

The need for transformative innovation in hypertension management

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Despite multiple available effective therapies for hypertension, many patients with high blood pressure in the United States are not adequately controlled. This inability to effectively manage hypertension can be attributed to patient, provider, and system failures. To create an effective model for hypertension management, current care delivery systems must be reorganized around the following principles: improved patient engagement and patient-provider communication, increased use of nonphysician providers, better performance monitoring and feedback systems, and better aligned reimbursement models. Transformation of care around these principles would lead to marked improvements in cost, quality, and access to care. (*Am Heart J* 2011;162:405-11.)

Less than half of hypertensive patients in America have their blood pressure treated to guideline-recommended target goals.¹ This low control rate can be attributed to several factors including a failure to successfully engage patients in their health management, clinical inertia among physicians, and misaligned incentives for disease management. Further challenges in hypertension control can be traced to inefficiencies in the traditional physician-patient interaction that relies solely on care delivery based in the physician's office. To truly change the treatment paradigm for blood pressure control, we believe that the current fragmented clinic model must be simultaneously reorganized around 4 critical principles: (1) improving patient engagement and patient-provider communication, (2) increasing the use of nonphysician providers, (3) better provider performance monitoring and feedback systems, and (4) better aligned health care reimbursement models. Although each of these factors has been independently shown in small studies or pilots to improve blood pressure control,^{2,9} they have not gained sustainable traction because they have not been simultaneously combined into a new care paradigm.

In this article, we will first examine the traditional care model for hypertension and highlight how incomplete information, communication, and other patient, provider, and system barriers impede blood pressure control. We

will then provide a framework for a hypertension care model that optimizes patient empowerment, patient-provider communication, and improved access to care. We will end with a discussion of the policy changes needed to promote adoption of our model and suggest a framework that aligns the critical elements for sustainability and success.

Failure of the current care model

Hypertension currently affects 1 of 6 Americans, costing approximately \$45.7 billion annually. Control of blood pressure among hypertensive patients has been demonstrated to decrease the lifetime risk of myocardial infarction, stroke, and all-cause mortality.^{10,11} Despite the fact that up to 90% of patients' blood pressures can be controlled if prescribed adequate pharmacotherapy, only half of patients have their blood pressure treated to target levels.^{1,10} This wide gap has propelled initiatives such as the Healthy People 2010 campaign to target blood pressure reduction as a national priority for reducing cardiovascular disease morbidity and mortality.^{12,13}

The widespread failure to control hypertension may be attributed to multiple and interrelated patient, provider, and system failures. For patients, hypertension is a silent disease with few to no symptoms until the onset of long-term complications. As a result, patients are less likely to closely monitor their blood pressure or seek ongoing follow-up with their medical teams.¹⁴ Patients also fail to engage in the management of their disease—defined as the day-to-day decisions regarding lifestyle and medication adherence to support better risk factor control.¹⁵ This failure to engage in monitoring and adhere to treatments detracts from the potential health improvements associated with evidence-based medicine.⁸

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For providers, failure to control blood pressure to guideline-based goals may be related to clinical inertia—the “recognition of a problem, but failure to act.”¹⁶ Several related factors contribute to the prevalence of clinical inertia in hypertension management among providers. First, blood pressure readings from various patient encounters are often not aggregated and communicated to the provider in a format that facilitates rapid assessment of a patient's blood pressure trajectory or efficient medical intervention.¹⁷ Within the current system, a single hypertensive event, possibly produced by “patient rushing” to clinic or a missed medication, may be discounted as an unusual event if it is presented to a provider without trended data or the patient's current medical therapy. Alternatively, providers may not advance therapy based on the assumption that another provider has already “taken charge” of treating a patient's hypertension, representing a treatment deficit stemming from a lack of information or communication.

