The Joint Commission Journal on Quality and Patient Safety 2018; 44:117–129

Improving Identification and Diagnosis of Hypertensive Patients Hiding in Plain Sight (HIPS) in Health Centers

Margaret Meador, MPH, C-PHI; Jerome A. Osheroff, MD; Benjamin Reisler, MPH

Background: Hypertension is the most prevalent chronic condition diagnosed among patients served in the safety net in the United States; however, many safety-net patients with hypertension are not formally diagnosed and may remain untreated and at increased risk for cardiovascular events. Identifying undiagnosed hypertension using algorithmic logic programmed into clinical decision support (CDS) approaches is a promising practice but has not been broadly tested in the safety-net setting.

Methods: The project used a quality improvement approach wherein information flows and actions related to blood pressure measurement were modified to include algorithm criteria to identify patients who might have undiagnosed hypertension. Identified patients were recalled for evaluation and hypertension diagnosis, if appropriate. Ten health centers in Arkansas, California, Kentucky, and Missouri were selected to participate in the project on the basis of high hypertension prevalence (compared to national average), demographic and geographic diversity, mature information systems infrastructure, and executive support. The project targeted patients from 18 to 85 years of age.

Results: After implementation of algorithm-based interventions, diagnosed hypertension prevalence increased significantly from 34.5% to 36.7% ($p < 0.05$). A cohort of patients was tracked from 8 of the 10 health centers to assess follow-up evaluation and diagnosis rates; 65.2% completed a follow-up evaluation, of which 31.9% received a hypertension diagnosis.

Conclusion: Using algorithmic logic and other CDS–enabled care process improvements appears to be an effective way health centers can identify and engage patients at risk for undiagnosed hypertension. Appropriately diagnosing all hypertensive patients ensures that hypertension control efforts yield maximal improvements in population health.

Hypertension increases risk for heart disease and stroke,[1] and many persons are unaware that they have it.[2] Blood pressure (BP) measurements are used to detect and diagnose hypertension and evaluate treatment. Controlling hypertension is a significant contributor to reducing risk for heart attack and stroke, which are leading causes of death in the United States.[3] A 2010 article asserted that treating hypertension was the clinical preventive service that could avert the greatest number of deaths.[4] Moreover, controlling hypertension may significantly reduce the more than $320 billion in health care costs and lost productivity caused by cardiovascular disease every year.[5]

Although clinical standards exist for managing hypertension,[6–8] some have argued that current guidelines in the United States for diagnosing hypertension are varied and vague with regard to recommending what number and level of elevated readings over what time frame are needed to make a hypertension diagnosis.[6,7] This lack of clear guidance may contribute to patients with undiagnosed hypertension "hiding in plain sight" (HIPS) because of provider inertia, in which clinical providers take a conservative *wait and see* approach—ordering further follow-up rather than diagnosing hypertension for those with repeated elevated BP readings.[9]

Previous projects focusing on identifying undiagnosed hypertension have used various algorithms.[10–13] Most initiatives involved querying an electronic health record (EHR) to identify patients meeting specific criteria for elevated BP. Some initiatives also included strategies to recall identified patients to diagnose or rule out hypertension. One project focused on health centers but used a nonexperimental retrospective study design to examine EHR data for elevated BP and did not assess patients for hypertension.[11] Rakotz et al. used sophisticated algorithms that excluded patients with prehypertension and addressed BP variability.[12] That study tested three algorithms to determine which criteria identified the most patients at risk for undiagnosed hypertension; no single algorithm identified all at-risk patients. Rakotz et al. further note that "systems seeking to replicate this approach may need to establish optimal algorithms for their populations."[12(p. 357)]

Our multistate quality improvement (QI) project to address undiagnosed hypertension built on work by Rakotz et al.[12] by developing an algorithm for use in safety-net health centers. These centers must meet specific requirements and provide comprehensive services to patients in underserved areas or populations, regardless of ability to pay.[14] We assessed the algorithm's usability and sensitivity to identify patients with

1553-7250/$-see front matter

https://doi.org/10.1016/j.jcjq.2017.09.003

possible undiagnosed hypertension. We also evaluated altered care processes to recall and evaluate identified patients, and the investment needed to implement these changes.

This project addressed the question: Does a comprehensive QI intervention employing interprofessional care teams using a HIPS–detecting algorithm identify and improve diagnosis of hypertension in adult safety-net primary care populations? The project, as well as this article, was informed by the SQUIRE 2.0 Guidelines.[15]

METHODS

The HIPS project ran from September 2014 through June 2016. In the initial phase (September– December 2014), we developed the algorithm used to identify patients at risk for undiagnosed hypertension. Care teams implemented the algorithm using a systematic QI approach during the second phase of the project (January 2015–June 2016). The Institutional Review Board at A.T. Still University's Kirksville College of Osteopathic Medicine in Kirksville, Missouri, reviewed this study, which was granted exempt status under 45 CFR (Code of Federal Regulations) 46.101(b)(5).[16]

Hiding in Plain Sight (HIPS) Algorithm Development

In December 2014 we convened a technical advisory group (TAG) with leaders in medical informatics, QI, and safety-net primary care practice to inform algorithm development. The TAG considered numerous factors to determine clinical criteria for identifying patients with potentially undiagnosed hypertension—relevant clinical guidelines,[7] alignment with external reporting requirements, health center capacity to obtain and extract pertinent data, exclusions, and look-back period. The TAG recommended that two sets of clinical criteria be employed together in the HIPS algorithm, corresponding to hypertension clinical staging[6] (stage 1: systolic BP [SBP] measurement between 140 mmHg and 159 mmHg or diastolic BP [DBP] measurement between 90 mmHg and 99 mmHg; stage 2: SBP measurement ≥ 160 mmHg or DBP measurement ≥ 100 mmHg), we now describe in detail.

- **Stage 1 Criteria.** Patients 18 to 85 years old without a diagnosis of hypertension (documented as an ICD-9-CM [International Classification of Diseases, Ninth Revision, Clinical Modification][17] assessment of 401–405) who have SBP or DBP measurements consistent with the definition of stage 1 hypertension at two separate medical visits, including the most recent visit, during the past 12 months. Exclusions: pregnancy, end-stage renal disease (ESRD).
- **Stage 2 Criteria.** Patients 18 to 85 years old without a diagnosis of hypertension who have an SBP or DBP measurement consistent with the definition of stage 2 hypertension at any one medical visit during the past 12 months. Exclusions: pregnancy, ESRD.

Patients who met either the stage 1 or stage 2 criteria were identified as a collective group of those with potentially undiagnosed hypertension. The complete list of factors, decisions made, and rationale for the HIPS algorithm is detailed in Table 1.

QI Approach

A variety of key components were used across all of the health centers to translate the HIPS algorithm into practice—having a clinical champion, engaging stakeholders in intervention design and testing, aligning changes in care delivery with existing processes or complementary QI targets, using data aggregation and analytics, QI coaching, and collaborative learning.

