Improving Regional Blood Pressure Control: a Positive Deviance Tiered Intensity Approach

Shari D. Bolen, MD, MPH[1,2,3,4], Thomas E. Love, PhD[1,2,3,4], Douglas Einstadter, MD, MPH[1,2,3,4], Jonathan Lever, MPH, NRP[2], Steven Lewis, MPH[1,3], Harry Persaud, MS[4], Jordan Fiegl, MS[5], Rujia Liu, MS[6], Wanda Ali-Matlock, RN[2], David Bar-Shain, MD[1,2,7], Aleece Caron, PhD[1,3], James Misak, MD[8], Todd Wagner, MD[9], Erick Kauffman, MD[10], Lloyd Cook, MD[11], Christopher Hebert, MD[12], Suzanne White, MD[13], Nana Kobaivanova, MD[14], and Randall Cebul, MD[1,2,4]

[1]Center for Health Care Research and Policy, Population Health Research Institute, Case Western Reserve University at The MetroHealth System, Cleveland, OH, USA; [2]Better Health Partnership, Cleveland, OH, USA; [3]Department of Medicine, Case Western Reserve University at The MetroHealth System, Cleveland, OH, USA; [4]Department of Population and Quantitative Health Sciences, Case Western Reserve University, Cleveland, OH, USA; [5]Department of Data Science and Analytics, University Hospitals, Cleveland, OH, USA; [6]Medpace Inc., Cincinnati, OH, USA; [7]Department of Pediatrics, Case Western Reserve University at The MetroHealth System, Cleveland, OH, USA; [8]Department of Family Medicine, Case Western Reserve University at The MetroHealth System, Cleveland, OH, USA; [9]Signature Health, Mentor, OH, USA; [10]Neighborhood Family Practice, Cleveland, OH, USA; [11]Medical Mutual, Cleveland, OH, USA; [12]Mercy Health, Cincinnati, OH, USA; [13]Northeast Ohio Neighborhood Health Services, Inc., Cleveland, OH, USA; [14]The Cleveland Clinic, Cleveland, OH, USA.

BACKGROUND: Accelerated translation of real-world interventions for hypertension management is critical to improving cardiovascular outcomes and reducing disparities.

OBJECTIVE: To determine whether a positive deviance approach would improve blood pressure (BP) control across diverse health systems.

DESIGN: Quality improvement study using 1-year cross sections of electronic health record data over 5 years (2013–2017).

PARTICIPANTS: Adults ≥ 18 with hypertension with two visits in 2 years with at least one primary care visit in the last year (N = 114,950 at baseline) to a primary care practice in Better Health Partnership, a regional health improvement collaborative.

INTERVENTIONS: Identification of a "positive deviant" and dissemination of this system's best practices for control of hypertension (i.e., accurate/repeat BP measurement; timely follow-up; outreach; standard treatment algorithm; and communication curriculum) using 3 different intensities (*low*: Learning Collaborative events describing the best practices; *moderate*: Learning Collaborative events plus consultation when requested; and *high*: Learning Collaborative events plus practice coaching).

MAIN MEASURES: We used a weighted linear model to estimate the pre- to post-intervention average change in BP control (< 140/90 mmHg) for 35 continuously participating clinics.

KEY RESULTS: BP control post-intervention improved by 7.6% [95% confidence interval (CI) 6.0–9.1], from 67% in 2013 to 74% in 2017. Subgroups with the greatest absolute improvement in BP control included Medicaid (12.0%, CI 10.5–13.5), Hispanic (10.5%, 95% CI 8.4–12.5), and African American (9.0%, 95% CI 7.7–10.4). Implementation intensity was associated with improvement in BP control (high: 14.9%, 95% CI 0.2–19.5; moderate: 5.2%, 95% CI 0.8–9.5; low: 0.2%, 95% CI−3.9 to 4.3).

CONCLUSIONS: Employing a positive deviance approach can accelerate translation of real-world best practices into care across diverse health systems in the context of a regional health improvement collaborative (RHIC). Using this approach within RHICs nationwide could translate to meaningful improvements in cardiovascular morbidity and mortality.

