Blood Pressure Control—Implementing a Team Approach

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Abstract

There are many types of quality improvement strategies that can be used to improve blood pressure (BP) control. Team-based care models have achieved much higher rates of BP control than other strategies. Team-based care interventions have been shown to lead to improved 24-hour BP control and is sustained when specific interventions are discontinued. In some cases, collaborative care is effective because there is greater opportunity to focus on behavioral approaches to improve patient self-efficacy and resulting medication adherence. In many cases, however, high BP control rates are achieved because of reduced clinical inertia and much more attention to frequent medication titration. In order to deliver team-based care for hypertension, the entire healthcare delivery system may need to be restructured to focus on chronic care rather than on acute, episodic care. The team can implement strategies to ensure adherence to office visits through reminders and telephone calls for missed appointments. Because healthcare teams can substantially improve outcomes, pay for performance and other approaches will make such approaches much more attractive to providers and health systems. Physicians and health system administrators should determine how they can incorporate team-based care for patients with hypertension.

Keywords

Hypertension, blood pressure, team-care, collaborative management, home blood pressure monitoring, medication adherence, clinical inertia

A 2011 report from the American Heart Association states that “On the basis of 2007 mortality rate data, more than 2,200 Americans die of CVD every day, an average of 1 death every 39 seconds.” The economic cost of cardiovascular disease (CVD) in the US was nearly $286 billion in 2007, which is 15% of total healthcare expenditure.

There are 13 million people living with a diagnosis of CVD.2 Stroke is the third leading cause of death and someone died every four minutes from stroke in 2007.3 One estimate is that the projected cost of stroke from 2005 to 2020 will be well over a trillion dollars.4 There were 1.1 million hospitalizations for heart failure in 2007 at a projected cost of $10.5 billion.

Uncontrolled hypertension is one of the major causes of all of these CVD events. The Centers for Disease Control and Prevention estimated that blood pressure (BP) was controlled in 46% of the US population with hypertension.5 There are many causes of poor BP control but poor patient adherence and failure to intensify therapy (clinical inertia) are two of the major reasons. This article will review team-based care strategies to improve BP control and will focus on more recent controlled trials and systematic reviews.

Meta-analyses and Systematic Reviews

The Patient-centered Medical Home (PCMH) is a system of care that has received a great deal of attention lately even though the concept is not new.6–14 Some of the key components of the PCMH include system changes in healthcare delivery, self-management support, clinical information systems, delivery system redesign, decision support, healthcare organization, and community resources.15–18 A major change in healthcare organization or delivery includes involving pharmacists or nurses as members of the healthcare team.19–22 A meta-analysis identified 298 clinical trials in the US that evaluated pharmacist-provided direct patient care for various chronic conditions, and found significant improvements in glycated hemoglobin (HgA1c), low density lipoprotein cholesterol, BP, adverse drug events, medication adherence, quality of life, and patient knowledge (p < 0.05).23 Another meta-analysis evaluated 37 controlled clinical trials that involved either pharmacist or nurse case management in hypertension and found such strategies were the most effective quality improvement approaches to achieve BP control.24 A meta-analysis of team-based care evaluated the potency of either nurse- or pharmacist-assisted management of hypertension.25 This
Some of these studies involved nurses in work-based sites, and studies involving nurses have included bachelor’s-trained nurses and nurse practitioners.19,20 Studies involving nurses or pharmacists as members of the care team can significantly improve BP control. However, many of the previous studies were small, single-site studies that were not intention-to-treat and did not control for critical covariates that can influence BP control. Several of these trials are designed.26

Recent Study Examples of Team-based Care for Hypertension

Studies over the last 40 years have consistently found that involving nurses or pharmacists as members of the care team can significantly improve BP control. However, many of the previous studies were small, single-site studies that were not intention-to-treat and did not control for critical covariates that can influence BP control. Several recent publications from federally funded and rigorously reviewed clinical trials have recently been published and will be discussed.