The teams used rapid cycle change Plan-Do-Study-Act (PDSA) Cycles from the Model for Improvement to plan, monitor, and test care process change ideas that each team identified to integrate the algorithm.[19] Details of the QI approach used in this project are described elsewhere.[20] To summarize, project teams identified promising change ideas using the Outpatient Essential CDS/QI Worksheet,[21] together with the Clinical Decision Support (CDS) Five Rights framework,[22] to map current HIPS–related clinical actions and information flow and identify potential enhancements. The CDS/QI Worksheet is a publicly available tool that offers a structured way to document current information flow and actions related to a specific target (that is, undiagnosed hypertension) and then assess where improvements can be made. It helps teams consider opportunities to support individual patients, address population management, and strengthen foundations for these activities.[21] The CDS Five Rights framework, recommended as a QI best practice, affirms that getting the right information to the right people in the right formats through the right channels at the right times is essential for improving care processes and outcomes.[22]

Setting and Participants

This QI project involved 10 health center organizations in Arkansas, California, Kentucky, and Missouri (as listed in the Acknowledgments, page 128) that provide care to underserved areas or populations. Beyond "bandwidth" for and interest in doing the project, the criteria for selection of health centers entailed demographic diversity (urban vs. rural and variation by race, ethnicity, and special populations [for example, agricultural workers and refugees]); high hypertension prevalence (34.5% across participating health centers vs. 23.2% nationally for health centers); comparatively lower BP control rates (55% across participating health centers vs. 64% for health centers nationally);[23] affiliation with a health center controlled network;[24] fully implemented EHR with access to population health management software; and executive support. Target patients were adults, 18 to 85 years of age. Table 2 provides a demographic description of the participating health centers.

Table 1. Hiding in Plain Sight (HIPS) Undiagnosed Hypertension Algorithm Clinical Criteria Decisions and Rationale*

Criteria	Decision	Rationale
Medical Visits[†]	At least one medical visit in the past 12 months	Aligns with National Quality Forum (NQF) 0018: Controlling High Blood Pressure measure[18]; catches patients who might have one stage 2 reading; identifies more patients than two visits.
Stage 1 Blood Pressure (BP) Readings—number	BP readings ≥ 140 mmHg systolic BP (SBP) or ≥ 90 mmHg diastolic BP (DSP) at two separate medical visits, including the most recent visit	Work in the field on undiagnosed hypertension has used both two and three elevated readings as thresholds to identify potentially undiagnosed hypertension patients. The Technical Advisory Group (TAG) recommended the lower threshold so patients are less likely to be missed.
Stage 1 BP Readings—look-back time frame	Past 12 months	Per the Centers for Disease Control and Prevention (CDC), 61.7% of unaware, untreated, and uncontrolled hypertension patients have 2 + visits in the past year,[10] which means 38.3% have fewer. Thus, a look-back period of 12 months may miss patients with two or more stage 1 elevated BP readings across a longer time frame. However, the TAG decided on a 12 month look-back period for two reasons: (1) to prioritize those patients who might be more likely to be successfully recalled and brought into care if diagnosed with hypertension, and (2) to keep the initial number of potentially undiagnosed patients manageable.
Stage 2 BP Readings	One BP reading ≥ 160 mmHg SBP or ≥ 100 mmHg DSP at any one medical visit during the past 12 months	Aligns with Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC-7) guidelines.[6]
No Hypertension Diagnosis by ICD-9-CM Codes[‡]	Exclude patients with codes 401–405 (I10–I15)	Secondary hypertension codes are excluded because the TAG considered these patients to be diagnosed with hypertension; 796.2 was not considered a qualifying diagnosis, as it is a code often used for "white coat syndrome" and is only a code for elevated BP, not hypertension.
Other Exclusion Diagnoses	Pregnancy End stage renal disease (ESRD)	Exclusions for pregnancy and ESRD both align with Uniform Data Set (UDS) and NQF 0018 specifications.[18]
Requirement for Hypertension Diagnosis Documentation in the Electronic Health Record (EHR)	Assessment/encounter diagnosis or problem list (if entries are linked with a diagnosis code)	Research indicates patients with problem list entries only (free-text entries without a diagnosis code) are much less likely to receive treatment for hypertension.[12,13]

*References can be found on pp. 128–129.
[†]Medical visits are defined as a completed face-to-face outpatient visit with a primary care provider, as determined by medical specialty in the EHR or consistent with Table 5 for the Bureau of Primary Health Care's Uniform Data System (UDS) reporting, which includes family physicians, general practitioners, internists, obstetricians/gynecologists, pediatricians, other specialty physicians, nurse practitioners, physician assistants, and certified nurse midwives (Health Resources and Services Administration, Bureau of Primary Health Care. Table 5—Staffing and Utilization. In Reporting Instructions for Health Centers (Uniform Data System Manual). Sep 3, 2015. Accessed Dec 13, 2017. https://bphc.hrsa.gov/datareporting/reporting/2015udsmanual.pdf.
[‡]International Classification of Diseases, Ninth Revision, Clinical Modification. Codes in parentheses indicate ICD-10-CM codes.

Interventions Implemented

Health centers integrated the HIPS algorithm into care processes by testing enhancements surfaced using the CDS/QI Worksheet and prioritized on the basis of organizational goals, anticipated value, and feasibility. These care changes were implemented by interprofessional care teams that varied among health centers but consistently included a clinician (physician, nurse practitioner, or physician assistant), a nurse, and a medical assistant. Care coordinator, health educator, and reception staff constituted the other team roles.

All participating health centers developed interventions that implemented the HIPS algorithm using health information technology (HIT) and other approaches to enhancing work flow. These included creating and applying registries

Table 2. Health Center Demographic Descriptions with Interventions*

Health Center	# Sites	Adult Population (18–85 years old)	Estimated Urbanicity of Care Delivery Locations	% Race (Non-Hispanic White and Black/ African American)	% Ethnicity (Hispanic/ Latino)	% Best Served in Another Language	% Patients ≤ 100% of Poverty Level	Additional Interventions†
Health Center 1	3	14,844	urban suburban	NHW: 23.0 B/AA: 10.6	60.3	66.9	88.2	• Provides BP checks without appointment and/or co-pay
Health Center 2	8	33,822	urban suburban rural	NHW: 40.7 B/AA: 3.3	53.2	36.4	80.4	• Provides BP checks without appointment and/or co-pay • Regular sharing of care team–level HIPS data performance dashboard • Static EHR point-of-care alert/ decision support
Health Center 3	4	10,794	suburban rural	NHW: 19.1 B/AA: 3.7	73.6	32.8	85.5	• Provides BP checks without appointment and/or co-pay • Regular sharing of care team–level HIPS data performance dashboard
Health Center 4	4	13,756	suburban rural	NHW: 16.8 B/AA: 15.1	75.5	26.6	76.1	• Provides BP checks without appointment and/or co-pay • Historical blood pressure graphical summary
Health Center 5	35	34,893	urban suburban rural	NHW: 77.8 B/AA: 19.0	2.8	1.0	69.3	• Regular sharing of care team–level HIPS data performance dashboard • Static EHR point-of-care alert/ decision support • Automated e-mail/text outreach to recall patients with potentially undiagnosed hypertension
Health Center 6	4	22,553	urban	NHW: 16.5 B/AA: 71.3	10.4	8.1	96.0	• Regular sharing of care team–level HIPS data performance dashboard • Point-of-care alerts at urgent care • Historical blood pressure graphical summary
Health Center 7	4	14,697	suburban rural	NHW: 88.9 B/AA: 5.5	5.2	2.5	76.8	• Heart door magnet point-of-care alert/decision support
Health Center 8	3	14,143	urban	NHW: 3.5 B/AA: 96.0	0.2	0.4	99.5	• Provides BP checks without appointment and/or co-pay • Heart door magnet point-of-care alert/decision support • Point-of-care alerts at podiatry and dental clinic • Hypertension screening patient questionnaire (when medical assistant takes vital signs)
Health Center 9	3	10,897	rural	NHW: 98.9 B/AA: 0.4	0.5	0.2	63.3	• Regular sharing of care team–level HIPS data performance dashboard
Health Center 10	6	20,635	rural	NHW: 98.2 B/AA: 0.7	0.6	0.3	54.0	• Regular sharing of care team–level HIPS data performance dashboard • Historical blood pressure graphical summary

*Sources of data: Number of sites and adult population were reported directly from health centers during the project (as of 12/31/2015). All other data are from Health Resources and Services Administration, 2015 National Health Center Data (as of 12/31/2015), available at: https://bphc.hrsa.gov/uds/datacenter.aspx?year=2015.

