



Initiatives to Enhance Primary Care Delivery: Two Examples From the Field

Jan L. Losby¹, Marnie J. House², Thearis Osuji², Sarah Abood O'Dell²,
Alberta M. Mirambeau¹, Joanna Elmi¹, Eileen Chappelle¹,
and Dara F. Schlueter²

Abstract

Objectives: Increasing demands on primary care providers have created a need for systems-level initiatives to improve primary care delivery. The purpose of this article is to describe and present outcomes for 2 such initiatives: the Pennsylvania Academy of Family Physicians' Residency Program Collaborative (RPC) and the St Johnsbury Vermont Community Health Team (CHT).

Methods: Researchers conducted case studies of the initiatives using mixed methods, including secondary analysis of program and electronic health record data, systematic document review, and interviews.

Results: The RPC is a learning collaborative that teaches quality improvement and patient centeredness to primary care providers, residents, clinical support staff, and administrative staff in residency programs. Results show that participation in a higher number of live learning sessions resulted in a significant increase in patient-centered medical home recognition attainment and significant improvements in performance in diabetic process measures including eye examinations (14.3%, $P = .004$), eye referrals (13.82%, $P = .013$), foot examinations (15.73%, $P = .003$), smoking cessation (15.83%, $P = .012$), and self-management goals (25.45%, $P = .001$). As a community-clinical linkages model, CHT involves primary care practices, community health workers (CHWs), and community partners. Results suggest that CHT members successfully work together to coordinate comprehensive care for the individuals they serve. Further, individuals exposed to CHWs experienced increased stability in access to health insurance ($P = .001$) and prescription drugs ($P = .000$) and the need for health education counseling ($P = .000$).

Conclusion: Findings from this study indicate that these 2 system-level strategies have the promise to improve primary care delivery. Additional research can determine the extent to which these strategies can improve other health outcomes.

Keywords

primary care, quality improvement, medical residents, community health workers, program evaluation, case study

Introduction

The recent expansion of health insurance coverage in the United States is expected to result in an increase in the utilization of health services that will place significant demands on the primary care system.¹⁻³ By 2025, the increased need for primary care services resulting from population growth, aging, and insurance expansion will require an additional 51880 primary care physicians.¹ Initiatives to prepare for this heightened need focus on (1) fostering innovation in the delivery of care, with an emphasis on comprehensive care models and (2) enhancing the support available for primary care providers.⁴

The US Centers for Disease Control and Prevention's (CDC's) Division for Heart Disease and Stroke Prevention (DHDSP) is committed to building practice-based evidence

by using preevaluation assessment methods to appraise a program's capacity and readiness for effectiveness evaluation.^{5,6} In 2011, DHDSP began work to identify field-based, system-level strategies to better understand how these strategies might effectively bridge the gap between patients and providers and

¹ Division for Heart Disease and Stroke Prevention, Centers for Disease Control and Prevention, Atlanta, GA, USA

² ICF International, Atlanta, GA, USA

Corresponding Author:

Jan L. Losby, Division for Heart Disease and Stroke Prevention, Centers for Disease Control and Prevention, 4770 Buford Hwy NE, MS-F72, Atlanta, GA 30341, USA.

Email: jlosby@cdc.gov



improve chronic disease outcomes. Through the careful pre-evaluation assessment process, 18 programs were identified and 2 were selected for evaluation: the Pennsylvania Academy of Family Physicians' (PAFP) Residency Program Collaborative (RPC) and the St Johnsbury Vermont Community Health Team (CHT). The purpose of this article is to describe these 2 initiatives and highlight selected outcomes.

Methods

The DHDSP selected the PAFP RPC and St Johnsbury Vermont CHT to undergo evaluations to describe program processes and assess short-term and intermediate program outcomes. Programs were selected due to their innovative design, promising implementation strategies, and readiness for in-depth evaluation. The DHDSP contracted with ICF, International to conduct both evaluations.

