



Improving cardiovascular outcomes by using team-supported, EHR-leveraged, active management: Disseminating a successful quality improvement project

Allison A. Lewinski^{a,b,c,*}, Hayden B. Bosworth^{a,b,c,d,e}, Karen M. Goldstein^{a,c}, Jennifer M. Gierisch^{a,b,c}, Shelley Jazowski^{b,f}, Felicia McCant^a, Courtney White-Clark^a, Valerie A. Smith^{a,b,c}, Leah L. Zullig^{a,b}

^a Center of Innovation to Accelerate Discovery and Practice Transformation, Durham Veterans Affairs Health Care System, Durham, NC, USA

^b Department of Population Health Sciences, Duke University School of Medicine, Durham, NC, USA

^c Division of General Internal Medicine, Department of Medicine, Duke University School of Medicine, Durham, NC, USA

^d Department of Psychiatry and Behavioral Sciences, Duke University School of Medicine, Durham, NC, USA

^e School of Nursing, Duke University, Durham, NC, USA

^f Department of Health Policy and Management, University of North Carolina at Chapel Hill, Chapel Hill, NC, USA

ARTICLE INFO

Keywords:

Cardiovascular diseases
Population health management
Implementation science
Quality improvement
Veterans

ABSTRACT

Background: Uncontrolled blood pressure (BP) is common among Veterans. Rural Veterans are at risk for sub-optimal care coordination as successful programs may be implemented at lower rates due to individual- and system-level factors. There is strong evidence to support the use of remotely delivered support and patient-generated data from home BP monitors and virtual BP visits to manage BP.

Objective: The purpose of this project is to augment the current approach to addressing uncontrolled BP so that existing clinical staff can reach a larger patient population.

Methods: Our project will address uncontrolled BP by leveraging team-based care, the Veteran's Health Administration Electronic Health Record, and patient-centered medical home data to address patient, provider, and system barriers to cardiovascular disease (CVD) preventive care. We will implement this project in cardiovascular disease practices in three rural Veterans Health Administration clinics. We will evaluate implementation processes as well as patient-level (e.g., clinical outcomes, referrals to specialty services) outcomes in a one-arm, pre-post design.

Discussion: This manuscript describes our process in expanding the implementation of a successful project to improve BP control in high-risk, rural Veterans. Findings from our study will inform an understanding of both implementation and clinical effectiveness outcomes of a potentially scalable BP intervention in rural, community-based clinics. Appropriate management of Veterans with uncontrolled BP can reduce morbidity and mortality related to CVD. In turn, improvements in BP, can lead to improved quality metrics and potentially decrease costs for a healthcare system.

Funding

The research reported in this publication was supported by Office of Rural Health Award grant #ORH 14379; Durham Center of Innovation to Accelerate Discovery and Practice Transformation grant #CIN 13-410; Department of Veterans Affairs Office of Academic Affiliations grant #TPH 21-000 (to AAL); and VA HSR&D grants #13-263 (to KMG) and #08-027 (to HBB). The content is solely the responsibility of the

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1. Introduction

Hypertension, obesity, and dyslipidemia are the most common chronic conditions among Veterans [1]. Additionally, high proportion of Veterans report smoking as well as a diagnosis of diabetes which increases their risk of poor cardiovascular disease (CVD) outcomes [1].

* Corresponding author. Durham VA Health Care System, HSR&D COIN (558/152), 508 Fulton Street, Durham, NC 27705, USA.

E-mail address: Allison.lewinski@duke.edu (A.A. Lewinski).

<https://doi.org/10.1016/j.conctc.2021.100705>

Received 15 June 2020; Received in revised form 24 August 2020; Accepted 1 January 2021

Available online 6 February 2021

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Abbreviations

ASCVD	Atherosclerotic cardiovascular disease
BP	Blood pressure
CVD	Cardiovascular disease
EHR	Electronic Health Record
IRB	Institutional Review Board
PACT	Patient-aligned care team
PCA	Primary Care Almanac
SBP	Systolic blood pressure
TEAM	<i>Team-supported, Electronic Health Record (EHR)-leveraged, Active Management</i>
VHA	Veterans Health Administration

Hypertension and dyslipidemia are the two leading risk factors for CVD. However, primary care providers are often overburdened and specialty care for the management of blood pressure (BP) is not often readily accessible across the United States [2]. While there are many evidence-based therapies to treat uncontrolled BP and CVD risk factors, considerable gaps exist in the delivery of evidence-based treatment and in achieving CVD risk factor as well as BP control across the Veteran population [3–7].