†All health centers participating in the HIPS project used the HIPS algorithm to configure clinical decision support interventions in EHRs or population management software systems. These included creating and applying registries of potentially undiagnosed hypertension patients, targeted outreach to recall potential HIPS patients for additional BP measurement and assessment, programming the algorithm into automated pre-visit planning reports, and using algorithm-based data to drive improvement, including metrics to assess the incidence of potentially undiagnosed hypertension. Additional interventions depict additional strategies health centers used to address undiagnosed hypertension beyond those implemented collectively.

NHW, non-Hispanic white; B/AA, black/African American; BP, blood pressure; HIPS, hiding in plain sight; EHR, electronic health record.

of potentially undiagnosed hypertension patients, using targeted outreach to recall potential HIPS patients for additional BP assessment, programming the algorithm into pre-visit planning reports, and using algorithm-based data to drive improvement. Health centers used either i2i Systems' i2i Tracks with PopIQ[25] or Azara Healthcare's Data Reporting & Visualization System[26] population management software systems. Both products have similar query-based registry capability to produce lists of individual patients, pre-visit planning reports, and performance dashboards by extracting EHR data.

Additional intervention strategies employed beyond those implemented collectively include noninterruptive EHR notifications or visual cues such as magnets on examination room doors to inform clinical providers about patients with potentially undiagnosed hypertension; regular performance reports to care teams highlighting potential HIPS patients; providing BP checks without an appointment and/or copayment; using historical BP graphical summaries to inform decision making; and point-of-care alerts at ancillary clinics such as podiatry or urgent care. Figure 1 provides detailed examples and images of several of the CDS interventions. Besides demographic data, Table 2 indicates additional intervention strategies adopted among participating health centers. The most effective interventions based on health center tests of change were compiled into a change package with supporting tools/resources.[27]

Main Outcomes and Measures

Table 3 defines the project's main outcome measures: hypertension prevalence (diagnosed), number of patients successfully recalled for evaluation (follow-up visits), and algorithm-triggered hypertension diagnoses.

Data Collection

Project results data were extracted from EHRs, collected from an online survey, and recorded from key informant interviews. Quantitative EHR data were collected monthly by each health center and uploaded to a Web-based sharing site. These data were used to calculate the outcome measure that applied to all 10 health centers: diagnosed hypertension prevalence.

Eight of the 10 participating health centers had the information system capacity to track patients longitudinally who were identified as at risk for undiagnosed hypertension. The 8 health centers covered all four states. The 2 health centers without the capability to track study group data were both rural health centers in Kentucky, representing 9 of the 74 care delivery locations. However, 1 of the 8 health centers in the longitudinal study did have five care delivery sites in rural Kentucky.

We designed measures for this cohort (Table 3) to identify patients with potentially undiagnosed hypertension who completed a follow-up office visit for confirmation of elevated BP, as well as estimate the algorithm utility and sensitivity in predicting undiagnosed hypertension.

We administered an online survey with 30 questions in June 2015 (via Qualtrics; Provo, Utah) to collect responses from project leaders—clinicians, nurses, QI staff, and operations staff—who oversaw intervention implementation at their health centers. The survey assessed perceptions about algorithm effectiveness in identifying and diagnosing hypertensive patients, resources required to implement the algorithm into work flows, and how organizations used undiagnosed hypertension data to drive improvement. This survey also queried perceptions about project successes, challenges, and future needs for addressing undiagnosed hypertension.

We conducted supplemental telephonic interviews with project leads in June–July 2016 to understand how care for individual patients, population management efforts, and foundational activities (for example, staff training) changed from implementing the HIPS algorithm and attempting to reduce undiagnosed hypertension.

Data Analysis

We conducted a pre-post statistical analysis of diagnosed hypertension prevalence EHR data using two-tailed z-tests for difference in proportions with a significance threshold set at 0.05. We also conducted a descriptive analysis by health center of the potentially undiagnosed hypertension study group on follow-up visits and subsequent hypertension diagnoses that occurred in the 16 months following implementation of algorithm-based interventions. Further, we provided a descriptive demographic stratification on the adult population from the participating health centers.

Quantitative survey data were compiled into scaled-choice response proportions. In addition, we conducted a thematic analysis of the text responses to the open-ended survey questions and interviews, which were recorded and then transcribed. For both, we induced themes using an open coding or conventional content analysis approach,[28] wherein data were analyzed with no predetermined theory, structure, or framework; the data themselves derived the structure of the analysis or themes.

RESULTS

Hypertension Prevalence

Hypertension prevalence across the 10 health centers increased significantly from January 2015 through June 2016—34.5%, (64,062/185,842) vs. 36.7%, (73,004/199,075) ($p < 0.05$). As patients are formally diagnosed with hypertension, they are included in the numerator for hypertension prevalence. A stratified analysis by health center (Table 4) shows significant increases in diagnosed hypertension prevalence for 6 of the 10 health centers.

Sample Interventions Based on the Algorithm to Identify Potentially Undiagnosed Hypertension