Received May 24, 2020
Accepted December 15, 2020
Published online January 26, 2021

J Gen Intern Med 36(6):1591–7
DOI: 10.1007/s11606-020-06480-z

BACKGROUND

Improved blood pressure (BP) control leads to reductions in cardiovascular outcomes and mortality.[1,2] However, managing hypertension is challenging and only 54% of patients with hypertension nationwide achieve recommended control (< 140/90 mmHg).[3] Blood pressure control among disadvantaged populations has been particularly difficult to achieve, as demonstrated by the persistent disparities in BP control by race/ethnicity and income.[4–6] The narrower target range recommended by the most recent American Colleges of Cardiology/American Heart Association hypertension guideline[7] will create even greater challenges.[8]

The identification and dissemination of effective programs for hypertension management are critical components of controlling blood pressure. Two recent systematic reviews have reported successful elements of hypertension programs which

others could emulate.[9,10] However, results from randomized trials are often difficult to translate into real-world practice due to an absence of implementation details or features not typically available to practicing clinicians (e.g., financial incentives for participation or additional research personnel). Taken together, these and other challenges may contribute to the documented 17-year delay in translating randomized trials into practice.[11]

One innovative technique for improving health outcomes is positive deviance.[12] This approach accelerates improvements in health by identifying positive deviants (or outliers with the best outcomes) and partnering with the positive deviants to disseminate their real-world best practices to others who have similar resources and settings. To date, positive deviance has been applied primarily to public health interventions (e.g., reducing malnutrition in Vietnam), with limited use in healthcare settings (e.g., reducing "door to balloon" time for adults with acute myocardial infarction).[13,14]

Better Health Partnership, a regional health improvement collaborative, uses electronic health record (EHR) data from primary care practices in Northeast Ohio to identify and disseminate potential best practices using a modified positive deviance approach.[15] Identifying new approaches to accelerate the real-world translation of evidence-based best practices could have a substantial impact on health outcomes.[16] We evaluated the effect of a positive deviance approach to identify and disseminate HTN best practices on BP control overall and by subgroups of patients with hypertension across diverse healthcare systems in Northeast Ohio. Additionally, we evaluated the effect of the intensity of implementation on BP control.

METHODS

Study Design and Population

We performed a quality improvement (QI) study using repeated 1-year cross sections of EHR data reported every 6 months over a 5-year period (2013 to 2017) by primary care practices that participate in Better Health Partnership (BHP). BHP, a non-profit organization, was established in 2007 as part of the Robert Wood Johnson Foundation Aligning Forces for Quality initiative.[15] BHP collects data from member primary care practices on adult patients (18 years and older) with hypertension and at least two visits to a primary care practice in the prior 2 years and at least one visit during the year-long measurement interval. Our sample included 35 primary care clinics that reported on at least 100 hypertensive patients in each 6-month period during the 5-year observation. We excluded pregnant women and adults with end-stage renal disease.

Positive Deviance Approach and Intervention Identification

During 2009 to 2011, we observed multiple clinic sites (positive deviants) within the same health system (Kaiser Permanente of Ohio) which demonstrated a high degree of improvement and achievement of BP control from BHP electronic health record reports (see Appendix Figure 1). While other clinics participating in BHP also improved or had high achievement, the consistent improvement at all the Kaiser clinics suggested the existence of a potentially replicable best practice for BP control. Next, we interviewed practice leaders from the "positive deviant" health system to determine what processes might be responsible for the observed improvements in BP control. Based on our interviews, we identified a hypertension best practice consisting of 5 key elements: (1) accurate BP measurement, including repeat measurement of an initially elevated BP (≥ 140/90 mmHg); (2) timely follow-up using staff-led hypertension visits within 35 days of an elevated BP measurement; (3) EHR-based registry outreach to contact patients whose last BP was elevated and who had no follow-up appointment scheduled within 35 days; (4) a treatment algorithm which prioritized once-daily, low-cost medications; and (5) a communication curriculum focused on building trusting relationships with patients. Subsequently, the "positive deviant" health system, Kaiser Permanente, published their national intervention.[17] In order to provide greater flexibility in integrating the best practice into other BHP member practices, we worked with practice leaders at Kaiser Permanente of Ohio to make minor adjustments to the best practice treatment algorithm and communication curriculum prior to dissemination.

Positive Deviance Approach and Intervention Implementation

Consistent with the positive deviance approach,[18] the "positive deviants" that we identified presented their best practice at Learning Collaborative conferences, participated in development of a modified curriculum, and supported QI coaches to answer questions from practices implementing the hypertension best practice.