Current ambulatory blood pressure care is rooted in having patients visit a hospital or clinic to see a provider, complete a blood pressure check, and receive treatment. After patients leave the point of care, they rarely interact with their provider until the next appointment, which creates lags in blood pressure management. Even when measured in the office, most blood pressure values are “hidden” in a series of paper charts, electronic records with unstructured data fields or text, or in systems that do not facilitate interpractice data exchange. Likewise, inefficient and static documentation of the patient's current medical problems, medications, and allergies limits the provider's ability to quickly and effectively react to a single abnormal blood pressure value in the ambulatory care setting. Furthermore, time constraints on the modern primary care practice place large burdens on achieving multiple health objectives in a single visit. For example, in one routine office visit, a primary care physician must address as many as 20 preventative screening services, as recommended by the US Preventive Services Task Force,^{18,19} in addition to providing chronic disease management and acute symptom or disease assessment. Because of these constraints, the primary care office has become a broken system of care delivery because of imperfect information exchange and time pressures precipitated by misaligned incentive structures (discussed in detail below).

Financial factors also affect blood pressure control rates. Office-based visits often require patients to pay significant co-payments; lose time and productivity at work; and incur transportation costs, day care expenses, and other indirect costs.²⁰ Therefore, frequent office visits for blood pressure measurements are both economically and practically unattractive and force patients and providers into a model that relies on sporadic blood pressure data for clinical decision making. Furthermore, the current reimbursement model for office-based care is

not efficient or productive for providers. Our payment structure reimburses physicians per visit rather than other metrics. Because of this, highly trained clinicians are incentivized to maximize the number of patients seen in the clinic regardless of their performance in managing a patient's chronic or acute condition.²⁰

Related to clinical performance, the lack of feedback and outcomes data to providers for patients in their care limits progress on improving blood pressure control. In other patient care settings, provider performance assessment and benchmarking have become standard for many conditions²¹ and in some cases are coupled with pay-for-performance metrics and incremental reimbursement. However, in the ambulatory care setting, these evaluations and incentives are rare. As a result, providers often lack critical feedback on their aggregate success in controlling hypertension relative to peers.

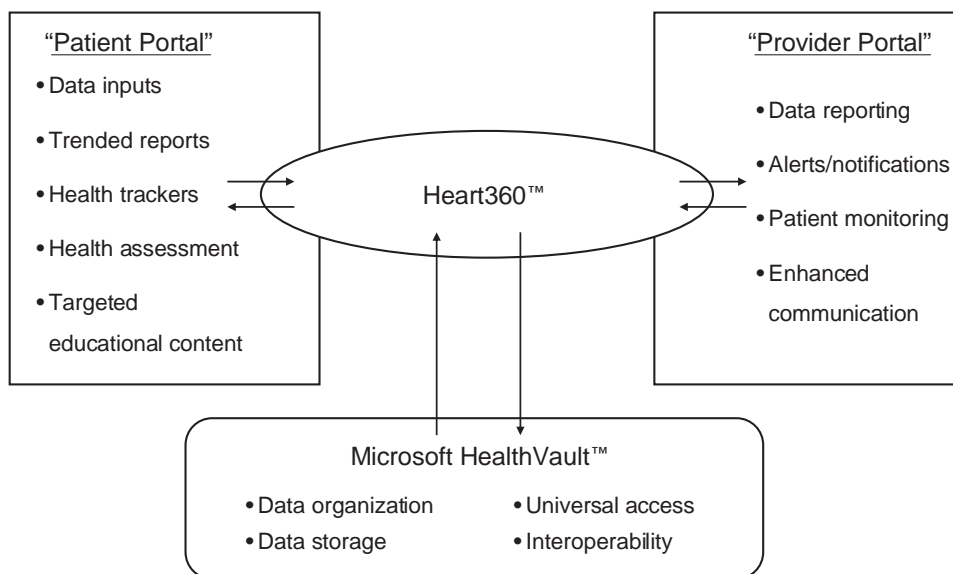
Transformative hypertension management

In the past decade, there has been a progressive evolution from hospital-based management of chronic disease to office-based care. This ambulatory-based model of disease management provides a potentially more efficient and more effective care model. Monitoring and management of blood pressure provide an ideal test case for this process. Accurate and affordable home blood pressure cuffs are now widely available and allow individuals to monitor daily blood pressures in their homes. Moreover, blood pressure data can be easily downloaded via the Internet to secure Web-based health information platforms that promote 2-way communication between the patient and provider.^{22,23} Heart360, for example, is a secure web site maintained by the American Heart Association (www.heart360.org) that provides an online platform for patients to record heart health data and share health information with their providers. The web site provides separate patient and provider portals, linked together by Microsoft's HealthVault technology (Redmond, WA), that promotes enhanced communication, data collection, disease tracking, and education through a combination of user-friendly interfaces (Figure 1).²² To reach its full potential, however, this care model must continually evolve through a radical shift in the locus of care from “the clinic to home.” In turn, transformative changes must occur at the patient, provider, and system levels to support an improved model.