Design

Using a mixed-methods evaluation approach, the researchers conducted in-depth case studies of each innovation to examine the efficacy of the innovations in strengthening chronic disease management. The case studies were conducted from September 2011 to February 2014 and used a 1-sample, mixed methods observational research design with repeated measures. Mixed-methods data collection and analysis included quantitative methods involving secondary analysis of program and electronic health record (EHR) data and qualitative methods involving in-depth interviews.

Data Collection

Study samples and measures were tailored to the specific intervention in each case study (see Appendix A). Quantitative methods involved secondary analysis of program and EHR data. For the PAFP RPC case study, this involved analysis of aggregate level practice data, which practices extracted monthly from their EHRs and reported to PAFP. For the St Johnsbury CHT, this involved analysis of data from Community Connections Team (CCT) Intake Forms and EHRs.

Qualitative methods involved in-depth interviews with program-specific stakeholders. For the PAFP RPC case study, this involved 5 in-depth interviews with QI team members. For the St Johnsbury CHT case study, this involved 9 in-depth interviews with primary care providers.

Analyses

In each case study, the researchers conducted thematic analysis of qualitative data and repeated measures analysis of quantitative data specific to the nature of the secondary data obtained. Specifically, the primary outcomes of interest for both case studies related to efficacy of program components, support for chronic disease self-management, and promising practices for program implementation. Because the case studies involved

observational research designs on existing innovations, the researchers primarily used descriptive statistics and repeated measures multivariate analysis to describe the efficacy of the innovations. As appropriate, repeated measure multivariate analyses controlled for relevant covariates (as described in the individual case studies).

Case Study I: PAFP RPC

Description of the Initiative

A quality improvement (QI) learning collaborative is an educational model that brings together individuals representing different primary care practices to work together on specific clinical areas—guided by experts in process improvement—to facilitate the sharing and dissemination of effective strategies to redesign their health care systems, become more patient focused, and improve the quality of care delivered to patients.⁷ In 2010, PAFP launched the RPC using the Chronic Care Model^{8,9} and the patient-centered medical home (PCMH) model¹⁰⁻¹² as its theoretical framework. The RPC is a primary care learning collaborative implemented in residency programs across Pennsylvania. In 2013, there were 24 QI teams in the RPC. The RPC aims to accomplish systems change in primary care practices by teaching QI and patient centeredness to primary care staff and assisting practices in becoming National Committee for Quality Assurance (NCQA) PCMH recognized.

The RPC uses a physician-to-physician communication and feedback approach. The QI teams receive tailored guidance from physicians and have the flexibility to implement data-driven changes specific to their practice. Each QI team represents a practice and consisted of a minimum of 3 practice staff members (physician, resident, and nonclinical staff) who participate in collaborative activities. Although staff participating in the collaborative at the practice level may vary over the course of implementation, 1 lead physician from each practice has consistent involvement. By engaging practice staff members at all levels, a practice conducts systems change and improves the quality of care delivered to patients. The collaborative promotes the use of effective systems change strategies by providing participants with concrete examples of how to implement approaches that help primary care practices manage the health of their patient population, promote patient centeredness, conduct ongoing performance measurement, and oversee care coordination.

Using a tested collaborative model,¹³ key program activities include the delivery of peer-to-peer guidance and technical assistance via designated faculty mentors familiar with QI in primary care, data reporting and sharing, and collaborative QI education. Faculty mentors are family or internal medicine physicians who have previous experience with planning and implementing QI strategies within their practices, have been through the NCQA PCMH submission and recognition process, and have direct experience in potential challenges and solutions for completing the application process. Through live learning