Poor population-level BP control has been largely attributed to therapeutic and clinical inertia (e.g., failure to appropriately intensify treatment) [8] and low patient engagement (e.g., missing clinic appointments, suboptimal medication adherence) [9,10]. While BP control is a core component of adult primary care, discussions about BP management may not always occur during traditional, face-to-face medical visits. Reasons for this inattention are multifaceted. BP control may not be a chief patient complaint and clinicians may not have adequate time to appropriately address these concerns with the patient. However, new models of care delivery that use patient-generated health data [11], computerized algorithms creating tailored programs [12], frequent communication and reporting [13], and non-physician providers organized as an integrated practice unit have the potential to transform population-based BP control [13–15]. For instance, patient-generated data from at home BP monitors, mobile health tools, and virtual BP visits are one way to help improve BP control [16,17]. Data from these tools can include regular progress reports by the patient in which they update the provider about their actions towards achieving BP goals, and the provider giving advice to promote and reinforce lifestyle changes [18]. These new models of care delivery can help identify high-risk patients and address modifiable risk factors.

Uncontrolled BP is common among Veterans, particularly among those residing in rural areas where access to care is more challenging than in urban settings. Suboptimal BP control among Veterans is attributed to patient (e.g., knowledge), provider (e.g., competing demands), system (e.g., lack of fully empowered patient care teams), and structural (e.g., limitations with secure messaging in the electronic health record [EHR]) barriers [19–22]. Certain populations, such as Veterans living in rural areas, may face significant barriers (e.g., transportation, availability of services) to receiving needed CVD risk management, BP management, and care [23,24]. Barriers create gaps between current guideline-concordant BP care and clinical practice; and these gaps drive inequities between rural and non-rural Veterans, as well as suboptimal care overall. Rural Veterans are at risk for suboptimal care coordination as successful healthcare and self-management programs may be implemented at lower rates due to organization, geographic, clinician, and patient-level factors [25–27]. Effective approaches are required to coordinate Veterans Health Administration (VHA) care for Veterans that are compatible to delivery in rural settings.

2. Project

We developed *Team-supported, EHR-leveraged, Active Management (TEAM)* to address CVD health in rural Veterans. We implemented TEAM in one rural VHA clinic during October 2018 and September 2019. The pilot project focused on hypertension and used the Atherosclerotic Cardiovascular Disease (ASCVD) score to develop a patient Heart Health Handout and guide how a population health manager interacted with the Veteran (Fig. 1). We used the EHR, existing provider panel management tools, and a population health manager to optimize hypertension control and CVD risk reduction. Pilot project findings indicated an increase in completion of scheduled medical appointments, an increase in Veteran-initiated interactions with their healthcare provider regarding health concerns, and a decrease in systolic and diastolic BP [28].

During the pilot study, the population health manager determined that calculating the ASCVD score and conveying tailored risk information to each Veteran was difficult versus communicating solely on BP control. For instance, providers and Veterans found the risk information too broad and not sufficiently actionable for Veterans. In response, we focused primarily on BP and secondarily on CVD risk reduction. Additionally, we simplified and refined the population health manager role and personalized Heart Health Handout sent to Veterans [28]. Based on the success of the pilot study, we aim to scale-out our project to an additional three rural VHA sites. Therefore, the purpose of the proposed project is to augment the current approach to addressing uncontrolled BP so that existing clinical staff can reach a larger patient population and improve the CVD health of rural Veterans.

Our intervention, *TEAM*, seeks to address suboptimal BP control by leveraging team-based care, the VHA EHR, and the Primary Care Almanac (PCA) to address patient, provider, and system barriers to CVD preventive care. Team-based care in the VHA is provided via patient-aligned care teams (PACT), a model in which a multidisciplinary group of clinical providers (ie, physician, registered nurse care manager, medical assistant) deliver Veteran-centered care [29]. Team-based care is one way to successfully decrease BP and assist in self-management of chronic illnesses [30–32]. The PCA is a VHA-specific, EHR-linked application that provides each PACT with tools to identify, manage, and coordinate care for their population of paneled patients [32,33]. TEAM will provide population health reports and individual-level actionable guides to the PACT nurse care manager. TEAM addresses a critical gap in translating research to practice and is practical to implement in a rural setting, and could become a model for both optimal BP management and the use of the EHR and PCA.

Guiding Framework. Our project draws on the Chronic Care Model [34–38]. The Chronic Care Model posits that “productive interactions” between an “informed, activated patient” and a “prepared, proactive practice team” can occur by strengthening community resources and policies as well as the health system’s organization. In turn, functional and clinical outcomes are improved [34–38]. TEAM leverages the EHR to identify Veterans with uncontrolled BP. Data in the EHR and information from the PCA is also used for decision support in the form of care plans and decision aides that support productive interactions between a proactive clinical team and an activated Veteran. TEAM provides Veteran self-management support through education, reminders, monitoring, and follow-up.