Patient engagement

Providers, payers, and society all need for patients to become active health care partners and participants by self-monitoring their disease state and sharing this information with providers in a timely fashion. To engage patients in the management of their health, they must become active stakeholders. Setting personalized targets

Figure 1



Conceptual diagram of Heart360 (adapted with permission from the American Heart Association).

for blood pressure goals, for example, will create a sense of personal investment in a patient's treatment algorithm while encouraging contribution to data collection through home self-monitoring and participation in alternative care settings.⁷ Home or remote (defined as blood pressure stations located throughout communities in public places) self-monitoring improves patient recognition levels of blood pressure control, which can lead to improved medication adherence and blood pressure control.^{2,6} Encouragement for self-management and monitoring could be enhanced by the provision of discount cards on health insurance costs, rewards for healthy behaviors, or financial rewards to patients who take medications and follow care plans. Behavioral modification programs could be more effectively managed to target specific patient problems (eg, smoking, excess alcohol intake, and obesity) while motivating patients toward improved medication compliance. Engagement may be further facilitated through accessible Web portals such as the Heart360, which serves to simultaneously educate patients and record data.²²

Recent regulatory changes have caused health care firms—from small group physician practices to national hospital management companies—to invest significant resources in health information technology.²⁴ As a result, reimbursement for appropriate use of health information technology has increased. This infrastructure, now supported by regulatory and financial incentives, can be leveraged to improve patient-patient and patient-provider feedback loops. Furthermore, as mobile and wireless technologies are becoming commoditized, easier to use, and more ubiquitous, remote health monitoring has

become a logical extension for providers. Although technology may be the most effective platform for some patients, others may prefer alternative engagement paradigms such as home visits by nurses, interaction with community health coaches, information kiosks, cell phone or text message reminders, or more frequent engagement with primary providers. In short, effective segmentation of patients based on personal preferences, available resources, and health needs will ensure a broad benefit to all patients.

Integrated provider teams

To create a seamless continuum of care, a collaborative health care team should support blood pressure management. Specifically, we need to move away from systems that require physicians to simultaneously monitor and manage patients. Instead, nonphysician providers (eg, nurse practitioners, pharmacists, and physician assistants) can augment blood pressure care by reviewing blood pressures in regular and more frequent intervals and making real-time therapeutic decisions using standardized algorithms. These collaborative teams have repeatedly been shown to be superior to physician-only or traditional hypertension management.^{6,25} This integration of care could reduce the frequency of uncontrolled hypertension owing to provider failures such as clinical inertia and insufficient follow-up on data. Similarly, community health workers could assist by engaging patients to ensure self-monitoring and adherence to medications.²⁶ The frequency of interaction between patients, nonphysician providers, and community health workers may increase

Table I. Expanding hypertension management

Model	Intervention	Outcome
Self-management ^{5,9}	Home and remote blood pressure monitoring Self-education Personalized goal setting	Improved blood pressure control Improved weight loss Increased monitoring of blood pressure
Nonphysician clinical providers ^{4,6,8,9}	Lifestyle and diet modification Medication titration Increased guideline adherence Extension of provider services	Diet and lifestyle improvements Improved weight loss Improved blood pressure control Increased access to primary care services More rapid blood pressure goal attainment
Telemedicine/Web-based care ^{3,6}	Remote monitoring of blood pressure Telephone-based behavioral intervention Disease management hotlines Web-based risk assessment Web-based lifestyle and behavioral interventions	Increased monitoring of blood pressure More cost effective educational intervention programs Improved risk assessment Increased access to primary care services Increased interactions with health care team
Non-clinic-based care ^{34,35}	Blood pressure kiosks in grocery stores, barber shops, ^{34,35} churches, and other public places Community health workers	Increased ability to check and monitor blood pressure Improved patient engagement Increased awareness Care provided closer to patient's home
Provider monitoring and feedback ^{40,41,43-45}	Clinical outcomes data tracked for providers, hospitals, and health systems Comparative analyses completed for providers Information released publicly	Improved clinical outcomes Physician benchmarking by providers, payers, and patients Quality improvement by physicians

in a collaborative care model, thereby encouraging patients to become more routinely engaged in their health status.^{5,25,27}

Through collaborative teams, hypertension management can be further “right-skilled” to produce a leaner, more efficient model of blood pressure management while allocating specialized providers more time for complicated cases. These interactions, less dependent on highly trained physicians and largely free from high overheads of traditional clinical settings, would improve the access, cost, monitoring, and, hence, quality of hypertension management.