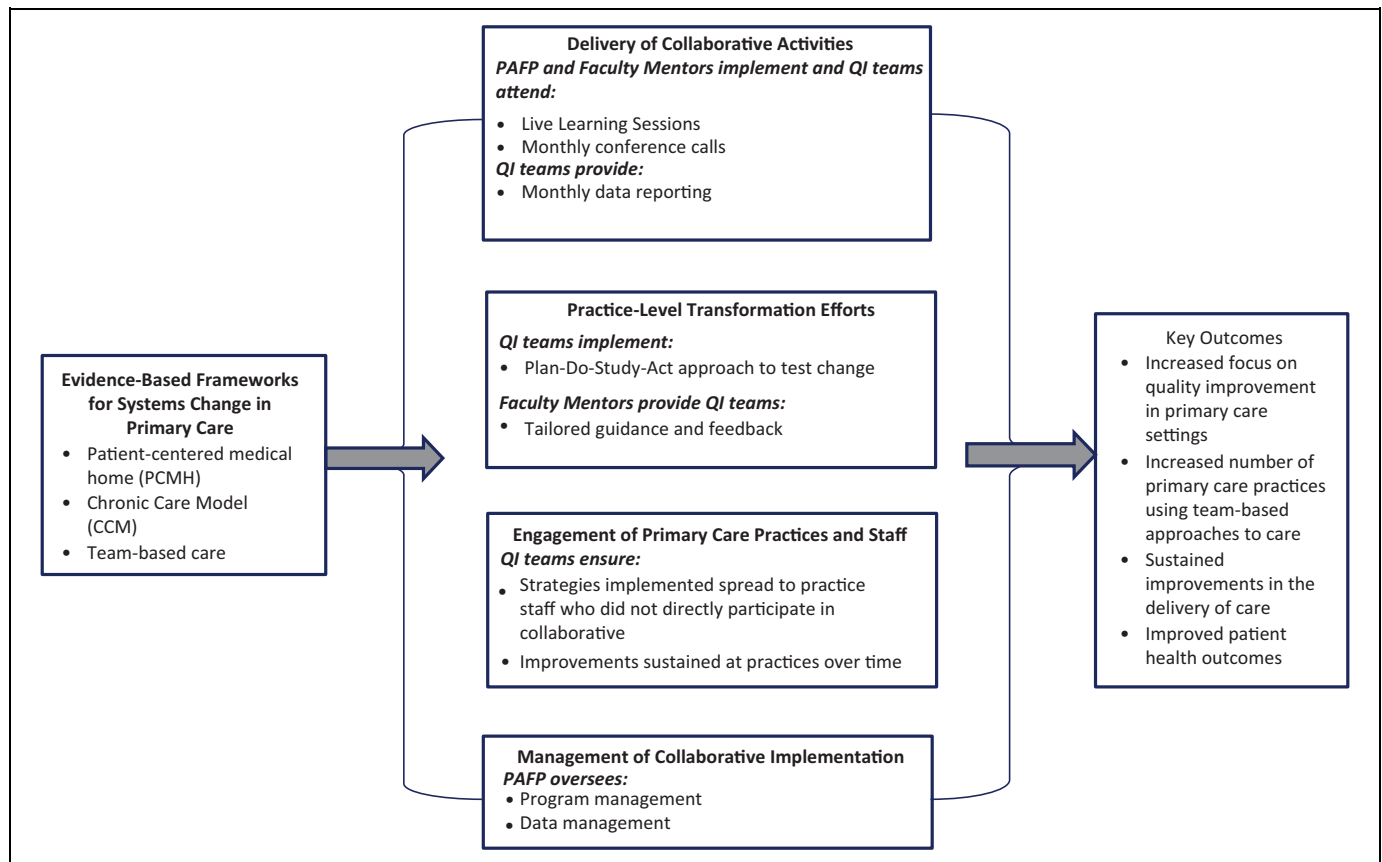


Figure 1. Residency Program Collaborative (RPC) program components.

sessions (ie, day-long, in-person sessions offered 3 times each year to provide participants with the opportunity to have face-to-face interaction and network with other primary care practitioners) and monthly conference calls with QI teams to reinforce messages related to quality and enable information-sharing among teams, QI teams are taught how to apply and use strategies for systems change to improve health care delivery within their practice and improve patient health outcomes. The QI teams are required to report practice-level data on a specific list of quality measures for certain disease states on a monthly basis, and faculty mentors review data submissions and provided tailored feedback to participating QI teams. This cyclical process—which includes data review and testing of QI strategies within a practice—helps guide QI teams in improving the quality of care delivered to patients in their practice.