Beginning in 2015, we disseminated the intervention among BHP practices using three different intensities—high, medium, and low. The high-intensity implementation was targeted at lower performing sites (n = 16) and included attendance at a Learning Collaborative (a day-long program of informational and educational sessions open to all BHP members) to hear about the best practice as well as practice coaching to guide the implementation of the best practice. We identified the 16 high-intensity practices based on the percentage of their patients with a BP < 140/90 mmHg in the last reporting period prior to starting the intervention. Practice coaching included monthly 1-h sessions for the first 6 months with a core QI group from the practice or, more commonly, with the entire clinic staff and providers. After 6 months, additional coaching occurred as needed or as requested. For further details, see http://www.betterhealthpartnership.org/hbp_online_toolkit.asp.

The moderate-intensity implementation was targeted at higher performing practices that requested assistance

implementing the hypertension best practice and included the Learning Collaborative plus phone calls or in person meetings (≤ 3) with practice leaders to provide advice and educational materials for implementing the best practice elements.

The low-intensity intervention included only the Learning Collaborative presentations and was available to any practice that attended one of these sessions.

Data Collection

Every 6 months, practices or healthcare systems submitted their de-identified EHR data including the last reported value for the previous 1-year reporting period. The available data describe repeated cross sections aggregated to the level of a primary care clinic and gathered every 6 months from 2013 through 2017. Patient information was collected regarding age, sex, race/ethnicity, insurance type, diabetes diagnosis, BP, body mass index, preferred language, and home address (used to estimate household income and education). Insurance type was defined as the primary insurance reported during the most recent visit. Data on race or ethnic group were obtained through self-report within the EHR. We estimated household income and educational level by geocoding each patient's home address to obtain the census block group and linking to the American Community Survey for 2015.[19] For addresses that we were unable to geocode (< 10%), we used zip code to estimate income and education.

Data Analysis and Synthesis

We analyzed data both overall and stratified by the specific characteristics described below. As noted above, the data are aggregated summaries at the clinic level (rather than patient-level information), so our unit of analysis is the clinic. Our primary outcome is the proportion of patients within a clinic whose most recent BP (within the past year) is controlled, i.e., less than 140/90 mmHg. We defined the pre-intervention period to comprise the five semi-annual reports describing 2013 to 2015, and the post-intervention period as the three semi-annual reports 2016 through 2017.

The change in post-intervention BP control for each intervention intensity (i.e., low, moderate, or high) was estimated using a linear model, with each clinic's contribution in a particular time period weighted by the number of hypertension patients at that clinic at each time point. The model describes annualized change in the BP control rate at the clinic level using the interaction of a binary indicator of intervention status (pre-intervention (2013–2015) or post-intervention (2016–2017)) with the three levels of intervention intensity. We excluded the 2015 semi-annual report from the modeling of post- compared to pre-intervention change in BP control since that occurred during the intervention period.

Per a pre-planned subgroup analysis, we estimated the change in post-intervention BP control in separate weighted linear regressions stratified by race (categorized as White, Hispanic, or Black), by income tertiles, by sex, by insurance (categorized as Medicare, Medicaid, Commercial, or Uninsured), and by education tertiles for the subjects within each clinic that were members of the subgroup in question. Each of the 35 clinics used in these (and our unstratified) analyses reported on at least 50 participants within each of the 15 subgroups. Models for each level of each subgroup-predicted change in BP control were based on pre- or post-intervention status alone, but otherwise followed the specifications of the primary model describing intervention intensity. All analyses were conducted using R version 3.6.0.[20]

Role of the Funding Source

The Centers for Disease Control and Prevention Racial and Ethnic Approaches to Community Health (CDC REACH) grant (DP14-1419PPHF14) and the Mt. Sinai Healthcare Foundation assisted in support of the project. The funding sources had no role in project design, conduct, or reporting.