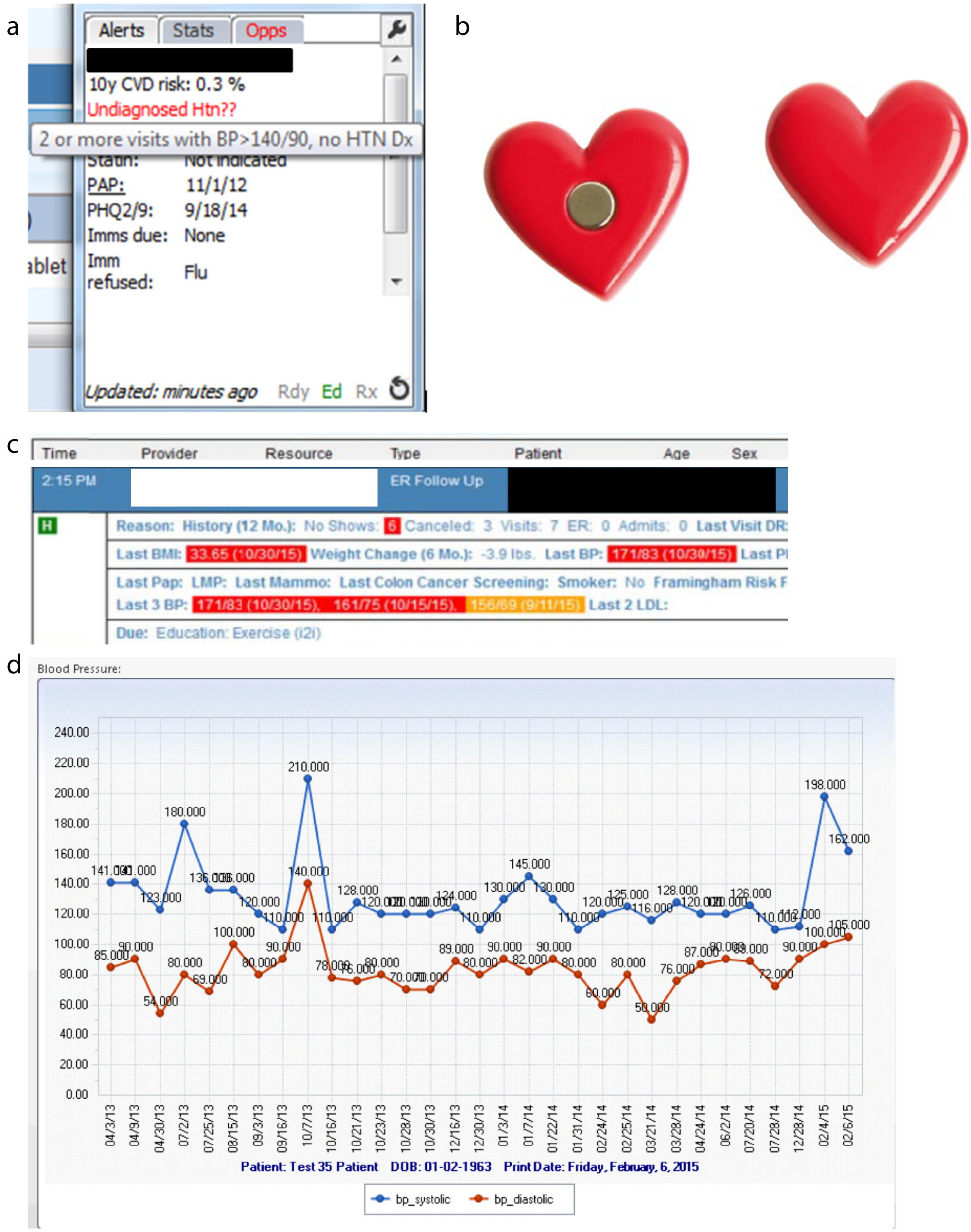

Figure 1: Detailed examples and images of several of the sample interventions are shown. Figure 1a: A prompt to the care team to address a potential undiagnosed hypertension/"hiding in plain sight" (HIPS) patient was integrated into an existing practice alert at one health center. The red text indicates an opportunity for the care team to act. Hovering over the text provides a brief explanation of why the patient may be a HIPS patient. Figure 1b: Two health centers used heart door magnets such as this one as a physical alert to cue providers that the patient waiting in the room for them had elevated blood pressure when his or her vital signs were taken. Figure 1c**:** Several health centers embedded the algorithm logic into automated pre-visit planning reports. In this report, elevated blood pressure readings are color-coded to red to indicate readings that are in the stage 2 hypertension range and color-coded yellow to indicate readings that are in the stage 1 hypertension range. Figure 1d**:** Several health centers used a flow sheet that graphically displayed historical blood pressure readings to understand whether patient patterns included multiple elevated blood pressure readings.

Table 3. Outcome Measure Definitions

Measure	Numerator	Denominator
Hypertension Prevalence (Diagnosed)	Number of patients in denominator with a diagnosis of essential hypertension (ICD-9-CM code 401 or ICD-10-CM code I10 documented in their EHR at an encounter or on the problem list)	Number of adult patients with 2 + medical visits in the past 12 months
Follow-Up Visits (Cohort only)	Number of patients in denominator who completed a follow-up visit during the study period (2/1/2015 – 6/30/2016)	Number of adult patients identified as potentially undiagnosed for hypertension as of 1/31/2015 (based on HIPS algorithm/potentially undiagnosed numerator definition above)
Algorithm-Triggered Hypertension Diagnoses (Cohort only)	Number of patients in denominator who were diagnosed with hypertension (ICD-9-CM codes 401–405 or ICD-10-CM codes I10–I15 documented in their EHR at an encounter or on the problem list) during the study period (2/1/2015 – 6/30/2016).	Number of patients identified as potentially undiagnosed for hypertension as of 1/31/2015 who completed a follow-up visit during the study period (2/1/2015 – 6/30/2016).

ICD-9-CM, International Classification of Diseases, Ninth Revision, Clinical Modification; EHR, electronic health record; HIPS, hiding in plain sight.

Table 4. Pre-Post Diagnosed Hypertension Prevalence by Health Center

Health Center	Time Frame:	Baseline: 2/1/2014 – 1/31/2015	End of Project: 7/1/2015 – 6/30/2016	*z*-Test for Difference in Proportions
Health Center 1	Diagnosed with Hypertension:	3,455	3,912	< 0.05
	Adult Patients Ages 18 to 85:	14,677	15,369	
	Hypertension Prevalence:	23.5%	25.5%	
Health Center 2	Diagnosed with Hypertension:	9,647	10,954	0.1074
	Adult Patients Ages 18 to 85:	31,427	35,025	
	Hypertension Prevalence:	30.7%	31.3%	
Health Center 3	Diagnosed with Hypertension:	3,636	4,057	< 0.05
	Adult Patients Ages 18 to 85:	13,643	13,916	
	Hypertension Prevalence:	26.7%	29.2%	
Health Center 4	Diagnosed with Hypertension:	2,881	2,816	< 0.05
	Adult Patients Ages 18 to 85:	11,492	9,655	
	Hypertension Prevalence:	25.1%	29.2%	
Health Center 5	Diagnosed with Hypertension:	13,204	15,862	< 0.05
	Adult Patients Ages 18 to 85:	34,893	37,677	
	Hypertension Prevalence:	37.8%	42.1%	
Health Center 6	Diagnosed with Hypertension:	9,263	9,325	< 0.05
	Adult Patients Ages 18 to 85:	23,624	22,378	
	Hypertension Prevalence:	39.2%	41.7%	
Health Center 7	Diagnosed with Hypertension:	4,230	4,999	0.5157
	Adult Patients Ages 18 to 85:	13,312	15,876	
	Hypertension Prevalence:	31.8%	31.5%	
Health Center 8	Diagnosed with Hypertension:	6,012	6,347	< 0.05
	Adult Patients Ages 18 to 85:	15,731	13,460	
	Hypertension Prevalence:	38.2%	47.2%	
Health Center 9	Diagnosed with Hypertension:	2,499	4,299	0.1096
	Adult Patients Ages 18 to 85:	7,964	14,166	
	Hypertension Prevalence:	31.4%	30.3%	
Health Center 10	Diagnosed with Hypertension:	9,235	10,433	0.9203
	Adult Patients Ages 18 to 85:	19,079	21,553	
	Hypertension Prevalence:	48.4%	48.4%	
Totals	**Diagnosed with Hypertension:**	**64,062**	**73,004**	**< 0.05**
	Adult Patients Ages 18 to 85:	**185,842**	**199,075**	
	Hypertension Prevalence:	**34.47%**	**36.67%**	

In the 8 health centers where patients with potentially undiagnosed hypertension were tracked longitudinally, 1,785 patients who were previously undiagnosed for hypertension and "hiding in plain sight" were diagnosed with hypertension. Specifically, postintervention, 65.2% (5,602/8,594) of adult patients identified by the HIPS algorithm were seen for a follow-up evaluation, of which 31.9% (1,785/5,602) received a hypertension diagnosis. Although this latter rate does not represent a true positive predictive value, it does provide an indicator of the HIPS algorithm sensitivity. Tables 5 stratifies these results by health center, showing that 23.2% to 38.8% of patients who had a follow-up BP evaluation were then formally diagnosed with hypertension. Figure 2 displays the proportion over time of patients in the study group with potentially undiagnosed hypertension, follow-up visits, and hypertension diagnoses.