Each activity offered as a part of the collaborative is designed to facilitate shared learning among participants and to equip primary care practitioners with the tools necessary to orchestrate continuous QI with their practice. By targeting residency programs, RPC prepares residents to work in an environment that supports QI and to build the primary care workforce. Further, by improving practice processes, RPC is intended to improve patient health outcomes within participating practices (see Figure 1). For additional details on the core components of the RPC, refer to the *Implementation Guide for Public Health Practitioners*.¹⁴

Findings

Case study analyses focused on 3 primary areas: (1) describing PCMH transformation at the practice level, (2) understanding the extent to which the collaborative participation influenced teams' ability to achieve NCQA PCMH recognition, and (3) exploring how performance in clinical process measures changed over time. The QI teams reported information related to their practice's experience in becoming an NCQA-recognized PCMH via a self-report survey administered over 3 time periods. Data from this survey were used to calculate a PCMH transformation score for each practice; quantitative data were supplemented with qualitative data collected via interviews with QI team participants. Using collaborative data, a binary variable indicating PCMH status was created (eg, "achieved" or "did not achieve" NCQA PCMH recognition) and attendance at live learning sessions was used as a proxy for collaborative exposure. For changes in diabetic clinical process measures, the analysis used aggregate, practice-level data to compare performance in these measures at baseline to the end of the data submission period.

Of the 24 residency programs that participated in the collaborative over a 36-month period, practices served an average of 371 diabetic patients ages 18 to 75 during this period (see Table 1). Significant increases were seen in practices'

Table 1. Results From the RPC Case Study Analyses.

Average PCMH Transformation Score, as Measured by PCMH Monitor Surveys, by Survey Administration Period ^a (N = 24 Practices)			
	Survey Administration Period		
	May 2011	Dec 2011	June 2012
Number of practices responding to survey	19	21	19
PCMH score, ^b mean (95% CI)	6.92 (6.31-7.53)	7.64 (7.02-8.26)	8.66 (7.81-9.51)**
Association Between Practices' NCQA PCMH Recognition Status and Teams' Exposure to RPC Collaborative (N = 196) ^c			
	Unadjusted Odds Ratio ^d (95% CI)		Adjusted Odds Ratio ^e (95% CI)
	0-1	Reference group	Reference group
2-4	3.06 (1.68-5.58)***		4.35 (2.27-8.33)***
Change in Percentage of Diabetic Patients Meeting Targets for Diabetic Clinical Process Measures From Baseline to End of Data Analysis Period (N = 22 Residency Programs)			
	Baseline %, ^f Mean (95% CI)	Post %, ^g Mean (95% CI)	Mean % ^h Difference
Diabetic measures			
Eye examination	25.70 (16.74-34.66)	40.00 (28.99-51.01)	14.30**
Eye referral	26.11 (19.32-32.9)	39.93 (31.62-48.24)	13.82*
Foot examination	48.05 (39.59-56.5)	63.78 (56.03-71.52)	15.73***
Nephrology examination	72.93 (65.50-80.36)	72.95 (63.89-82.00)	0.02
Patients who smoke	27.58 (23.28-31.88)	27.98 (24.34-31.62)	0.40
Smoking cessation counseling	60.44 (49.60-71.29)	76.28 (66.17-86.38)	15.83*
Self-management goals	18.68 (6.65-30.72)	44.14 (31.63-56.64)	25.45***

Abbreviations: CI, confidence interval; NCQA, National Committee for Quality Assurance; PCMH, patient-centered medical home; RPC, Residency Program Collaborative.

^a *P value < .05, **P value < .01, and ***P value < .001 adjusted for initial practice quality measures (number of eye, foot, and renal examinations conducted) and practice size using multivariate regression with clustering at the practice level.

^b The PCMH score was created using PCMH Monitor Survey data which included 11 domains. Data from each of the domains were used to create an overall PCMH score which ranged from 1 (1 = "practice does not have this feature") to 11 (11 = "practice has this feature").

^c Includes 21 residency programs. Three residency programs were excluded from the analysis because (1) they gained NCQA PCMH recognition within the first month of the collaborative, indicating they had already submitted their NCQA PCMH application prior to participation or (2) they had significant missing data for practice-level quality measures needed to control for differences in practice characteristics.

^d *P value < .05, **P value < .01, and ***P value < .001 for t test.