3. Methods

To enhance our understanding of the process of implementing TEAM, we will evaluate implementation processes as well as patient-level outcomes in a one-arm, pre-post design. The process evaluation will examine the implementation of TEAM in three community-based outpatient clinics. Patient-level outcomes will include qualitative interviews and a retrospective examination of PACT measures, clinical outcomes, and CVD clinical referrals.

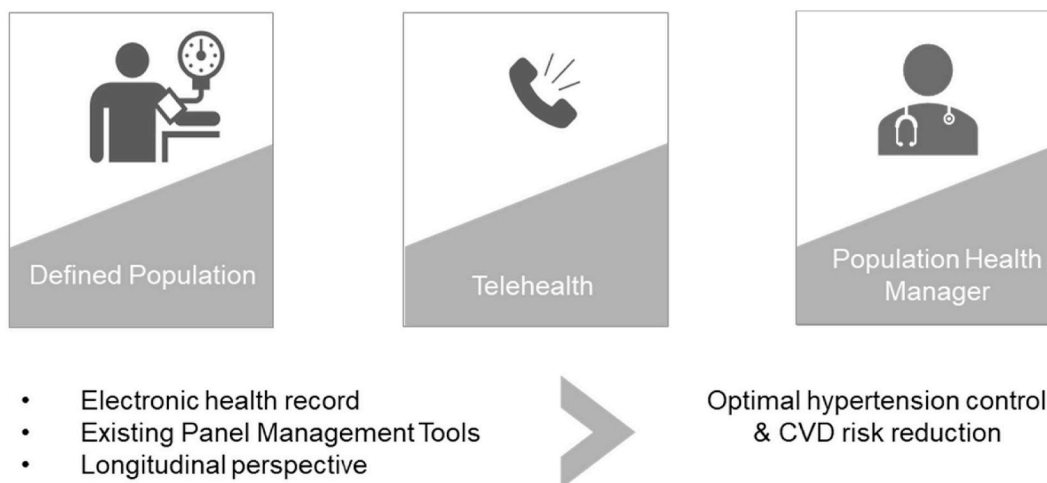


Fig. 1. Team-supported, Electronic Health Record (EHR)-leveraged, Active Management (TEAM) components. CVD, cardiovascular disease.

Project Setting. The project will be implemented at three rural, VHA community-based outpatient clinics in the southeastern United States. One site is in southeastern Tennessee and two sites are in western North Carolina. The main focus of each site is to provide primary care to Veterans. We selected sites due to each site's leadership expressing interest in participating in TEAM to improve BP control at their respective clinic.

Sample and eligibility. We will enroll up to 100 Veterans at each site, for a total of at least 300 Veterans. TEAM is offered to Veterans with uncontrolled BP (elevated 12-month systolic blood pressure [SBP] (>140 mm/Hg)). Veterans will be ineligible if they are: 1) receiving hospice or palliative care and/or diagnosed with stage 4 cancer; or 2) age ≥ 80 years, since the risk calculator is only available to individuals less than 80 years of age. All Veterans in PACT with poor SBP control will be eligible, and we will use a population-based approach to identify and enroll eligible Veterans. We view a population-based approach as being a low-intensity intervention that focuses on the needs of a group of patients, in this case Veterans in a specific area with CVD risk factors, as opposed to an intervention that targets specific Veterans. While we anticipate that Veterans will benefit, the overarching goal is to improve the health of the population as a whole. Veteran eligibility will be determined from existing VHA data sources that include diagnosis codes, medication data, vital sign data, and laboratory data.

Recruitment and enrollment. Veterans will be enrolled over 3 months; we will send letters to all eligible Veterans who receive care via PACT to inform the Veteran of a higher level of care that is available at their VHA clinic. The introductory letter will explain that with the assistance of the TEAM population health manager, the Veteran is receiving individualized health risk factor information prior to their clinic appointments to help guide the discussion between them and their providers at their next visit. The letter will also let the Veteran know that they may be contacted by VHA project staff seeking feedback regarding the Veteran's participation in the TEAM program. We will also include information in the letter if the Veteran does not want to participate in TEAM. For Veterans who decline to participate, we will obtain PACT measures, clinical outcomes, and referrals to other forms of care such as specialists and compare these Veterans who those who participated in TEAM. This study was reviewed by our local Institutional Review Board (IRB), which determined this to be a hybrid non-research clinical demonstration and research project. Specifically, as the interventional components of this project were deemed as non-research by IRB, this project is not registered into clinicaltrials.gov. However, Veterans and providers will provide consent to participate in the program evaluation. The IRB approved the qualitative interviews with Veterans, population health managers, and VA stakeholders at conclusion of TEAM.