RESULTS

Study Population

At baseline (2013), there were 114,950 adults with hypertension receiving care from 614 providers in 35 participating clinics across 7 healthcare systems. Table 1 summarizes the baseline population overall and by intervention intensity of their associated clinic. The mean age was 59 years, 53% were female, 64% White, 33% Black/African American, 3% Hispanic, and < 1% Other. The estimated median neighborhood income was $44,300 and primary insurance type was 43% Medicare, 40% Commercial, 11% Medicaid, and 6% uninsured. As expected, the groups differed across intervention intensity, due to our targeting lower performing practices to receive the high-intensity implementation. Population characteristics within clinics and within intervention intensity groups remained similar over time (Appendix Table 1).

Improvements in Blood Pressure Control Overall and by Subgroup

The proportion of patients with BP controlled (< 140/90 mmHg) increased overall from 67% in 2013 to 74% in 2017 with improvements across all patient demographic and insurance type subgroups (Fig. 1). The post-intervention model-estimated absolute improvement in BP control was 7.6 percent (95% CI 6.0–9.1) for all patients, with the greatest improvement observed among Medicaid, Hispanic, low education, low income, uninsured, and African American subgroups (Fig. 2).

Improvements in Blood Pressure Control by Intensity

The change in BP control over time was positively associated with intervention intensity and we observed meaningful improvements in BP control for both the moderate-intensity

Table 1 Baseline Patient Characteristics Overall and by Intervention Intensity in 2013

Patient characteristics	Overall (*n* = 114,950)	Low (*n* = 10,086)	Moderate (*n* = 74,550)	High (*n* = 30,314)
Number of participating clinics	35	4	15	16
Number of providers	614	111	207	296
Number of health systems	7	3	2	3
Mean age (in years)	58.6	56.3	60.1	57.9
% Female	52.5	19.2	53.6	60.9
% BP < 140/90 (mmHg)	66.6	63.1	70.1	59.1
Mean baseline BP (mmHg)	133/78	133/80	132/79	135/77
% with BMI < 30 at baseline	46.5	49.7	48.6	40.4
% Not using tobacco	81.6	64.9	87.7	72.2
% Diabetes (18–75 years old)[a]	20.5	30.4	17.0	25.8
Race/ethnicity				
% White	63.7	37.0	76.1	42.1
% African American/Black	32.5	56.4	22.2	50.1
% Hispanic	3.0	5.2	1.8	5.3
% Other	0.8	1.4	0.0	2.5
Insurance type				
% Medicare	43.3	38.8	46.2	37.8
% Commercial	40.2	45.7	46.9	21.9
% Medicaid	10.7	5.3	1.7	34.5
% Uninsured	5.8	10.3	5.2	5.8
Neighborhood median income[b]				
% High income (≥ $55,000)	46.1	19.1	60.4	19.9
% Middle income	28.3	45.7	24.8	30.9
% Low income (< $33,000)	25.7	35.2	14.8	49.2
Mean neighborhood income	$44,300	$39,100	$51,900	$38,500
Educational attainment[2]				
% High education (≥ 93%)	41.8	16.9	54.2	19.5
% Middle education	35.4	43.8	34.0	36.2
% Low education (< 83%)	22.8	39.3	11.8	44.3
Mean estimated % high school graduates	83.8	81.7	87.2	81.2

[a]*Percentage of patients who were also included in diabetes reporting to BHP, which specifically requires a diabetes diagnosis, age 18–75 and seen at least twice in the 1-year reporting period*
[b]*Categories for median income and educational attainment (high school graduation rate) were specified to match 33rd and 67th median income percentiles across Cuyahoga County at the census block level as estimated by the American Community Survey*
BP blood pressure, BMI body mass index

(consultation plus Learning Collaboratives) and high-intensity (practice coaches plus Learning Collaborative) groups; the low-intensity (Learning Collaborative alone) group experienced no meaningful change in BP control (Fig. 3). Model estimates of the absolute change for post-intervention patients with BP < 140/90 mmHg were 14.9% (95% CI 10.2–19.5) for the high-intensity group, 5.2 percent (95% CI 0.8–9.5) for the moderate-intensity group and 0.2 percent (95% CI –3.9 to 4.3) for the low-intensity group.

CONCLUSION

To our knowledge, this is the first study to evaluate the ability of a modified positive deviance approach to improve BP control in hypertension patients seen in multiple diverse health systems across a region, and to describe differential effects on BP control using different implementation intensities. Our findings demonstrate that a modified positive deviance approach can be used to improve BP control within a few years of implementation, much earlier than the Institute of Medicine's estimated 17-year gap translating randomized trial evidence into care. Improvements in BP control were seen across subgroups of the population with often difficult to control blood pressure. In addition, within the context of a regional health improvement collaborative, both practice coaching and practice consultation were associated with improvements in BP control.