^e *P value < .05, **P value < .01, and ***P value < .001 adjusted for initial practice quality measures (number of eye, foot, and renal examinations conducted) and practice size using piece-wise constant complimentary log-log model.

^f Baseline refers to first month of nonmissing data across all clinical process measures submitted.

^g Post refers to the last month of nonmissing data across all clinical process measures submitted (on average this is 30 months).

^h *P value < .05, **P value < .01, and ***P value < .001 for t test.

implementation of PCMH components and efforts to achieve NCQA PCMH recognition via the PCMH Monitor. Results from qualitative data collection revealed that QI teams positively attributed their participation in the collaborative to practice transformation efforts and consistently reported that the focus on PCMH principles throughout the delivery of the program via live learning sessions provided teams with the skills necessary to implement practice transformation strategies within their primary care practices.

Results from the multivariate analyses, adjusting for initial practice quality measures (number of eye, foot, and renal examinations conducted) and practice size, also revealed that participation in a higher number of live learning sessions was associated with significant increases in PCMH recognition attainment. This finding was further supported by qualitative

analysis, as QI teams indicated that participation in collaborative activities such as live learning sessions contributed to their ability to achieve NCQA PCMH recognition, especially by providing tools and guidance on how to complete the application process and how to implement necessary QI strategies within a primary care setting.

Finally, results revealed significant increases in performance in diabetic process measures from baseline to the end of the analysis period, including eye examinations (14.3%, $P = .004$), eye referrals (13.82%, $P = .013$), foot examinations (15.73%, $P = .003$), smoking cessation (15.83%, $P = .012$), and self-management goals (25.45%, $P = .001$; see Table 1). These findings suggest that QI teams' were able to contribute to improvements in the delivery of care for diabetic patients during the time of their participation in the collaborative.