Identification of a population health manager. A key component of TEAM is the use of a population health manager at each site. The population health manager will identify eligible Veterans for TEAM, interact with Veterans to discuss the Veteran's uncontrolled BP, connect the Veterans to VHA services or other assistance, and notify the Veteran's providers if any concerns arise. Qualifications for the population health manager include being a registered nurse at the clinic who is familiar with VHA policies and procedures. At all sites, TEAM will provide funds for the population health manager to engage in the project.

Development of a patient decision tool. Veterans will be provided with a Heart Health Handout prior to their scheduled visit with the population health manager. The Heart Health Handout is unique as it will: (1) use data from the EHR to identify Veterans with uncontrolled BP; (2) determine which preventive interventions may be most applicable for the Veteran; (3) calculate and prioritize, on a personalized basis, the likely impact each preventive intervention would have on the Veteran's BP; and (4) display the results in a graphical format that enables the population health manager, Veteran, and Veteran's providers to explore the impact of different combinations of risk factor reduction to engage in as a means of lowering BP [39]. The Heart Health Handout (Fig. 2) provides detailed information and treatment options, presents options in a 6th grade reading level, and facilitates communication between the Veteran and providers [40,41]. The Heart Health Handout is designed to activate the Veteran to participate in discussions with their providers as well as engage in self-management activities.

Development of a care plan that incorporates Veteran preference. TEAM organizes Veteran information into a clinical report that guides providers, allows the Veteran to control key decisions about the BP Care Plan, and supports rapid clinician documentation and execution of orders. The population health manager will generate a clinical report within 24 h of Veteran contact in order to assist the Veteran's providers in developing a BP Care Plan. The Veteran's providers will be able to accept the BP Care Plan as written or add an addendum if desired. Providers will also have the option of noting alterations to the BP Care Plan in the provider's note from the Veteran's clinic visit. The Veteran's PACT can enact the suggested BP Care Plan directly through placing orders in the Veteran's chart or by using a clinical reminder that will be designed to include potential recommended treatment options. After reviewing the Veteran's EHR, a PACT member will document the discussion of the care plan with the Veteran. At this time, the PACT member will be able to order medications or behavioral interventions using templated EHR chart notes and order sets.



Utilization of current VHA resources to develop care plans. The VHA's EHR supports care plan development and implementation. TEAM uses EHR-generated data: (1) secure messaging reminders for medication

Heart Health Report: Blood Pressure

Individual Blood Pressure Report for

The VA Healthcare center cares about your health. You have been selected to receive this letter because your blood pressure at your last few appointments has been high. This report explains your current blood pressure and what you can do to improve it. People with high blood pressure have a higher risk of developing heart disease and strokes than people whose blood pressure is not high.

Your average BP over the last 6 months was XXX / XX Diabetic Yes or No

<p style="margin: 0;">Systolic Blood Pressure</p> 	<p style="margin: 0;">Diastolic Blood Pressure</p> 	<p>Blood Pressure control : Age 18–59 with or without Diabetes Red $\geq 150/90$ (Not at goal – high) Yellow $>140 - <150$ (Not at goal-medium) Green $<140/90$ (At goal)</p>
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What do the numbers mean?

- High numbers mean you are at a greater risk of problems from your blood pressure.
- ✓ Blood pressure is measured by 2 numbers,
- ✓ Top number (Systolic) – is the pressure in your blood vessels when your heart is beating.
- ✓ Bottom number (Diastolic) – is the pressure in your blood vessels in-between heart beats.

Either of these numbers can be high, or both can be high

- ✓ If the top (systolic) number is high it causes vessels to stiffen and that can lead to heart disease, stroke, and damage to your kidneys or other organs.
- ✓ If the bottom (diastolic) number is high it can cause overstretched, weakened sections in the body's main artery.

Usually, you cannot tell if your blood pressure is too high. So, it is important to check it frequently and make sure it is staying in a safe range.

Blood pressure self-monitoring and taking your blood pressure medications are two of the most important things you can do to manage you blood pressure.