Survey

The survey queried respondents on their perceptions of the importance of addressing undiagnosed hypertension and the resources required to implement the HIPS algorithm and supporting interventions. There were 10 respondents, representing 9 of the 10 participating health centers (1 organization had project co-leaders, both of whom responded). All respondents (100%) indicated that the HIPS algorithm was effective in identifying hypertensive patients. Survey responses also showed that undiagnosed hypertension data were used for: patient outreach (80%), pre-visit planning (70%), provider/care team feedback (70%), targeting interventions (70%), and performance assessment (70%). Staff time to do QI work was mentioned as a top implementation challenge (40%). Regarding investment required for different elements of the HIPS interventions, staff thought all elements required moderate to high effort. Work flow mapping and redesign was perceived as requiring the highest amount of resource investment (staff time and/or funding), followed by HIT/data programming and reporting. Staff training on redesigned work flows and accurate BP measurement, and patient outreach/recall also required moderate to high investment. Most respondents rated visit-related intervention implementation (for example, alerting providers to address elevated BP) as requiring moderate resource investment. The top successes from the project were improved work flows (70%), exposure to tools/approaches applicable to other QI initiatives (50%), and improved clinical outcomes (40%). Detailed survey results are shown in Appendix 1 (available in online article), which also contains themes and examples from the open-ended survey questions. One theme was surprise at the number of potentially undiagnosed hypertension patients identified; another was the value in standardizing criteria to identify patients who might be undiagnosed for hypertension. Challenges scheduling identified patients for follow-up visits

Table 5. Undiagnosed Hypertension Longitudinal Study Group: Proportion with a Follow-Up Visit and Proportion Receiving a Hypertension Diagnosis Between 2/1/2015 and 6/30/2016 by Health Center

	Health Center 1	Health Center 2	Health Center 3	Health Center 4	Health Center 5	Health Center 6	Health Center 7	Health Center 8	Total
Patients Identified as HIPS (hiding in plain sight)*	358	534	425	573	2,576	1,592	897	1,639	**8,594**
Proportion with Follow-Up Visit†	230 (64.2%)	412 (77.2%)	301 (70.8%)	379 (66.1%)	1,785 (69.3%)	904 (56.8%)	573 (63.9%)	1,018 (62.1%)	**5,602 (65.2%)**
Diagnosed with Hypertension (of those with Follow-Up Visit)‡	78 (33.9%	130 (31.6%)	84 (27.9%)	147 (38.8%)	632 (35.4%)	226 (25.0%)	133 (23.2%)	355 (34.9%)	**1,785 (31.9%)**

*Patients in the undiagnosed hypertension longitudinal study group (patients identified by the HIPS algorithm as potentially undiagnosed for hypertension as of 1/31/2015).

†Patients in the undiagnosed hypertension longitudinal study group (patients identified by the HIPS algorithm as potentially undiagnosed for hypertension as of 1/31/2015) who had a follow-up visit on or after 2/1/2015 (*follow-up visit* is defined as a face-to-face encounter with a medical provider in the health center on or after 2/1/2015).

‡Patients in the undiagnosed hypertension longitudinal study group (patients identified by the HIPS algorithm as potentially undiagnosed for hypertension as of 1/31/2015) who had a follow-up visit on or after 2/1/2015 (*follow-up visit* is defined as a face-to-face encounter with a medical provider in the health center on or after 2/1/2015) and who were diagnosed for hypertension on or after 2/1/2015.

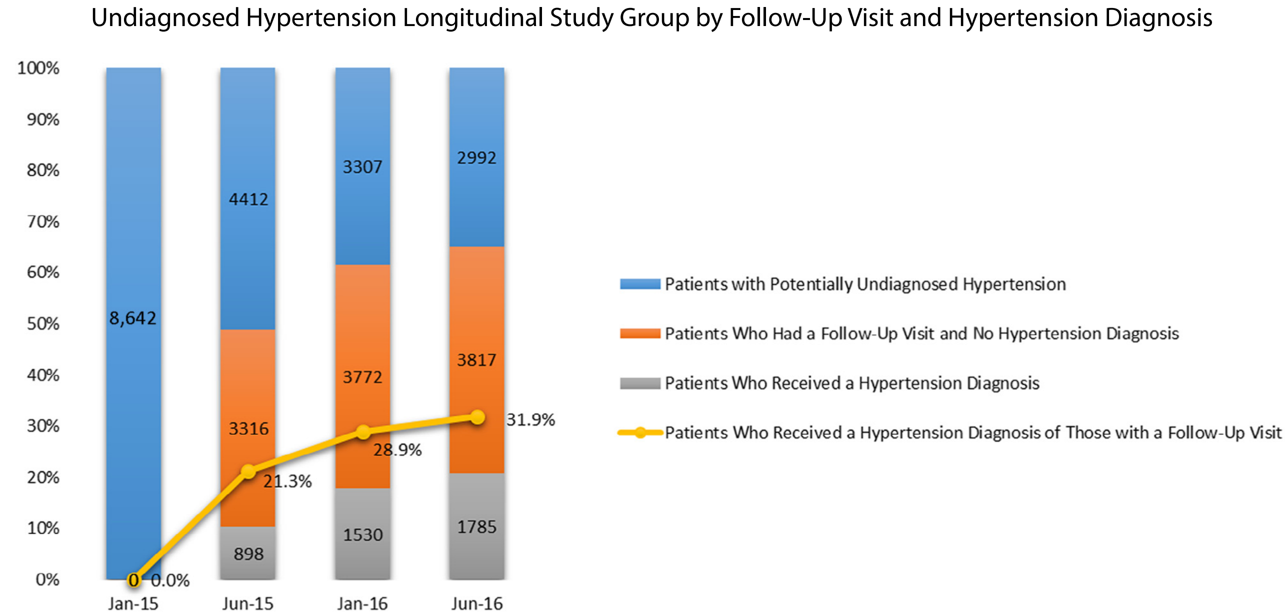

Figure 2: The columns depict patients in the undiagnosed hypertension longitudinal study group (patients identified by the hiding in plain sight (HIPS) algorithm as potentially undiagnosed for hypertension as of 1/31/2015), the proportion of the study group who had a follow-up visit, and the proportion of the study group who had both a follow-up visit and received a hypertension diagnosis, from January 2015 to June 2016. The curve represents the percentage of patients who received a hypertension diagnosis out of those who had a follow-up visit, from January 2015 to June 2016.

emerged as a theme, as did greater awareness of undiagnosed hypertension and a shift to addressing the problem proactively.