Prior implementation studies on hypertension management within one health system (such as Kaiser Permanente or the Veterans Administration) have shown that use of standardized protocols can improve BP control.[17] In addition, prior studies have demonstrated that practice coaches and involvement in a regional health improvement collaborative can improve clinical outcomes.[21–23] Further, the positive deviance approach has been used by others to improve public health and clinical care outcomes such as door to balloon time for acute myocardial infarction.[12,14] Our study adds to that literature by demonstrating the successful use of a modified positive deviance approach to improve outcomes for all hypertension patients including disadvantaged subgroups in a primary care setting across multiple healthcare systems. The observed improvements in BP control included uninsured and Medicaid populations, groups not previously captured in many hypertension implementation studies. Finally, our results add to the literature on successful methods for adoption of best practices, an area which is critical for clinical leaders and administrators endeavoring to make rapid changes in care.

Several limitations associated with real-world implementation deserve mention. First, we could have introduced selection bias. We targeted lower performing sites (i.e., those with the greatest potential for improvement) with our high-intensity intervention, and high-intensity practice coaching was associated with greater improvements in BP control than the moderate- or low-intensity interventions. Taken together, this could have over-estimated the impact of the high-intensity intervention. However, our primary finding of improved BP control for all patients with either high-intensity (i.e. coaching) or moderate-intensity (i.e. consultation) implementation suggests the improvements are real and potentially could be

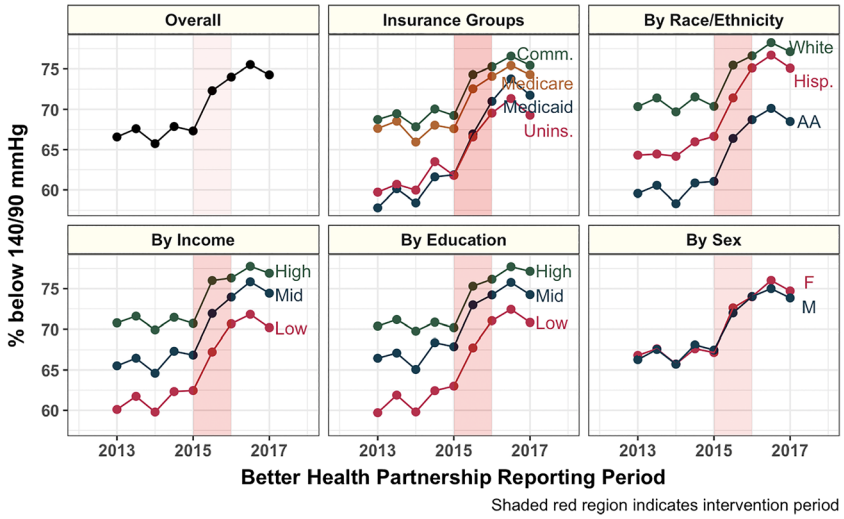

Figure 1 Percentage of adults with hypertension under good blood pressure control (< 140/90 mmHg) overall and by subgroup, 2013 to 2017.

generalized to other regional health improvement collaboratives across the USA.[24]

Second, our results could be affected by unadjusted confounders. Because data from one health system was reported in aggregate and not at the patient level, we were not able to adjust our results for potential confounding factors. However, we noted no meaningful change in the composition of either the low-, moderate-, or high-intensity groups over time. As our analysis focused on within group changes over time, the lack of change in group composition over time suggests a minimal role for confounding in explaining the results.

Third, we recognize that other contemporaneous programs such as patient-centered medical home models and value-based payment reforms such as Accountable Care Organizations may have contributed to the observed improvement in BP control as part of secular trends.[25] These other programs likely encouraged clinics to work with the practice coaches and increased their interest in participating in our regional health improvement collaborative. While this context promoted adoption of the intervention, our comparator clinics were exposed to these same contextual changes and did not show substantial improvements in BP control even though they may have heard about the evidence-based best practice at our Learning Collaborative events. Further, during the period of 2014 to 2018, the national Healthcare Effectiveness Data and Information Set (HEDIS) quality measures for BP control (< 140/90 mmHg) reported improvement only for the Medicare preferred provider organization group from 68.5% in 2014 to 72.0% in 2018[26]; all other groups remained the same or worsened slightly.