<p style="margin: 0;">Most Recent Blood Pressure</p> <p style="margin: 0; text-align: center;">XXX / XX</p> 	<p style="margin: 0;">Last 3 Outpatient BPs for the previous 6 months.</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th style="padding: 2px;">Date</th> <th style="padding: 2px;">Systolic</th> <th style="padding: 2px;">Diastolic</th> </tr> </thead> <tbody> <tr> <td style="padding: 2px;">Visit 1</td> <td style="padding: 2px;">XXX</td> <td style="padding: 2px;">XX</td> </tr> <tr> <td style="padding: 2px;">Visit 2</td> <td style="padding: 2px;">XXX</td> <td style="padding: 2px;">XX</td> </tr> <tr> <td style="padding: 2px;">Visit 3</td> <td style="padding: 2px;">XXX</td> <td style="padding: 2px;">XX</td> </tr> </tbody> </table>	Date	Systolic	Diastolic	Visit 1	XXX	XX	Visit 2	XXX	XX	Visit 3	XXX	XX
Date	Systolic	Diastolic											
Visit 1	XXX	XX											
Visit 2	XXX	XX											
Visit 3	XXX	XX											

Fig. 2. Heart health Handout.

refills and laboratory tests; and (2) quarterly risk factor progress reports sent to Veterans (via postal mail or secure messaging) and PACTs as a function of data from the PCA. Additionally, EHR supports self-management activities (e.g. home BP monitoring, pharmacy refill reminders, medication refills), as well as facilitating communication between Veteran and PACT members working collaboratively to execute the BP Care Plan.

4. Team project activities

TEAM consists of five steps (Fig. 3) and will be implemented as part of usual care in designated clinics over a period of 12 months (Table 1). Clinical issues outside the scope of this project raised by the Veterans will be addressed by the clinical staff at the facilities as part of usual care. Veterans and clinical staff will be selected to participate in qualitative interviews regarding the implementation of the program at the conclusion of the project.

What can I do to lower my risk of heart disease and stroke?

Action	Recommendations	
Take your medication as prescribed	There are many medicines to treat blood pressure. Talk to your doctor, nurse or pharmacist about what might be right for you.	
Know your numbers	Use a home blood pressure monitor to keep track of what is happening with your blood pressure and blood glucose. Take these values with you to your primary care visits to discuss with your health care provider. Understanding your numbers allows you to take control of your health.	
Stop Tobacco Use	Stopping smoking is one of the most important things you can do to lower your chances of heart disease or stroke. There are lots of ways to help you stop smoking including support groups and medications. If you smoke, ask your doctor, nurse or pharmacist for more information.	
Get your body moving	Try to build in 40 minutes of moderate exercise 3-4 days a week. This could include things like walking, jogging, swimming or yard work. If you don't think you'll make it for 40 minutes, set a reachable goal for today and increase your time as you get stronger.	
Eat a heart healthy diet	Try to eat a healthier diet. Cut down on the amount of salt you eat. Eat fresh or frozen fruits, vegetables, whole grains, low-fat dairy products, poultry, fish and nuts. Limit red meats, sugary foods, and sweet beverages.	
Achieve a healthy weight	List what you will need to prepare for losing weight (i.e, foods or menus for healthy meals or allowing extra time to pack a healthy lunch). Get motivated – set a date to start and stick to it. Talk with your doctor about a healthy weight is for you. Set realistic goals – be specific and practical and discuss them with your doctor. Remember, losing even 10 pounds can be beneficial to your health. Think about the benefits of losing weight and remember you are doing this for your future health!	
Planning your Next Steps:		
<ol style="list-style-type: none"> 1. Expect a call from the population health manager to review the information in this document. 2. Bring your home blood pressure values to your next primary care provider office visit. 3. Bring this letter to your next primary care provider visit to select goals for each item. 		
Action	Goal	Steps to help achieve plan
Take medications		
Know your numbers		
Move more		
Stop Tobacco Use		
Eat a heart healthy diet		
Achieve a healthy weight		

Fig. 2. (continued).

STEP 1. Identify Veterans with uncontrolled BP. The population health manager will assess Veterans' risk factors using EHR and BP algorithms. Cutoffs for uncontrolled BP will be based upon VHA clinical practice guidelines [42,43]. The population health manager will develop a Heart Health Handout based upon methods of effective communication and drawing on expertise in health literacy and numeracy. This tailored Heart Health Handout will also communicate the Veteran's uncontrolled

BP (Fig. 2). The population health manager will save a copy of this handout in the Veteran's EHR record with a provider of the PACT listed as additional signer.

STEP 2. Activate Veterans regarding their uncontrolled BP status. The population health manager will send the Heart Health Handout to the Veteran. Within 2 days the population health manager will contact the

Self monitoring Form for Blood Pressure

Please record your blood pressure on the form below each week (Sunday –Saturday) for the next 2 weeks. List the reading of the day in the area labeled for that day. Make sure to include the date and time of the reading. Please have the completed the form available when you speak to the population health manager.