Interviews

Postintervention interviews with project leads revealed additional insights about how the algorithm was operationalized, when it was implemented, how well new work flows were accepted, and how consistently they were followed (see Appendix 1 for queries, themes, and sample responses). Interviews were completed with 9 of the 10 project leads. Highlights were that, although providers had an important role, implementing the HIPS algorithm required collaboration across the care team. Other notable findings were that all organizations coupled algorithm use with technology-enabled work flow changes, employed the algorithm in patient registries to identify patients to recall and confirm elevated BP, and used it at the point of care for decision support and pre/post-visit planning. New algorithm-based work flows (altered care actions and information flow) had variable acceptance but overall were received positively by care teams. The new HIPS work flows caused care teams to start looking at BP over time versus in isolated visits. By viewing trends, care teams realized that some patients had repeated high BP measurements and were not receiving diagnoses or treatment for hypertension.

The interviews also elicited other work flow changes designed to help address undiagnosed hypertension, such as adding nurse visits requiring no copayment for the express purpose of checking BP, creating standing orders for nurses and medical assistants to address potential hypertension at every encounter, making reminder telephone calls and/or sending text or e-mail messages to potential HIPS patients with scheduled appointments, and conducting outreach to potential HIPS patients who did not have a visit scheduled. Consistent messages from project leads, provider champions, and leadership on the importance of addressing undiagnosed hypertension, plus sharing successes with care teams, were noted as effective strategies in reinforcing work flows.

DISCUSSION

Hypertension documentation in the EHR is strongly associated with patients receiving treatment[10]; thus, recent efforts have centered on leveraging EHR data to increase the accuracy and efficiency of identifying and diagnosing hypertension.[12,13] Despite challenges with the structure, consistency, and completeness of EHR data, auditing these data for elevated BP readings (≥140 mmHg systolic or ≥ 90 mmHg diastolic) is an effective means to identify patients with hypertension who are "hiding in plain sight."[10–13,29]

We found that diagnosed hypertension prevalence increased significantly from baseline to project end (34.5% in January 2015 vs. 36.7% in June 2016); this increase suggests that health centers can successfully use an algorithm-based approach to identify undiagnosed hypertension patients, confirm elevated BP, and diagnose appropriate patients with hypertension. Diagnosed hypertension prevalence increased despite the fact that participating health centers experienced an 7.1% increase in adult patients, which was likely due to Medicaid-expansion legislation in Arkansas, California, and Kentucky, which opened up health insurance coverage for uninsured adults who were previously excluded from Medicaid.[30] The total number of adult patients across health centers increased from 185,842 to 199,075 (13,233 new patients) during the 17-month project. The addition of these patients could have masked effects of efforts to identify and diagnose HIPS patients. Because patients newly eligible for Medicaid may have been unable to obtain insurance previously, many may not have been receiving regular health care.[30] Thus, they may have had disproportionately high levels of potentially undiagnosed hypertension, which could have a negative effect on diagnosed hypertension prevalence as these patients become included in the measure denominator. An influx of new patients may also delay the ability of established patients to schedule follow-up visits for confirmation of elevated BP.

Mining data to find elevated BP readings significantly increases hypertension identification,[10-13,29] and health systems can benefit from assessing EHR data to identify potentially undiagnosed hypertension,[11,12] but specific criteria that are optimal for building HIPS–detecting algorithms are less well understood. Health centers care for vulnerable populations and may not have access to sophisticated analytics technology or the staff to use it. It was thus unclear how many elevated BP readings, with what thresholds, over what time periods should be programmed into algorithms to identify potentially undiagnosed hypertension in health centers. In addition, where, to whom, through what channels, and in what formats these data provide the most benefit for enhancing hypertension-related care decisions and actions in the safety-net setting was not well understood. This project helped define and clarify these factors by applying the CDS Five Rights framework, together with the CDS/QI Worksheet, which were core elements of this project's QI approach.[20] Interventions that improve care team attention to and action on undiagnosed hypertension must not only be based on the right information (algorithmic criteria) but also packaged and delivered effectively within clinical work flows.[31] This project addressed and assessed both success dimensions.

The longitudinal potentially undiagnosed cohort evaluation yielded insights about the algorithm's value in identifying hypertension. Close to two thirds (65.2%) of those identified at baseline as potential HIPS patients returned for a follow-up visit for confirmation of elevated BP; of these, approximately 1 in 3 (31.9%) subsequently received a formal hypertension diagnosis. While more complex algorithms have yielded higher sensitivity in identifying true hypertension,[12] they also may pose a greater challenge to implement and may cause patients to be overlooked. Two guiding principles for this project's algorithm were maintaining simplicity and balancing identifying true hypertension with not missing patients due to overly restrictive parameters.

When asked about algorithm effectiveness, project leads responded unanimously that having standardized criteria for undiagnosed hypertension driving decision support for their care teams was helpful. They also responded that addressing undiagnosed hypertension was important in improving care quality and patient outcomes. Feedback on recommended algorithm changes centered not on broadening or narrowing the clinical criteria but on refining how the information was operationalized in work flows or adding supporting procedures such as systematically scheduling algorithm-identified patients for appointments to assess for hypertension.

On the basis of qualitative feedback, critical success factors for effective algorithm use included staff engagement, EHR configuration, establishing supportive policies and protocols, and leveraging and training full care teams, beyond clinicians. In addition, accurate BP measurement and accurate EHR documentation helped mitigate provider inertia resulting from mistrusting data.[9] Care teams adopting and sustaining new practices (work flows), was also important.

All participating health centers implemented algorithm-based registries, pre-visit planning, and targeted outreach to recall potential HIPS patients for additional BP assessment. Health centers also all implemented at least one additional intervention strategy (see Table 2). Although variation across health centers in achieving significant increases in diagnosed hypertension prevalence is difficult to attribute to specific additional intervention strategies employed, some indication of the impact of certain strategies did surface.

Four of the six health centers (Health Centers 1, 3, 4, and 8) with significant increases in diagnosed hypertension prevalence offered BP checks with no copayment and/or on a walk-in basis. Health Center 2, which also offered no copayment BP visits, did not have a statistically significant increase in diagnosed hypertension prevalence, but did have the highest proportion of patients recalled for BP assessment (77.2% [412/534]) in the study group analysis of potential HIPS patients. Health Center 5, with a 4.3 percentage point increase in diagnosed hypertension prevalence, uniquely implemented automated e-mail/text technology to recall potential HIPS patients. Health Center 8, which showed the greatest increase in diagnosed hypertension prevalence (9 percentage points) was the only organization to screen for undiagnosed hypertension in its dental and podiatry clinics.

Other participating health centers (Health Centers 7, 9, and 10) that used additional strategies such as point-of-care decision support and regular sharing of care team–level HIPS performance dashboards did not show significant increases in diagnosed hypertension prevalence. The impact of these strategies could have been diluted by increases in new patients, as mentioned previously.

Further investigation and evaluation would be required to isolate effects of individual interventions as well as understand the influence of varying care delivery environments and patient mix represented across the participating health centers.