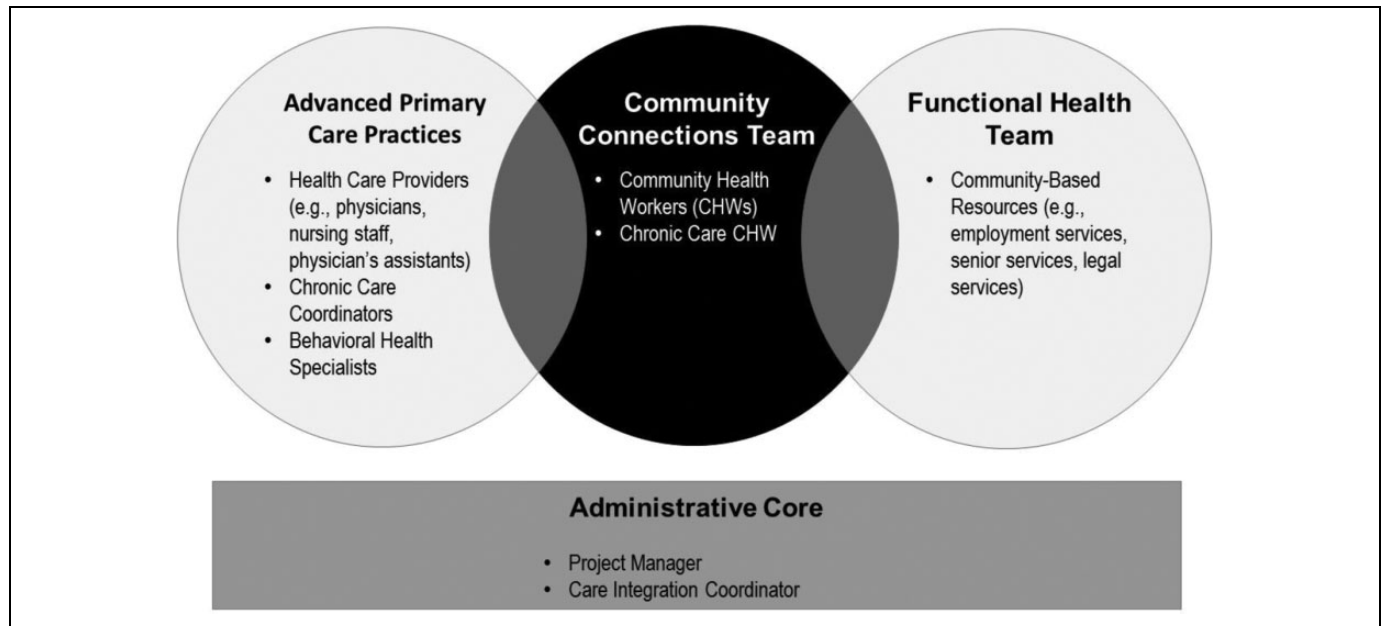


Figure 2. An illustration of the community-clinical linkages in the St. Johnsbury Community Health Team (CHT) model.

Case Study 2: St. Johnsbury Vermont CHT

Description of the Initiative

High rates of hypertension, diabetes, and asthma prompted the state of Vermont to create an initiative that addressed chronic disease control through coordinated care by way of a CHT. Since 2008, the Vermont Blueprint for Health has supported the CHT model of care.¹⁵ This model was designed to provide seamless coordination of preventive health and primary health care to improve health outcomes and reduce health care costs across the state. In St. Johnsbury, Vermont, the CHT is an integrated group of multidisciplinary practitioners that address the spectrum of medical and nonmedical needs of patients with chronic disease conditions using community-clinical linkages fostered by CHWs.

As a part of the CHT, the CHWs are an integral component and specifically aim to help meet client social needs so that patients can improve their life conditions, health, and ultimately their well-being. There is increased interest to implement and expand public health interventions that effectively address socioeconomic factors—the broadest base of the health impact pyramid—as these have the greatest potential population impact.¹⁶ Emerging evidence suggests that CHWs can play an important role in the community to affect issues related to the social determinants of health.^{17,18} Evidence also suggests that CHWs can improve health outcomes when they are included in disease prevention and chronic disease management efforts for conditions like asthma, cancer, diabetes, cardiovascular disease, nutrition, and depression.^{19,20}

The St. Johnsbury CHT model is comprised of 4 core elements. (1) *Advanced Primary Care Practices (APCPs)* are NCQA recognized PCMHs. St. Johnsbury APCPs include health care providers, chronic care coordinators (CCCs), and behavioral health specialists (BHSs). The BHSs provide short-

term, solution-focused therapy to patients (approximately 3-8 sessions). The CCCs are responsible for managing the care of patients and expanding the range of services provided in the practice and providing a critical linkage to the other components of the CHT, specifically the CCT. (2) The *CCT* consists of CHWs who are primarily responsible for linking clients to community-based and local state agencies that can provide financial and other tangible resources to meet clients' needs, such as vouchers for heating and transportation assistance. A chronic care CHW provides similar services, but primarily acts as a health coach to clients to improve their self-management skills related to chronic disease. (3) The *Functional Health Team* has more than 30 community partners that provide a variety of services to the community (ie, housing, legal aid, or mental health services). (4) And finally, the *Administrative Core* has a program manager and a care integration coordinator who provide oversight for the CHT and coordinate efforts of the CHT members.

Through the work of the CHWs, the CHT model demonstrates how community-clinical linkages can support primary care providers by providing a range of services to community members as illustrated in Figure 2. In this model, APCPs, the CCT, and the Functional Health Team are overlapping elements. For additional details on the St. Johnsbury CHT model, refer to the *Implementation Guide for Public Health Practitioners*²¹ and a separate cost analysis of this model.²²

Findings

To assess outcomes of the St. Johnsbury CHT, the researchers examined data from 3 data sources: (1) a sample of variables extracted from EHRs, (2) a sample of CHW records, and (3) qualitative interviews with primary care providers in the St. Johnsbury CHT. The EHRs sample presented in Table 2

Table 2. Results from the St Johnsbury CHT Case Study Analyses.Distribution of Health and Demographic Characteristics and CHT Exposure Within a Sample of Medical Home Patients and Subsamples of Patients Exposed to CCC, BHS, and CHW (N = 2711 Medical Home Patients)^a