Green et al. evaluated 778 participants with uncontrolled essential hypertension and Internet access.27 Subjects were randomly assigned to usual care, home BP monitoring and secure patient website training only, or home BP monitoring and website training plus pharmacist care management delivered through web communications. There was no significant difference in patients who achieved the goal BP ≤140/90 mmHg when assigned to home BP monitoring and web training or usual care (36 % versus 31 %, p=0.21). Adding web-based pharmacist care to home BP monitoring and web training significantly increased the percentage of subjects who achieved the goal BP (56 %) compared with usual care (p<0.001) or to home BP monitoring and web training only (p<0.001).

Bosworth et al. randomly assigned 636 hypertensive patients to usual care, a behavioral intervention delivered by nurses over the telephone, home BP monitoring three-times weekly, or a behavioral intervention plus home monitoring.30 At 24 months and relative to usual care, the systolic BP (SBP) was 0.6 mmHg higher (95 % CI -2.2 to 3.4 mmHg) in the behavioral intervention, 0.6 mmHg lower (95 % CI -3.6 to 2.3 mmHg) in the home BP monitoring group, and 3.9 mmHg lower (95 % CI -6.9 to -0.9) in the home monitoring plus behavioral group. The only arm with a statistically significant difference to usual care was the combined intervention group. Two limitations of this study were that BP was controlled in 73 % of subjects at baseline and 25 % of subjects were missing for the 24-month BP measurement. Both of these issues make it harder to detect a difference between groups and may partially explain the smaller differences in BP than in other studies. An economic analysis of this intervention was conducted and found no difference between the four arms in inpatient and outpatient costs.31 The costs were estimated to be $90 for home BP monitoring, $345 for the behavioral intervention, and $416 for the combined intervention.

One of the potential biases of previous studies is that a given physician might have had a patient in both the control and intervention groups. While such a condition would tend to bias towards the null hypothesis, a more rigorous design is to include multiple clinics or medical offices and to randomize by clinic. Such studies are labeled cluster-randomized trials and special statistical considerations must be established when these trials are designed.28

A cluster-randomized trial enrolled 402 patients and was conducted in six family medicine offices in Iowa that all had clinical pharmacists on staff.29 Clinical pharmacists who were faculty members in these offices made drug therapy recommendations to physicians in this six-month intervention. Research nurses performed BP measurements and 24-hour BP monitoring. The intervention lasted for six months, which is short, and it is generally difficult to achieve high BP control rates this quickly. Mean BP decreased by 6.8/4.5 mmHg in the control group and 20.7/9.7 mmHg in the intervention groups, respectively (p<0.05 for between-group SBP comparison). The adjusted difference in SBP was -12.0 (95 % CI -24.0 to 0.0) mmHg. BP was controlled in 64 % of patients in the intervention group compared with 30 % in the control group (p=0.001). The results of this study and one other trial27 were combined to perform a cost-effectiveness analysis in 496 patients, 244 in the control group and 252 in the intervention group.32 Relative to usual care, the physician–pharmacist collaboration intervention cost an average of $250 more per patient, resulting in $1,009 per additional patient with BP control, and $27 per 1 mmHg reduction in SBP over six months. While this cost may appear high, the authors concluded that the intervention...
is cost-effective when considering the potential for reduced myocardial infarctions, strokes, heart failure, and other complications.

**Can the Effects of Team-based Care be Sustained?**

There is very little information on whether the effects of team-based care can be sustained for long periods of time. Most studies are relatively short (4–9 months) but a few have lasted for 12–24 months.18,24