Fourth, our modified positive deviance approach used EHR data to identify clinics which improved and was followed by

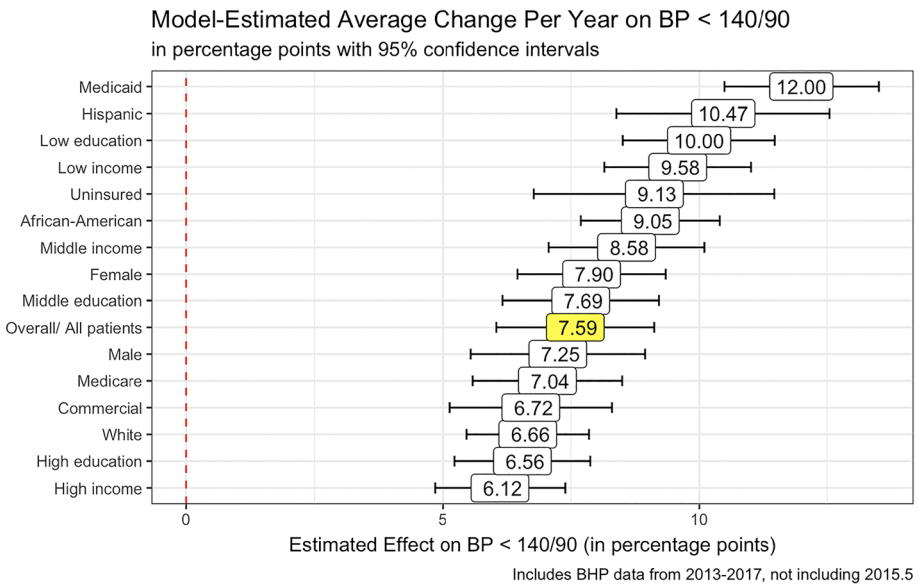

Figure 2 Model-estimated change in post-intervention blood pressure control (< 140/90 mmHg) in adults with hypertension overall and stratified by subgroup, 2013 to 2017.

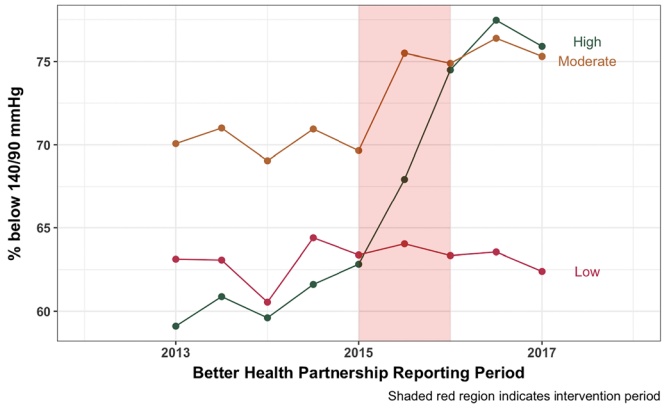

Figure 3 Percentage of adults with hypertension under good blood pressure control (< 140/90 mmHg) by intervention intensity, 2013 to 2017.

interviews with key practice leaders. This process worked well to identify this particular hypertension best practice and was pragmatic with time and resource constraints. However, this approach may not work to clearly identify a potential best practice if limited to improvements at one site or where interventions are less clear to practice leaders. In other settings, more in-depth quantitative and qualitative analyses may be necessary to identify potential best practices for dissemination.

Lastly, we were not able to measure each of the 5 best practice elements over time in all practices and thus are unable to identify which elements of the bundled intervention were most effective. In a separate analysis from one of our participating health systems, we found that repeating the BP at the time of the visit improved BP control (< 140/90 mmHg) 36% of the time, with an estimated effect of regression to the mean of 6.1 mmHg.[27] At another health system within our collaborative, Pfoh et al. demonstrated in an adjusted model that medication intensification had a greater impact than BP rechecks within 30 days. During visits with an elevated BP, physicians were significantly more likely to intensify medication in 2016 than in 2015 (43% vs 40%) and slightly more likely to obtain a BP recheck within 30 days (15% vs 14%).[28]

Our study findings have several clinical, administrative, and policy implications. Given challenges related to cost, insurance status, trust, and other social determinants, clinicians may feel discouraged about persistent disparities in health outcomes. Our results demonstrate that standardized protocols and clear implementation instructions in the setting of a regional health improvement collaborative can result in improvements in health outcomes within a region including among disadvantaged populations. Collaborating with communities to improve economic opportunities and address other social determinants of health could complement these effects and should be an area for future research.