System transformation

Improvement in blood pressure monitoring and the frequency of patient interactions with care providers requires a transformed support structure that includes nontraditional interactions between patients and providers, nonclinical settings for care, and an information technology system that connects all participants. In short, hypertension monitoring and management must transition into a model resembling the patient-centered medical home (a model focused on primary care, patient-centric care, new model practice, and payment reform).^{28,29}

One feasible example of such a system involves delegation or outsourcing of all hypertension-related care (potentially along with the management of other chronic conditions) to low-cost managers or external vendors, to efficiently and effectively manage hypertension through task shifting and economies of scale. For example, external vendors could leverage a recurring revenue stream produced by a capitated model to implement innovative

systems that have been demonstrated to improve blood pressure control: self- and remote monitoring,^{5,9} nonphysician medical teams,^{4,6,8,9,30} and non-office-based interactions to improve the frequency of blood pressure measurements (Table I).^{3,6} We envision that these external management services would complement, rather than replace, the current paradigm to improve care efficiency. Although the authors propose a seamless continuum of care composed of collaborative teams in a multitude of clinical and nonclinical settings, increased care fragmentation in the absence of advanced communication systems could hinder the system with increased inefficiency.

Although an external vendor would acquire the greatest portion of the hypertension management burden, primary care providers would maintain an important role in patient care through management of complex or refractory cases and provision of medical guidance for interactions of medical therapies. As hypertension care is transformed to a higher standard, physicians must ensure that focus is not lost on management of comorbid disease. Adequate attention must be given to individual therapeutic regimens to prevent polypharmacy or medication-compliance problems. Furthermore, although information technology should serve as the platform for this new model, existing human infrastructure will be critical for guiding management and care. Given that providers' roles and responsibilities may change significantly, it is essential that analyses of these models examine the new demand on physicians and office staff. Reimbursement and productivity measures should be transformed to incorporate and compensate for additional burden.³¹ Although the current predominance of fee-for-service reimbursement models may hinder implementation of

Table II. Aligning incentives for blood pressure control

	Current system incentives	New incentive structure	Desired outcome
Patient	Few to none	Decreased premiums Discount cards Treatment benefits Gym memberships	Increased responsibility for blood pressure management Improved dietary and lifestyle behavior Frequent engagement in self-management Increased medication compliance
Provider	Frequency of visits	Capitated base payment Incremental payment based on outcomes metrics	Attainment of target blood pressure Increased focus on guideline adherence Transparency of quality of physician services Benchmarking
System	Reduce overall health care spending	Payment for outcomes Controlled costs Managing providers to produce outcomes Increased efficiency of care delivered Public reporting of control rates	Reduction in long-term disease sequelae Increased cost efficiency Improved outcomes

innovative care delivery models, the movement toward global payment models within integrated delivery networks such as Kaiser Permanente, the Veterans Affairs system, or the recent publication of the Principles of Accountable Care Organizations³² could facilitate uptake of novel care paradigms.³³ Although preliminary studies have demonstrated the efficacy of similar care models, more extensive trials are needed to ensure the potential for large-scale implementation without adverse effects.