There is also very little information on what happens when a team-based care intervention for hypertension is discontinued. In fact, to my knowledge there was only one study that was a randomized controlled trial with a parallel control group that examined discontinuation prospectively; it was published in *Circulation* in 1973.29 This study randomized 50 patients to traditional pharmacy services or an intervention group, both encountered in a community pharmacy. The pharmacist evaluated patients in the intervention group to assess BP control, poor medication adherence, or adverse events. Uniquely, the pharmacist worked closely with two physicians in an urban health center, visited the physicians' office to review medical records, and made recommendations for changes in therapy. BP and medication adherence was measured at baseline, after the five-month intervention or control period, and then after the intervention was discontinued. BP, as measured in the physicians' office, increased in the control group (163/93 versus 166/101 mmHg) but was lowered in the intervention group (157/99 versus 146/90 mmHg).30 The difference between the two groups was significant (p<0.001). There were also significant improvements in medication adherence and patient knowledge of hypertension in the intervention but not in the control group. Once the intervention was discontinued, BP was improved over baseline but BP and adherence deteriorated more in the control group compared with the intervention group.

One cluster-randomized trial performed a nine-month intervention by pharmacists within family medicine offices.27 All patients had uncontrolled BP at baseline and BP was measured in a structured manner by research nurses at two-month intervals. This study found that BP was controlled in 89 % of patients in the intervention group compared with 54 % of the control group. Once the study was completed, a retrospective chart review evaluated BP for another 18 months (27 months total from baseline of initiation of the intervention).30 BP deteriorated in both groups after the prospective study was discontinued but the difference between the two groups remained significant at 27 months, where BP control was 55 % and 36 % in the intervention and control groups, respectively (p<0.05).

A similar retrospective chart review was conducted following the six-month study of a pharmacist intervention noted above.23 In this analysis, BP control continued to improve modestly in the intervention group, from 64 % at the end of the intervention to 67 % 18 months after discontinuation. BP control also improved in the control group from 30 % at the end of the study to 36 % 10 months later. The difference at 18 months after discontinuation between the intervention and control groups was statistically significant (p<0.0001).31

**Studies that Included 24-hour Blood Pressure Monitoring**

Studies have found that it is important to control BP for the entire 24 hours in order to achieve optimal reductions in cardiovascular events.32 Only two studies have evaluated 24-hour BP monitoring to confirm the office pressures and determine the circadian pattern of the intervention.23,27 While the mean 24-hour BP was characteristically lower than office pressures, when compared with the control group, these were reduced to an almost identical degree as with clinical pressures.

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*Figure 1: Model for Team-based Care*

Adapted from Carter, 2007.20
measured by the research nurses. One of these studies provided a more in-depth evaluation of the patterns of 24-hour control. The pharmacist collaborative intervention was found to reduce daytime SBP more than was achieved in the control group, by 15.2 (standard deviation [SD] 11.5) versus 5.5 (SD 13.5) mmHg (p<0.001); night-time SBP, by 12.2 (SD 14.8) versus 3.4 (SD 13.3) mmHg (p=0.001); and 24-hour DeltaSBP, by 14.1 (SD 11.3) versus 5.5 (SD 12.5) mmHg (p<0.001). Overall 24-hour ambulatory BP control was significantly greater in the intervention group than in the control group at the end of the study (75.0 % versus 50.7 %) (p<0.001). These findings suggest that the pharmacist may have been recommending antihypertensives with longer-acting properties. These results might also suggest that the pharmacist’s extensive knowledge of product formulations, pharmacokinetics, and pharmacodynamics may lead to selection of agents that control BP for the entire dosing interval.

**Why is Team-based Care Effective?**

In some populations, the major effect of the intervention is to improve patient self-efficacy and medication adherence. In the studies by Bosworth et al., a nurse provided behavioral-based counseling by telephone monthly for a year. This, and other studies including underserved minorities, demonstrate the expertise of nurses in providing the behavioral approaches needed for long-term disease state management.

Another study in 200 elderly patients conducted at Walter Reed Medical Center evaluated a pharmacist intervention along with unit-dose medication packaging. Mean medication adherence at baseline was 61.2 % and increased to 96.9 % (p<0.001) following the six-month intervention. There was also a significant reduction in SBP (133.2 [SD 14.9] to 129.9 [SD 16.0] mmHg; p=0.02). The intervention was then discontinued and patients were randomized to continued intervention or usual care. The persistence of medication adherence decreased to 69.1 % in patients assigned to usual care, but it was sustained at 95.5 % in the group that continued to receive pharmacy care (p=0.001). This was associated with significant reductions in SBP in the pharmacy intervention group (-6.9 mmHg; 95 % CI -10.7 to -3.1 mmHg) versus the usual care group (-1.0 mmHg; 95 % CI -5.9 to 3.9 mmHg; p=0.04).