This project's central focus was identifying patients hiding in plain sight with hypertension using algorithm-based interventions. We did this by working with health centers to embed the HIPS algorithm into their work flows; however, these efforts also included patient engagement strategies that were essential to encourage those identified as potentially having hypertension to make and keep follow-up appointments so their hypertension status could be determined. Keeping appointments is often challenging for underserved patients because they tend to have more barriers to accessing health care services.[32] This reinforces the important role that enabling services can play in facilitating access to care.[33] It also underlines the value of proactive pre-visit preparation to engage these patients[34] and the importance of addressing chronic disease even when patient visits are for another reason. Much attention in the project focused on additional work flow changes designed to help address access barriers and facilitate patient follow-up. It may not be coincidental that there were significant increases in diagnosed hypertension prevalence in four of the five health centers that added no copayment, walk-in BP checks.

Many health centers were surprised by how many potentially undiagnosed patients they had. Recognizing the difficulty of recalling every patient quickly to confirm elevated BP, they developed plans to prioritize patients most in need of attention. In addition, health centers established clear diagnosis parameters (for example, number of BP measurements needed over a specific number of visits within a specific time frame) to avoid repeated office visits to confirm elevated BP not producing a decision on hypertension diagnosis.

Future Directions

Even with a HIPS detection algorithm, clearly defined clinical work flows to translate algorithm results into action, as well as efforts to improve accuracy of BP measurement and EHR documentation, one significant barrier to diagnosis continues to be provider inertia stemming from distrusting office visit BP readings.[9] "White coat" hypertension is a key reason for this distrust. This condition, in which patients experience elevated BP levels in an office environment but normal readings outside the office,[35] may be present in 30% to 40% of patients.[36] This high prevalence significantly affects the accuracy of outpatient BP readings even when measured and recorded properly and may contribute to providers delaying hypertension diagnosis based on office readings.[9] To help address this problem, in October 2015 the US Preventive Services Task Force (USPSTF) issued a recommendation to use out-of-office BP measurement to confirm hypertension diagnosis.[37] This project identified algorithm-driven care process changes that, if added to out-of-office confirmation of elevated BP, could be a promising approach to reduce undiagnosed hypertension in primary care settings, and, in turn, lower the health and cost burden from cardiovascular disease.

This project also uncovered a need to define and track subgroups of patients identified as potentially undiagnosed for hypertension to distinguish between those who are most likely to have true hypertension and those who are at lower risk and/or may require different monitoring and follow-up actions (for example, those with prehypertension vs. those confirmed to have white coat hypertension). Further, understanding the differences between patients identified as potentially undiagnosed who return for a follow-up visit and those who do not, as well as those who are diagnosed and those who are not, could yield more effective, targeted algorithms and interventions.

Applying the approaches and learning from this project to other chronic disease care targets such as diabetes also warrants exploration; two recent retrospective analyses of health center EHR data detected a substantial number of patients meeting USPSTF criteria for diabetes who were undiagnosed and needed treatment.[38,39]

Limitations

This project focused on health centers. Applying the HIPS algorithm and supporting care processes in other settings needs further testing. The algorithm also did not distinguish between undocumented hypertension and undiagnosed hypertension. Although it excluded patients with hypertension diagnoses documented as an encounter assessment or on their EHR's problem list, it could have identified patients as potentially undiagnosed for hypertension who may be receiving treatment but whose diagnosis was not documented in one of these two places. Further, the QI intervention was not standardized. The core algorithm deployed was consistent across health centers, and several intervention strategies were adopted by all organizations, but how they were translated into practice into clinical work flows differed to accommodate various practice environments. Finally, the algorithm look-back period of 12 months may have excluded patients without a health care encounter in the past year. Addressing health care access barriers and proactive patient engagement focused on patients without visits in the past 12 months may help increase how many patients benefit from applying the HIPS algorithm.

CONCLUSION

Using algorithmic logic and other CDS–enabled care process improvements, coupled with patient engagement strategies, appears to be an effective way primary care providers in the safety net in the United States can identify and support patients at risk for undiagnosed hypertension. Identifying all hypertensive patients is a key step to ensure that hypertension control efforts yield maximal improvements in population cardiovascular health and related costs.

Funding. This project was funded by US Federal Award Identification Number (US) 3U8OT00223 from the Centers for Disease Control and Prevention (CDC) 3U38OT000223-03S1.

Acknowledgments. The authors thank Judy Hannan, RN, MPH; Haley Stolp, MPH; and Hilary Wall, MPH, Centers for Disease Control and Prevention for their dedication and guidance, and work on the design of this project. The authors also thank the following health centers and health center controlled networks for their dedicated work in this project: Affinia Healthcare, St. Louis; Altura Centers for Health, Tulare, California; ARcare, Augusta, Arkansas; Golden Valley Health Centers, Merced, California; Grace Community Health Center, Gray, Kentucky; Jordan Valley Community Health Center, Springfield, Missouri; La Maestra Community Health Centers, City Heights, California; Mountain Comprehensive Health Corporation, Inc., Whitesburg, Kentucky; Myrtle Hilliard Davis Comprehensive Health Centers, St. Louis; Neighborhood Healthcare, Escondido, California; Central Valley Health Network, Sacramento, California; Health Center Partners of Southern California, San Diego; Kentucky Health Center Network, Mt. Sterling; and Missouri Primary Care Association, Jefferson City.

Conflicts of Interest. All authors report no conflicts of interest.

Margaret Meador, MPH, C-PHI, is Director, Clinical Integration and Education, National Association of Community Health Centers, Bethesda, Maryland. **Jerome A. Osheroff, MD,** is Principal, TMIT Consulting, LLC, Naples, Florida. **Benjamin Reisler, MPH,** is Health Analyst, Civilian Health Group, Logistics Management Institute, Tysons,Virginia. Please address correspondence to Margaret Meador, mmeador@nachc.org.

ONLINE-ONLY CONTENT

See the online version of this article for Appendix 1. Descriptive Survey Results and Thematic Analyses of Both Open-Text Survey Question Responses and Interviews

