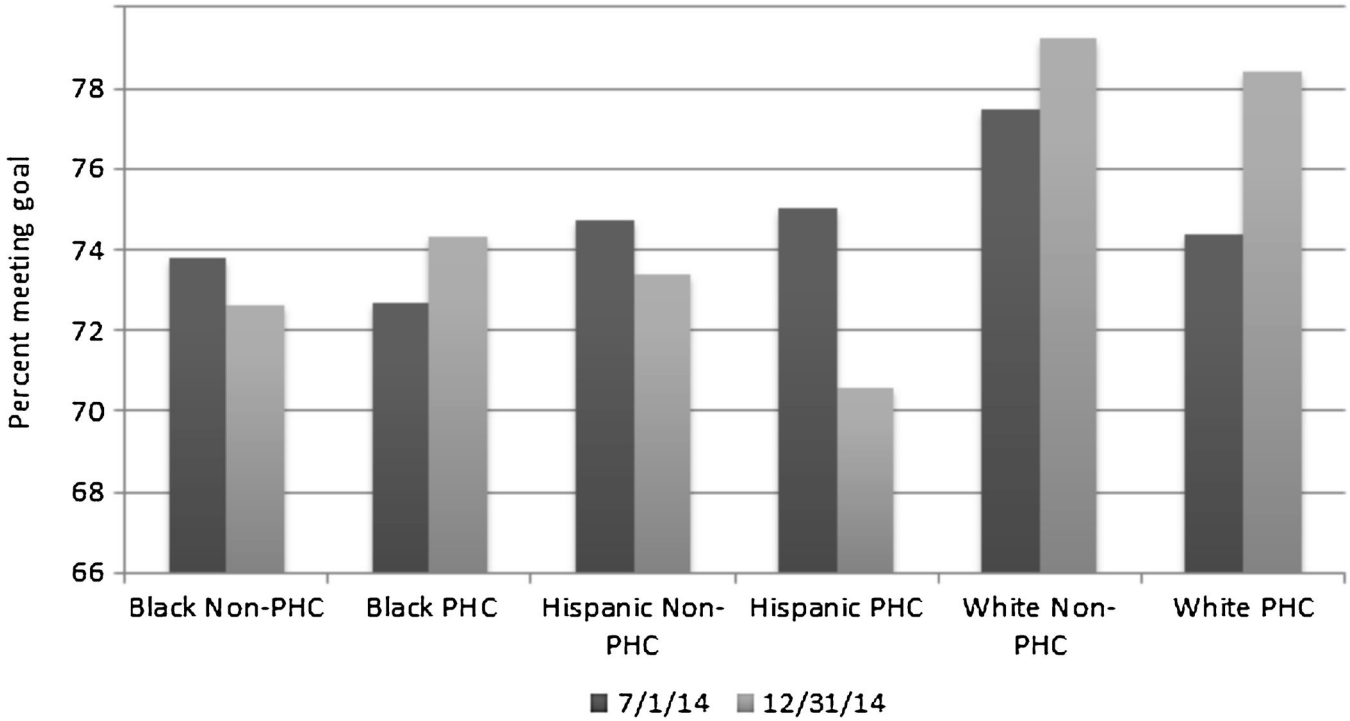

Figure 2 Percentage of participants meeting blood pressure goal by time, intervention group, and race/ethnicity

persisted.[15,16] However, these prior studies did not evaluate the addition of a dedicated population health management workforce. The current study presents new evidence that this additional feature—while improving overall quality—may not be sufficient to reduce racial/ethnic disparities in cardiovascular risk factor control. In contrast to chronic disease management, more studies of population management interventions for cancer screening have shown narrowing of disparities.[26,27] One explanation for this discrepancy may be that disease screening is often a single discrete task, such as obtaining a mammogram, whereas achieving control of a chronic disease typically requires multiple appointments, medication changes, and patient counseling.

The difficulty in simultaneously improving quality and reducing disparities in chronic disease management is an important finding with implications for future research on improving healthcare delivery. While quality improvement efforts are widespread, equity improvement efforts are less so, and even effective quality improvement interventions may not 'lift all boats' with regard to achieving equity goals. Interestingly, programs designed to address health disparities have been found to be effective in improving blood pressure and lipid control in both racial/ethnic minorities and the overall population.[28,29] We believe that including specific and explicit strategies aimed at narrowing inequality should be a fundamental part of the design of population health programs. These strategies may include the addition of tools to overcome socioeconomic barriers to care, as racial/ethnic minority patients may disproportionately face these barriers,[30] and improve access to care, patient engagement, and patient-provider communication. Adding community-based participation, in which those individuals the program will serve are included in the design, implementation, and evaluation of the program, may be a fruitful way to improve these programs. Other directions for future research include examining the role differences age and gender may play in population health management efforts and using qualitative methods to investigate the experiences of different demographic groups within the program.

This study has several important limitations. The 6-month study period, while adequate to determine the effect of the intervention, is relatively short for assessing outcomes in chronic conditions such as hypertension or high LDL cholesterol. Some patients may have come into control over a longer period, though we do not expect there would be differences between PHC and non-PHC practices in the proportion of the patients who do so. Because PHCs were expanded to all practices at the end of the 6-month study period, we were unable to analyze a longer timeframe. This study focused on dichotomous treatment goals, but some patients, particularly those with very elevated LDL and BP, may receive clinical benefit even if they remain above goal, which would not be captured in our analysis. Alternative quality indicators, which capture the clinical value of improvement even for patients who do not meet a particular threshold, may be one way to better capture the clinical benefit of population health management programs.[31] As a single healthcare delivery network, the results may not be generalizable to other settings, particularly with different racial/ethnic composition. However, the network does include a diversity of practice types including

community health centers, private practice, as well as teaching and non-teaching practices. It is also important to note that the magnitude of racial/ethnic disparities in our population is less than the national average.[4–6] Thus, the effect of similar programs may be different in other settings. Due to limitations of the data source, we were not able to evaluate potential mechanisms of disparities in LDL and BP control, such as reduced medication adherence, food insecurity, or other barriers. Who benefits from LDL control as well as what level to target is an area of ongoing controversy, and changes have occurred since the study period.[32,33] While the same target was applied throughout this study, how our results would apply to different LDL control strategies that may be developed is unclear. Finally, the relatively lower number of non-Hispanic black and Hispanic participants may have reduced power to detect differences.

These limitations are balanced by several strengths. This study evaluated the real-world implementation of a population management program consisting of a population health management information technology system with or without a dedicated population health coordinator in a large and diverse primary care network, suggesting similar programs may be feasible in routine care. Furthermore, the linking of population-level improvements in quality metrics to pay-for-performance contracts suggests a possible financial mechanism to implement programs that improve equity of care.

This study found that a multi-faceted population health management intervention, including both information technology and workforce components, did show overall improvements, but was not sufficient to reduce disparities in chronic disease measures. To improve both healthcare quality and equity, we believe future population health management interventions should explicitly focus on decreasing disparities in care.

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Compliance with Ethical Standards:

Conflict of Interest: *Massachusetts General Hospital entered into a royalty arrangement on June 27, 2013, to commercialize the population management system with SRG Technology, a for-profit company. Dr. Atlas is a beneficiary of this royalty arrangement but has not received any payments to date. Dr. Atlas has received payments as a consultant for the company. All other authors declare that they have no disclosures.*

Dr. Berkowitz had full access to all of the data in the study and takes responsibility for the integrity of the data and accuracy of the data analysis.

Prior Presentation: *A version of the study was presented as an Oral Abstract at the Society for General Internal Medicine Meeting in Washington, DC, on April 21, 2017.*

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