While medication adherence is an important issue, many of the above studies have found that the most common reason for poor BP control is that medication regimens are not intensive enough. The most common changes made by the pharmacist, or recommended to the physician, were to add a thiazide diuretic, increase the dose of an existing antihypertensive, or add another agent to the regimen. These changes were made early and titrated frequently in order to achieve BP control within 6–9 months. These strategies are even more important for patients with diabetes or chronic kidney disease (CKD) in which the goal BP is lower and regimens frequently require three or four medications to achieve the goal.

Team-based interventions are usually multifactorial and are probably successful for different reasons. However, several key elements are probably critical. The first is that a member of the team is assigned the task of focusing on particular patients, in this case those with hypertension. This individual can usually dedicate more focused time to patient education, medication management, and follow-up than can be delivered by the busy primary care provider. Most importantly, patient follow-up is more frequent than is typical in primary care, especially during the medication titration period. Patients who fail to follow up are contacted and become re-engaged in the care process. All of these elements are important for improving chronic conditions (see Figure 1).

**Who Should Receive Team-based Care for Hypertension?**

Delivery of care to patients with chronic conditions will require high efficiency for several reasons. Firstly, there are so many patients with chronic conditions that providers need to determine which individuals will receive the greatest benefit from team-based care. Secondly, since team-based care may be more expensive than traditional care, it is not cost-effective to deliver these interventions to patients who will not receive significant improvement, in this case in BP reductions.

The best candidates for team-based care would be patients with uncontrolled BP or those with other cardiovascular comorbidities. These may include patients who have medication adherence problems or those requiring multiple medications. Good candidates for nurses might be patients who need extensive behavioral counseling and education about diet and nutrition (unless the provider has access to dieticians or nutritionists). Patients with complex medication regimens where there may be adverse effects and the potential for drug interactions would be good candidates for the pharmacist.

The PCMH will require population-based strategies to identify patients in the practice with uncontrolled BP but who are not making routine follow-ups. Clerical personnel or others can identify such individuals and help them with scheduling office visits and follow-up. Many patients who have well-controlled BP may still be at risk of future deterioration in BP control or medication adherence. Guidelines generally suggest follow-up every 3–6 months for patients with controlled BP. Such individuals would probably not be good candidates for pharmacist management. Rather, a nurse or other individual should be assigned to the patient as a case or care manager who can see the patient between physician visits, support medication adherence, and perform follow-up BP measurements. Depending on the case and the logistics of the medical office, the nurse may well make medication adjustments if BP control deteriorates. Alternatively, such patients might be referred to the pharmacist, especially if they have complex medication regimens.

**Implementing the Team Approach**

The Chronic Care Model (CCM) is a model for organizing the delivery of care within a health system and community. The CCM leads to an informed, activated patient who interacts with a prepared, proactive care team which may include pharmacists. Collaborative team-based care has been defined as:

- collaborative definition of problems;
- goal-setting, planning, and action plans;
- a continuum of self-management training and support services; and
- active and sustained follow-up.

Another important model in primary care is the PCMH. Four medical associations representing 333,000 physicians developed joint principles
Hypertension

on the Medical Home (March 5, 2007). Team care increases the opportunity to build patient-management and teaching strategies tailored to individual progress and receptivity. In the PCMH, the point of access to care is organized around the needs of the patient, built upon the relationship with the patient and his/her personal physician, where a team may form and re-form according to the needs of the patient. It is the need to form and re-form the team that requires coordination of care. This personal relationship helps overcome barriers to care often seen in vulnerable populations. The physician delegates responsibility to the nurse or pharmacist to provide the types of interventions described above. Frequent communication of goal-directed therapy allows the physician to address more acute problems and complications.