Second, implementation efforts such as those described in this study often require increased staff/provider time and resources. Policies and financial incentives should be aligned to accommodate the increased demands that QI programs place on already busy primary care practices. New models of care delivery and value-based care incentives offer promise in addressing these issues. Our study results encourage policies which support use of EHR data to identify best practices to improve outcomes, and which seek to develop and maintain regional health improvement collaboratives as a dissemination method for quality improvement. These collaboratives should involve the primary care community in both leadership and implementation of positive deviance interventions. They should also promote use of practice coaches and consultation approaches where appropriate to accelerate improvements in care.

In conclusion, we employed practice coaching and consultation to achieve improvements in BP control for hypertension patients within a region using a positive deviance approach within the context of a regional health improvement collaborative. Future research should investigate whether this model could be expanded to include other chronic disease prevention and management efforts and what factors are associated with clinics able to make greater improvements and sustaining improvements in health outcomes, and explore how new models of care delivery can better assist with the increased time and resources that these efforts require during both the implementation and maintenance phases.

Supplementary Information *The online version contains supplementary material available at https://doi.org/10.1007/s11606-020-06480-z.*

Acknowledgments: *The authors would like to thank the participating clinics for their partnership in this work.*

Corresponding Author: *Shari D. Bolen, MD, MPH; Center for Health Care Research and Policy, Population Health Research Institute, Case Western Reserve University at The Metro Health System, Cleveland, OH, USA (e-mail: sdb73@case.edu).*

Funding *This publication is supported by The Centers for Disease Control and Prevention Racial and Ethnic Approaches to Community Health (CDC REACH) grant (DP14-1419PPHF14) and the Mt. Sinai Healthcare Foundation.*

Compliance with Ethical Standards:

Conflict of Interest: *The authors declare that they do not have a conflict of interest.*

Disclaimer: *The findings and conclusions are those of the authors and do not necessarily represent the official position of the CDC, the US Department of Health and Human Services, or the Mt. Sinai Foundation.*