REFERENCES

1. Mozaffarian D, et al. Heart disease and stroke statistics—2015 update: a report from the American Heart Association. Circulation. 2015 Jun 16;131:e29–e322. Erratum in: Circulation. 2015 Jun 16;131:e535; and Circulation. 2016 Feb 23;133:3417.
2. Nwankwo T, et al. Hypertension among adults in the United States: National Health and Nutrition Examination Survey, 2011–2012. NCHS Data Brief. 2013;(133):1–8. Accessed Dec 13, 2017. https://www.cdc.gov/nchs/data/databriefs/db133.pdf.
3. Centers for Disease Control and Prevention, National Center for Health Statistics. Underlying Cause of Death 1999–2016 on CDC WONDER Online Database. Dec 2016. Accessed Dec 13, 2017. https://wonder.cdc.gov/ucd-icd10.html.
4. Farley TA, et al. Deaths preventable in the U.S. by improvements in use of clinical preventive services. Am J Prev Med. 2010 Jun;38:600–609.
5. Foundation CDC. Heart Disease and Stroke Cost America Nearly $1 Billion a day in Medical Costs, Lost Productivity. Apr 29, 2015. Accessed Dec 13, 2017. https://www.cdcfoundation.org/pr/2015/heart-disease-and-stroke-cost-america-nearly-1-billion-day-medical-costs-lost-productivity.
6. Chobanian AV, et al. Seventh report of the Joint National Committee on prevention, detection, evaluation, and treatment of high blood pressure. Hypertension. 2003;42:1206–1252.
7. James PA, et al. 2014 evidence-based guideline for the management of high blood pressure in adults: report from the panel members appointed to the Eighth Joint National Committee (JNC 8). JAMA. 2014 Feb 5;311:507–520.
8. National Institute for Health and Clinical Excellence. Hypertension: Clinical Management of Primary Hypertension in Adults. Aug 2011. Accessed Dec 13, 2017. https://workspace.imperial.ac.uk/ref/Public/UoA%2002%20-%20Public%20Health,%20Health%20Services%20and%20Primary%20Care/NICE%20hypertension%20guidelines.pdf.
9. LeBeau JP, et al. The concept and definition of therapeutic inertia in hypertension in primary care: a qualitative systematic review. BMC Fam Pract. 2014 Jul 2;15:130.
10. Wall HK, Hannan JA, Wright JS. Patients with undiagnosed hypertension: hiding in plain sight. JAMA. 2014;312:1973–1974.
11. Baus A, Hendryx M, Pollard C. Identifying patients with hypertension: a case for auditing electronic health record data. Perspect Health Inf Manag. 2012;9(Spring):1e.
12. Rakotz MK, et al. A technology-based quality innovation to identify undiagnosed hypertension among active primary care patients. Ann Fam Med. 2014;12:352–358.
13. Banerjee D, et al. Underdiagnosis of hypertension using electronic health records. Am J Hypertens. 2012;25:97–102.
14. Rural Health Information Hub. Federally Qualified Health Centers (FQHCs). (Updated: May 29, 2015). Accessed Dec 13, 2017. https://www.ruralhealthinfo.org/topics/federally-qualified-health-centers.
15. Goodman D, et al. Explanation and elaboration of the SQUIRE (Standards for Quality Improvement Reporting Excellence) Guidelines, V.2.0: examples of SQUIRE elements in the healthcare improvement literature. BMJ Qual Saf. 2016;25(12):e7.
16. US Department of Health & Human Services, Office for Human Research Protections. Code of Federal Regulations Title 45: Public Welfare, Part 46: Protection of Human Subjects. Effective Jul 14, 2009. Accessed Dec 13, 2017. https://www.hhs.gov/ohrp/regulations-and-policy/regulations/45-cfr-46/index.html#46.101.
17. Centers for Medicare & Medicaid Services. ICD-9-CM Diagnosis and Procedure Codes: Abbreviated and Full Code Titles, version 32. Effective 1 Oct 2014. Accessed Dec 13, 2017. https://www.cms.gov/Medicare/Coding/ICD9ProviderDiagnosticCodes/codes.html.
18. National Quality Forum. Quality Positioning System (QPS) Measure Description Display Information. 0018: Controlling High Blood Pressure. Steward: National Committee for Quality Assurance. (Updated: Apr 3, 2013). Accessed Dec 13, 2017. http://www.qualityforum.org/QPS/MeasureDetails.aspx?standardID=1236&print=0&entityTypeID=1.
19. Langley GL, et al. The Improvement Guide: A Practical Approach to Enhancing Organizational Performance, 2nd ed. San Francisco: Jossey-Bass, 2009.
20. Health Information Technology, Evaluation, and Quality Center. Guide to Improving Care Processes and Outcomes in Health Centers. Osheroff, JA. Sep 9, 2016. Accessed Dec 13, 2017. http://Bit.ly/qiguide.
21. Osheroff JA. Clinical Decision Support–Enabled Quality Improvement Worksheet (Essential Version) ["Essential CDS/QI Worksheet"], version 4. Feb 24, 2016. Accessed Dec 13, 2017. http://hiteqcenter.org/Resources/Health-IT-Enabled-QI/Improving-Performance/ArtMID/849/ArticleID/310/Clinical-Decision-Support-enabled-Quality-Improvement-Worksheet-Essential-Version.

22. Osheroff JA, et al. Improving Outcomes with Clinical Decision Support: An Implementer's Guide, 2nd ed. Chicago: Healthcare Information and Management Systems Society. 2012.
23. Health Resources and Services Administration, Bureau of Primary Health Care. National Health Center Data. 2014. Accessed July 2015. https://bphc.hrsa.gov/uds/datacenter.aspx.
24. Health Resources and Services Administration. Health Center Controlled Networks. Accessed Dec 13, 2017. https://bphc.hrsa.gov/qualityimprovement/strategicpartnerships/hccn.html.
25. i2i Population Health. Solutions. Accessed Dec 13, 2017. https://www.i2ipophealth.com/solutions/.
26. Azara Healthcare. Azara DRVS. Accessed Dec 13, 2017. http://www.azarahealthcare.com/solutions/azara-drvs/.
27. National Association of Community Health Centers. Million Hearts: Leveraging Health Information Technology (HIT), Quality Improvement (QI), and Primary Care Teams to Identify Hypertensive Patients Hiding in Plain Sight (HIPS): Consolidated Change Package. Meador M, Osheroff JA. Jun 30, 2015. Accessed Dec 13, 2017. http://mylearning.nachc.com/diweb/fs/file/id/229350.
28. Hsieh HF, Shannon SE. Three approaches to qualitative content analysis. Qual Health Res. 2005;15:1277–1288.
29. University at Albany, School of Public Health. Hiding in Plain Sight: Finding Patients with Undiagnosed Hypertension. [Webcast.] Wall HK, Cafarchio S. Feb 18, 2016. Accessed Dec 13, 2017. http://www.albany.edu/sph/cphce/phl_0216.shtml.
30. Kaiser Family Foundation. Medicaid Moving Forward. Paradise K. Issue Brief. Mar 2015. Accessed Dec 13, 2017. http://files.kff.org/attachment/issue-brief-medicaid-moving-forward.
31. Mishuris RG, et al. Integrating data from an online diabetes prevention program into an electronic health record and clinical workflow, a design phase usability study. BMC Med Inform Decis Mak. 2016 Jul 11;16:88.
32. DeVoe JE, et al. Insurance + access ≠ health care: typology of barriers to health care access for low-income families. Ann Fam Med. 2007;5:511–518.
33. Park HL. Enabling Services at Health Centers: Eliminating Disparities and Improving Quality: Challenges and Opportunities for Health Centers in Collecting Data on Enabling Services. New York: New York Academy of Medicine. 2006. Accessed Mar 21, 2017. http://www.aapcho.org/wp/wp-content/uploads/2012/03/ES-Metlife-Report.pdf.
34. Rivo J, et al. The impact of comprehensive pre-visit preparation on patient engagement and quality of care in a population of underserved patients with diabetes: evidence from the care management medical home center model. Popul Health Manag. 2016;19:171–177.
35. de la Sierra A. Definition of white coat hypertension: ambulatory blood pressure, self-measured blood pressure, or both? Hypertension. 2013;62:16–17.
36. Mancia G, et al. Diagnosis and management of patients with white-coat and masked hypertension. Nat Rev Cardiol. 2011 Aug 9;8:686–693.
37. Siu AL, U.S. Preventive Services Task Force. Screening for high blood pressure in adults: U.S. Preventive Services Task Force Recommendation Statement. Ann Intern Med. 2015 Nov 17;163:778–786.
38. Sohler N, et al. Opportunistic screening for diabetes and prediabetes using hemoglobin A1c in an urban primary care setting. Endocr Pract. 2016;22:143–150.
39. O'Brien MJ, et al. Detecting dysglycemia using the 2015 United States Preventive Services Task Force screening criteria: a cohort analysis of community health center patients. PLoS Med. 2016 Jul 12;13:e1002074.