Example of how to record blood pressure (BP) readings					
1 st Week		Date	Time	BP	Pulse
	Monday- BP reading	2/13/2009	9:00 AM	140/75	65

1 st Week		Date	Time	Blood Pressure	Pulse
	Sunday - BP reading				
	Monday - BP reading				
	Tuesday - BP reading				
	Wednesday – BP reading				
	Thursday - BP reading				
	Friday - BP reading				
	Saturday - BP reading				

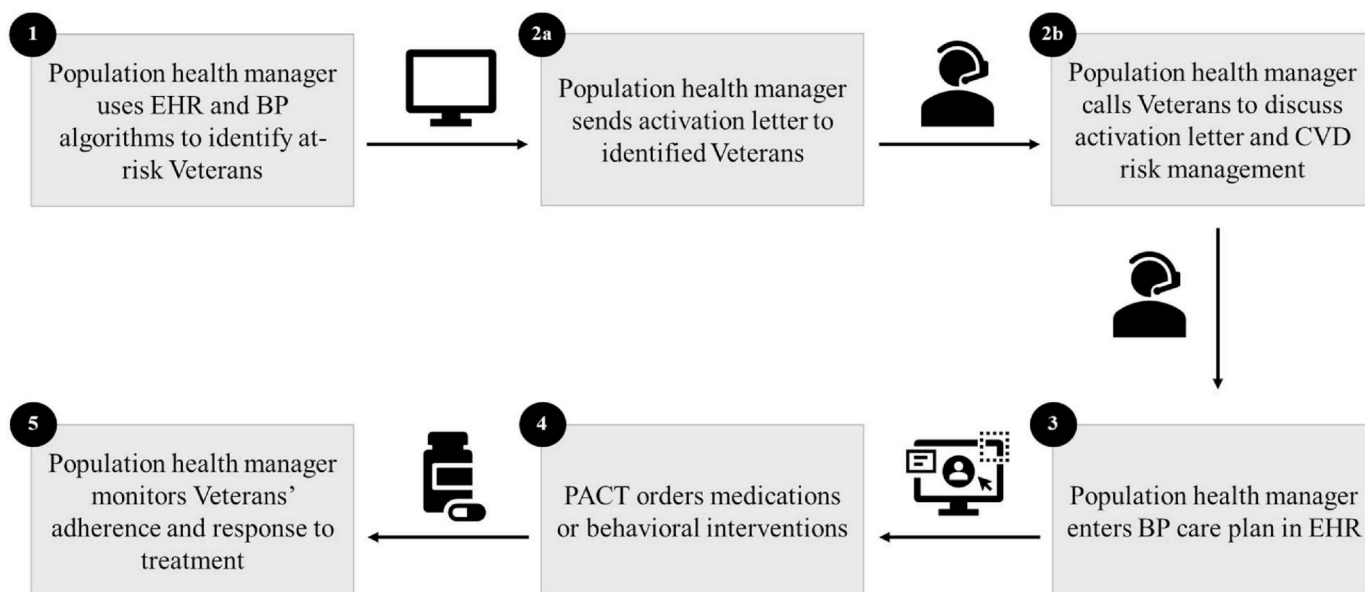
2 nd Week		Date	Time	Blood Pressure	Pulse
	Sunday - BP reading				
	Monday - BP reading				
	Tuesday - BP reading				
	Wednesday – BP reading				
	Thursday - BP reading				
	Friday - BP reading				
	Saturday - BP reading				

Fig. 2. (continued).

Veteran to discuss the program, inform them of the Heart Health Handout and encourage them to self-monitored their BP for the next week. Two weeks after the Heart Health Handout is sent, the population health manager will contact the Veteran again by telephone to review both the Heart Health Handout and information on BP control. If possible, the population health manager will convert the telephone call to a video call to review BP self-management techniques and monitor BP

collection for entry into the EHR. Video calls will be completed using the VHA’s Video Connect, which is a VHA-only service that enables synchronous, video connections between a Veteran and provider over a secure connection.

STEP 3. Provider reports and care plans. The population health manager will place a BP Care Plan note into the Veteran’s EHR record which will



Abbreviations: BP, blood pressure; EHR, electronic health record; PACT, patient aligned care team

Fig. 3. Flow of activities in TEAM.

Table 1
Study timeline.