REFERENCES

1. **Group SR, Wright JT, Jr., Williamson JD, Whelton PK, Snyder JK, Sink KM, et al.** A Randomized Trial of Intensive versus Standard Blood-Pressure Control. N Engl J Med. 2015;373(22):2103-16.
2. Major cardiovascular events in hypertensive patients randomized to doxazosin vs chlorthalidone: the antihypertensive and lipid-lowering treatment to prevent heart attack trial (ALLHAT). ALLHAT Collaborative Research Group. Jama. 2000;283(15):1967-75.
3. High Blood Pressure Fact Sheet. Centers for Disease Control and Prevention. Division of heart disease and stroke prevention. Available at: https://www.cdc.gov/dhdsp/data_statistics/fact_sheets/fs_bloodpressure.htm. 2016. Accessed 10-12-2019.
4. **Paulsen MS, Andersen M, Munck AP, Larsen PV, Hansen DG, Jacobsen IA, et al.** Socio-economic status influences blood pressure control despite equal access to care. Fam Pract. 2012;29(5):503-10.
5. **Nwankwo T, Yoon SS, Burt V, Gu Q.** Hypertension among adults in the United States: National Health and Nutrition Examination Survey, 2011-2012. NCHS Data Brief. 2013(133):1-8.
6. **Mozaffarian D, Benjamin EJ, Go AS, Arnett DK, Blaha MJ, Cushman M, et al.** Executive Summary: Heart Disease and Stroke Statistics–2016 Update: A Report From the American Heart Association. Circulation. 2016;133(4):447-54.
7. **Whelton PK, Carey RM, Aronow WS, Casey DE, Jr., Collins KJ, Dennison Himmelfarb C, et al.** 2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. Hypertension. 2018;71(6):e13-e115.
8. **Bolen SD, Einstadter D, Love TE, Husak S, Lever J, Cebul RD.** Real-World Implications of Changing Blood Pressure Targets in Urban Primary Care. J Gen Intern Med. 2018;33(12):2027-9.
9. **Walsh JM, McDonald KM, Shojania KG, Sundaram V, Nayak S, Lewis R, et al.** Quality improvement strategies for hypertension management: a systematic review. Med Care. 2006;44(7):646-57.
10. **Glynn LG, Murphy AW, Smith SM, Schroeder K, Fahey T.** Interventions used to improve control of blood pressure in patients with hypertension. Cochrane Database Syst Rev. 2010(3):Cd005182.
11. Institute of Medicine Committee on Quality of Health Care in A Crossing the Quality Chasm: A New Health System for the 21st Century. Washington (DC): National Academies Press (US). Copyright 2001 by the National Academy of Sciences. All rights reserved.; 2001.
12. **Marsh DR, Schroeder DG, Dearden KA, Sternin J, Sternin M.** The power of positive deviance. Bmj. 2004;329(7475):1177-9.
13. **Bradley EH, Curry LA, Ramanadhan S, Rowe L, Nembhard IM, Krumholz HM.** Research in action: using positive deviance to improve quality of health care. Implement Sci. 2009;4:25.
14. **Krumholz HM, Curry LA, Bradley EH.** Survival after acute myocardial infarction (SAMI) study: the design and implementation of a positive deviance study. Am Heart J. 2011;162(6):981-7.e9.
15. Better Health Partnership. Collaborating for a healthy community. Available at: http://www.betterhealthpartnership.org/. Accessed on 10-12-2019.
16. **Cebul RD, Love TE, Einstadter D, Petrulis AS, Corlett JR.** MetroHealth Care Plus: effects of a prepared safety net on quality of care in a Medicaid expansion population. Health Aff (Millwood). 2015;34(7):1121-30.
17. **Jaffe MG, Lee GA, Young JD, Sidney S, Go AS.** Improved blood pressure control associated with a large-scale hypertension program. Jama. 2013;310(7):699-705.
18. **Sternin RPJSM.** The Power of Positive Deviance. How Unlikely Innovators Solve the World's Toughest Problems. Boston, Massachusetts: Harvard Business Press; 2010.
19. American Community Survey. Available at: https://www.census.gov/programs-surveys/acs/. Accessed on 10-12-2019.
20. **R Core Team** (2019). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. Available at: https://www.R-project.org/.
21. **Wang A, Pollack T, Kadziel LA, Ross SM, McHugh M, Jordan N, et al.** Impact of Practice Facilitation in Primary Care on Chronic Disease Care Processes and Outcomes: a Systematic Review. J Gen Intern Med. 2018;33(11):1968-77.
22. **Beamish L, Sagorin Z, Stanley C, English K, Garelnabi R, Cousineau D, et al.** Implementation of a regional quality improvement collaborative to improve care of people living with opioid use disorder in a Canadian setting. BMC Health Serv Res. 2019;19(1):663.
23. **Tanenbaum J, Cebul RD, Votruba M, Einstadter D.** Association Of A Regional Health Improvement Collaborative With Ambulatory Care-Sensitive Hospitalizations. Health Aff (Millwood). 2018;37(2):266-74.
24. The Network for Regional Healthcare Improvement (NRHI). Available at: https://www.nrhi.org/about-nrhi/. Accessed on 10-12-2019.
25. Centers for Medicare and Medicaid Services. Value-based programs. Available at: https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/Value-Based-Programs/Value-Based-Programs.html. Accessed on 10-12-2019.
26. Controlling High Blood Pressure. Healthcare Effectiveness Data and Information Set (HEDIS) Measures and Technical Resources. National Council for Quality Assurance. Available at: https://www.ncqa.org/hedis/measures/controlling-high-blood-pressure/. Accessed 09-07-2020.
27. **Einstadter D, Bolen SD, Misak JE, Bar-Shain DS, Cebul RD.** Association of Repeated Measurements With Blood Pressure Control in Primary Care. JAMA Intern Med. 2018;178(6):858-60.
28. **Pfoh ER, Martinez K, Vakharia N, Rothberg M.** Impact of a system-wide quality improvement initiative on blood pressure control: a cohort analysis. BMJ Qual Saf. 2020;29(3):225-31.