Because the volume of patients is so high, there needs to be a blend of face-to-face visits with team members, telephone visits, email, and web-based strategies. Newer technology such as Facebook or Twitter is being investigated and will probably be used much more widely in the near future.

Whether a nurse, pharmacist, or both are used to assist the physician will be determined by the size and structure of the medical office and the structure of the health system with which it resides. The above studies, however, do not help determine how to most efficiently use the various professionals required to optimize BP control in large populations.

Physicians may not have access to nursing staff with the time or expertise to perform chronic management. Job roles and descriptions will need to be redefined and other staff may need to perform more routine duties so that qualified nurses can assist with BP management. Large practices may have clinical pharmacists on staff, but they may not routinely perform BP management. Again, job roles and descriptions can be revised to provide the pharmacist with the authority to perform BP management. However, most private physician offices will not have access to clinical pharmacists on-site. Therefore, some physicians contract with innovative community pharmacists or consultants and develop collaborative practice agreements so that patients can be managed from a distance.

Research has found that one of the most important strategies for achieving high BP control rates is to have a goal-oriented approach to treating hypertension. Everyone in the medical office must understand and have 'buy-in' regarding their responsibility for achieving goal BP in each patient; this may require a complete change in the structure and process of delivering care. The clinic must move from an acute care model to a model for managing chronic conditions proactively to fully engage the patient. For example scheduling personnel must understand the requirement for timely follow-up and continuity with the hypertension management team. Processes to track patients, remind them of their upcoming office visits, and contact them when they do not show up for an appointment are key functions for office staff. Electronic medical records now allow patients to have access to schedule their own appointments, email providers, and receive web-based support, which improves BP control for some patients. Another way to effectively engage the patient in treatment decisions is to include home monitoring. After the nurse or other office staff member appropriately trains the patient in the use of the monitor, the physician might engage selected community pharmacies that provide more advanced services to help with monitoring BP, assessing BP control, and monitoring for adverse reactions or drug interactions. The pharmacist will be able to assist with more cost-effective medication regimens.

The physician should also see the patient at appropriate intervals to conduct periodic physical examinations and follow-up assessments for target organ damage. The physician should coordinate the care provided to the patient. If at any point new signs or symptoms develop, the physician should evaluate the patient.

Many patients with hypertension will have coexisting conditions, complications, or other drug therapy that may make treatment decisions more difficult. It may be helpful to collaborate with the clinical pharmacist for such patients. In this team-based model of care that we have investigated, the pharmacist performs a thorough assessment of medications and dosages, evaluating laboratory parameters, adverse reactions, drug-drug interactions, drug-disease interactions, and costs. Depending on the physician’s desires, the pharmacist may be delegated responsibility for making medication modifications or dosage adjustments to improve BP control and/or the control of other conditions such as diabetes mellitus or dyslipidemia. In other settings, the pharmacist makes specific recommendations for changes to the physician who can then make the medication adjustments. The nurse would continue to see the patient for follow-up visits but the pharmacist may also see the patient if BP control deteriorates or to assist with more complex medication modifications.

This team-based care model requires a great deal of communication. Accurate and complete medical record documentation is critical. In addition, providers should establish protocols, policies, and procedures for communication, triage, and referral back to the physician, so information transfers are coordinated and complete. Such policies and collaborative agreements are especially important if the physician is collaborating with external providers such as community pharmacists.

Summary

Team-based care models have achieved much higher rates of BP control than has care provided by individuals. Several managed care organizations have achieved very high BP control rates by using such models of care. To optimally provide care for patients with hypertension, the entire healthcare delivery system needs to be structured to focus on a chronic care model. Strategies must be implemented to ensure adherence to office visits through reminders and telephone calls for missed appointments. Physicians and health system administrators should determine how they can incorporate these concepts into the care of patients with chronic conditions, especially those with hypertension.

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Blood Pressure Control—Implementing a Team Approach

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