Nonclinical settings for remote monitoring of blood pressure, such as churches, grocery stores, barber shops,^{34,35} other social hubs, and homes, could produce blood pressure monitoring at a lower cost than what is possible in traditional clinical settings. The success of such a system, however, depends on an integrated information technology platform that facilitates information sharing between multiple providers and patients across numerous locations.³⁶ The improvements in patient engagement and frequency of disease monitoring allow physician and nonphysician providers to make more accurate and timely treatment modifications and intensifications that are tailored to disease progression and are demonstrated to improve clinical outcomes.³⁷

Incentive changes needed for transformation

Transformation of the current clinical paradigm for hypertension to a non-office-based, collaborative care model faces significant hurdles that require simultaneous alignment from the patients, providers, and payers. For patients, there must be increased accountability for disease management and health maintenance because long-term improvement in clinical outcomes will not be the driver for patients to engage in blood pressure control. Instead, patient incentives must focus on extrinsic rewards such as decreased premiums or discounts on health services. Although pilot programs emphasizing extrinsic rewards for medication compliance and patient engagement have shown encouraging

results, there remains a need for detailed analysis of the impact of these programs on long-term patient outcomes.^{38,39} Although the creation of novel incentive programs may improve health outcomes initially, it could also lead to an exacerbation of the disparity gap between socioeconomic classes, exclusion of patients with multiple comorbidities, or refusal of care to patients who are difficult to manage. Finally, financial and nonfinancial incentives could significantly improve the sustainability of a transformative model for care by creating net savings in health care spending from reduced morbidity related to hypertension-related diseases (Table II).

For providers, current compensation for managing patients with hypertension is grounded on episode-of-care payment in a fee-for-service environment. Although this model provides incentives for providers to see patients, it does not reflect the ability to achieve blood pressure control. Rosenthal and Dudley⁴⁰ describe 5 key elements for effectively rewarding health outcomes: choosing to pay the individual versus the group, paying the “right” amount, selecting high-impact performance measures, paying for absolute performance rather than relative performance, and paying for quality improvements in underserved populations. Using these elements in a 2-pronged approach, incentives could be denoted for both individual providers and physician practices. Although group incentives could direct overall system transformation, alignment of incentives for individual physician blood pressure management could be achieved by decreasing the reimbursement for routine office visits to nearly zero and effectively devaluing episodes of care. In turn, providers could be given a capitated annual payment for all hypertensive patients for whom they provide care and a tiered “bonus” payment for achieving preset performance targets across this population. The alignment of provider incentives toward improving blood pressure control, through capitation, pay for performance, or target-based bonuses, can help to eliminate asymmetries in behaviors by all parties that impede achievement of health targets. However, pilot studies

should evaluate these incentives to ensure that deleterious effects, such as overmedication to achieve targets or physician distraction from nonincentivized conditions, do not occur.

Finally, the system must be revamped to include public reporting for outpatient services. Public reporting has been demonstrated in numerous disease states to increase clinical performance.⁴¹ The benchmarking and resulting peer pressure that occur with public reporting drive physicians to improve blood pressure control through stricter adherence to guidelines, innovation, and increased monitoring of disease.⁴² Although the mechanisms for clinical improvement are not fully understood, it is thought that provider profiling may positively promote internal quality improvement measures (both within the hospital and in individual practice).⁴¹ To improve patient decision making around quality of provider care, a standardized set of basic performance metrics could be published periodically to share benchmarks of high-quality care. Publication of these data would allow patients to make educated decisions regarding care and would reward providers who effectively control blood pressure.^{41,43-45} In addition to potential improvements in clinical outcomes and patient decision making, publication of performance metrics could spur physicians to actively search for low-cost, high-quality partners to help manage blood pressure.

Conclusion

There are numerous possibilities for transformative innovations in hypertension care. We have discussed model components that would break the current boundaries defined by cost, access, and quality. This disruption is predicated on the simultaneous existence and prevalence of intercommunicating information systems, alignment of incentives for all stakeholders, improvements in the quality and frequency of interactions between patients and the health care system, increased patient responsibility for management of disease, and a strategic implementation focused on the creation of an independently sustainable system. Given that this model represents a transformative change to one aspect of the health care system, it will be necessary to develop extensive pilot studies to validate theoretical improvements in the efficacy, efficiency, and costs of care.

The successful implementation of a new care model ultimately depends on the active participation of every stakeholder and a general enthusiasm for changing the status quo. This participation must be augmented by a disintermediation and a universal exchange of health care information to increase the efficiency of health care delivery. Similarly, reimbursement incentives should be aligned to engage patients, reward providers for success, and create benchmarking among providers. Only by

transforming our broken system of episode and office-based care and developing novel methods to engage individual patients, incentivize providers to innovate, and link information universally can we gain significant ground on blood pressure control.

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