Activity	Q1	Q2	Q3	Q4
Milestones				
Stakeholder engagement at 3 sites				
Refine clinical notes & complete programming				
Recruit & train population health managers				
Introduce the role & function of the population health managers to PACTs & sites				
Recruit & enroll eligible Veterans				
Conduct TEAM activities at sites				
Data Collection and Reports				
Systolic blood pressure measurements				
Risk-factor assessment ^a				
Veteran qualitative interviews				
Provider and staff qualitative interviews				
Observe and document barriers and facilitators				
Present quantitative and qualitative findings to clinic stakeholders				
Final Report to funding agency				

Abbreviations: PACT, patient aligned care team; TEAM, Team-supported, EHR-leveraged, Active Management.

^a Risk factors include receipt of statins and Atherosclerotic Cardiovascular Disease (ASCVD) score.

be available for the Veteran’s PACT team to review. The population health manager’s BP Care Plan note will include: (1) the Veteran’s uncontrolled BP profile identified using the algorithm; (2) Veteran data necessary for therapeutic decision-making (e.g., distance from Veteran identified self-management goal, current therapies, labs, medications, allergies); (3) a summary of treatment option recommendations and current guidelines discussed during the population health manager call; (4) provide input if needed or if there are any questions for the Veteran’s providers; and (5) links to templated EHR chart notes and orders completed during the population health manager call. The Veteran’s providers can document any treatment changes either as an addendum to the population health manager’s BP Care Plan note, or in the provider’s regular clinic visit note.

STEPS 4. & 5. Care Plan Implementation and Longitudinal Care. The

population health manager will follow each Veteran for six months and BP Care Plan implementation begins when the providers order medications or behavioral interventions. Safety, therapy and medication adherence, and Veteran response to treatments will be monitored by the population health manager and Veteran’s PACT. The population health manager will work with the PACT to continue to monitor the Veteran’s progress and support the Veteran’s PACT in working to decrease the Veteran’s uncontrolled BP. For instance, the population health manager will alert the PACT that treatment intensification may be necessary if adherent Veterans, as identified by the Veteran confirming they are taking their medication and/or there is indication of medication refill, do not reach pre-stated goals. If a Veteran is non-adherent despite reminders, the population health manager will contact the Veteran to explore reasons for non-adherence and consider referral for additional support services. The population health manager will also alert the PACT if an alteration in treatment regimen is necessary due to the onset of side effects.

5. Outcomes

We will examine TEAM using both quantitative and qualitative methods (Table 2). The primary outcome for TEAM is 6-month SBP. We will obtain this outcome from the EHR and use the Veteran’s SBP measurements taken at regular outpatient visits and/or virtual BP visits over a 20-month period (ie, 12-months prior to enrollment in TEAM through 8-months post-enrollment in TEAM). We selected SBP because there are clear clinical outcomes related to changes in SBP. Additionally, discussions with clinical stakeholders indicated that SBP as a primary outcome was best due to the focus on current Healthcare Effectiveness Data and Information Set measures in clinic sites. We will assess pre-intervention SBP using data available within 1-year prior to the start of the study.

6. Quantitative analysis plan

Change in 6-month SBP. The primary study outcome, SBP, will be ascertained through EHR clinic data pulls. We will retrospectively examine SBP prior to the initiation of the program and at 6 months after

Table 2
Outcomes and measures.

Characteristic	Source
Outcomes	
Change in 6-month SBP	EHR
Penetration (number of eligible Veterans, enrolled Veterans, and Veterans retained)	Internal tracking of enrollment by project coordinator
Feasibility and acceptability	Qualitative interviews with Veterans, population health managers, and VA stakeholders at conclusion of TEAM; field notes written throughout the 12-month implementation
Measures	
Patient demographics (e.g., age, race, gender, rurality)	EHR
Clinical characteristics (e.g., SBP, body mass index, ASCVD score)	EHR
Lifestyle factors (e.g., tobacco use)	EHR

Abbreviations: ASCVD, Atherosclerotic cardiovascular disease; EHR, electronic health record; SBP, systolic blood pressure; TEAM, Team-supported, EHR-leveraged, Active Management.

Veterans receive the TEAM activation letter. First, we will calculate descriptive statistics to describe the characteristics of all Veterans who participated in TEAM. To discern general trends in SBP over time, we will create plots of the observed values of SBP versus time. For example, most Veterans may exhibit a steady improvement in SBP over the study period; or most Veterans may show initial improvement which is then sustained for the remainder of the study period. We will rely on SBP measurements taken at the Veteran's outpatient or virtual visits; therefore, the actual number and timing of SBP measurements available will vary between Veterans. Linear mixed-effects models will be used to estimate average trends in SBP over time. We will include the following fixed effects in these models: (1) time, coded continuously as the number of days from baseline; and (2) clinic site [44,45]. The best fitting functional form of time (e.g., linear, quadratic, cubic, etc.) will be assessed via Akaike Information Criteria, and a change in slopes will be included to allow for differing trends prior to, and following, enrollment in TEAM. The models will also include patient-level random effects for intercept. Patient-level random effects for linear time and the correlation between intercept and slope will be included if model selection suggests improved fit. Sensitivity analyses will examine the impact of Veterans with higher values being measured more frequently during their regular clinical care (ie, outcome-dependent follow-up).

Penetration of TEAM. We will use internal tracking data (e.g., notes on enrollment and services used as collected by the project coordinator) to describe the penetration [46] (e.g., number of eligible Veterans, number of enrolled Veterans, and number of Veterans retained, number of referrals attempted/completed, number of calls attempted/completed, staff effort and time) of TEAM across sites. We will count the number of attempted and completed referrals to clinic-based supportive services (i.e., pharmacy program, home telehealth, weight loss and nutrition, mental health) to fully describe the implementation of TEAM in the clinic.

7. Qualitative analysis plan

We will assess feasibility and acceptability using qualitative interview and field note data [47]. First, we will conduct semi-structured interviews via telephone with Veterans to understand Veteran satisfaction with TEAM and how the TEAM approach could be more helpful to them in understanding and acting upon their uncontrolled BP. Second, the project coordinators will use a field note template to document each sites facilitators and barriers to implementing TEAM over 12 months. Third, we will interview clinic staff involved in TEAM to identify facilitators and barriers to implementing TEAM. For staff, interview

questions, informed by the guiding framework, will elicit strategies used to implement TEAM, thoughts on strategies to sustain the project, satisfaction with TEAM approach, and barriers and facilitators to the program. Fourth, we will present results to clinic stakeholders and develop strategies to sustain the implementation of TEAM in their clinic based on the information gathered through both the qualitative and quantitative analysis. Across all of these groups, we will use deviant case analysis (instances in data which contradict emerging hypotheses) to assess robustness and rigor of findings.

All Veteran and staff telephone-based interviews will be audio recorded and transcribed by research staff. Names and other identifying information will be redacted. An initial coding scheme will be generated based on the Chronic Care Model [34], [-37] existing knowledge about barriers to health behaviors in general from the literature, and our research expertise. The coding scheme will be reviewed by all co-investigators until it is agreed upon by mutual consensus. While applying these initial codes to the data, the co-investigators will identify emergent themes that reflect barriers discussed by respondents and not captured by the initial coding scheme. These emergent codes will also be refined by a systematic process of consensus among the investigative team. We will use NVivo (QSR International Pty Ltd, Version 12, 2018), a qualitative data analysis software program that supports data analysis.

8. Discussion

This manuscript describes our process in expanding the implementation of a successful project to improve uncontrolled BP in high-risk, rural Veterans. During the first year at a single rural site, our project showed promise in decreasing CVD risk among rural Veterans [28]. Our project will expand to three rural sites to further refine how quality improvement projects are implemented into community-based, rural healthcare clinics. Not only will we examine health outcomes, but we will also obtain information on the process of implementing TEAM by interviewing Veterans and providers. Describing the challenges faced while implementing a quality improvement project is an important step in integrating and sustaining successful programs into rural, VHA clinics. By using data routinely collected by the VHA, our findings can help further identify and determine which Veterans may benefit the most from enrolling in a low-touch population health management program. Thus, identifying Veteran characteristics and implementation factors will assist in further refining and determining the right population and right clinic setting for the TEAM intervention.

Appropriate management of uncontrolled BP can reduce morbidity and mortality related to CVD among Veterans. In addition, improvements in BP control, can lead to improved quality metrics and potentially decrease costs for a healthcare system. As the incidence of uncontrolled BP rises among rural Veterans, there is a growing need to develop and integrate cost-effective programs in healthcare systems caring for this population. In this protocol, we describe a low resource intervention that can be scaled for widespread use. Notably, we developed our project so that it can be completed using resources available within the rural clinic and the healthcare system. The population health manager, a central component of TEAM, is a nurse who is already embedded within the clinic and is familiar with the workings of the healthcare system. This multi-pronged approach enables the population health manager to support Veterans in improving their BP control.

As an integrated healthcare system, the VHA is an ideal position to lead population health efforts as the VHA is committed to caring for Veterans over their lifespan. Investing in prevention and improving BP control aligns with the VHA's focus on promoting long-term function and high quality of life in Veterans. First, the VHA has a range of in-house providers, programs, and opportunities available to help Veterans make behavior change, obtain medication, and obtain consults to address self-management challenges. Second, the VHA has an established nationwide telehealth system which can be used by the population health manager to engage with Veterans enrolled in TEAM. Third,

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