	Total Sample	CCC Patients (n = 199)	BHS Patients (n = 63)	CHW Clients (n = 63)
Age				
18-64	1332 (49.1%)	86 (43.2%)	37 (58.7%)	39 (61.9%)
65-85	1379 (50.9%)	113 (56.8%)	26 (41.3%)	24 (38.1%)
Sex				
Male	1337 (49.3%)	86 (43.2%)	27 (42.9%)	32 (50.8%)
Female	1374 (50.7%)	113 (56.8%)	36 (57.1%)	31 (49.2%)
Insurance payer type				
Medicare	1382 (51.0%)	129 (64.8%)*	29 (46.0%) ^b	34 (54.0%)*
Medicaid	156 (5.8%)	18 (9.0%)		14 (22.2%)
Diabetes comorbidity	607 (22.4%)	103 (51.8%)*	19 (30.2%)	28 (44.4%)*
Community health team exposure				
Chronic care coordinator	199 (7.3%)	–	15 (23.8%)*	31 (49.2%)*
Behavioral health specialist	63 (2.3%)	15 (7.5%)*	–	^b
Community connections team CHWs	63 (2.3%)	31 (15.6%)*	^b	–
Emergency room (ER) use				
0 ER visits	2128 (78.5%)	115 (57.8%)*	44 (69.8%)	36 (57.1%)*
1 ER visit	392 (14.5%)	42 (21.1%)	12 (19.0%)	10 (15.9%)
2 or more ER visits	191 (7.0%)	42 (21.1%)	^b	17 (27.0%)
Inpatient hospital stay	187 (6.9%)	34 (17.1%)*	^b	11 (17.5%)*

Change in CHW Assessments of Clients' Life Conditions on a Scale of 0 to 10 Between Clients' First and Most Recent Visits During the Observation Period (N = 210 Community Connections Team clients)^c

	First Visit Mean (Standard Deviation)	Most Recent Visit Mean (Standard Deviation)
Access to health insurance ^d (n = 186)	6.95 (3.63)	7.54 (3.28)**
Access to prescription drugs ^e (n = 180)	6.66 (3.61)	7.40 (3.39)**
Need for health education counseling ^f (n = 142)	6.23 (2.43)	6.87 (2.31)**

Abbreviations: BHS, behavioral health specialist; CCC, chronic care coordinator; CHT, Community Health Team; CHW, community health worker.

^a*P value < .05, **P value < .01, and ***P value < .001 for chi-square difference of proportions (compared to unexposed counterparts).^bn < 10 not reported to protect the identity of participants.^cClients' first and most recent encounter with a CHW occurred between January 1 and August 19, 2013. At each encounter, CHWs assess clients' need for assistance on 13 key aspects of well-being on a scale of 0 to 10 (0 = "immediate threat or crisis," 5 = "neither crisis nor self-sufficient," and 10 = "self sufficient"). *P value < .05, **P value < .01, and ***P value < .001 for repeated measures multivariate general linear models which adjusted for the primary purpose of the client's first encounter with the CHWs, age, marital status, source of the client's referral, number of encounters during the observation period, and self-reported initial health status at the time of the first encounter with the CHWs.^dFor access to health insurance, the CHWs considered whether the client (and the client's family) had active, stable, and adequate health insurance with out of pocket costs that do not pose barriers to the client.^eFor access to prescription drugs, the CHWs considered whether the client (and family members) have coverage for prescription drugs and the ability of the client to pay for prescriptions.^fFor need for health education counseling, the CHWs considered the extent to which the client understands any health conditions they have and whether the client has the knowledge, skills, and awareness to maintain their health.

included 2711 patients between the ages of 18 and 85 years with a diagnosis of hypertension and at least 1 blood pressure measurement during the study observation period. In all, 22.4% of patients also had diabetes. In all, 51.0% of this sample were Medicare patients, while another 5.8% were Medicaid patients. In all, 21.5% of the sample had a least 1 ER visit during the observation period, and 6.9% had an inpatient hospital stay during this period. Among those exposed to a CCC or CHW, there was a higher proportion of patients with diabetes comorbidity, emergency room visits, and inpatient hospital stays. This suggests that CHT members are serving patients with

greater health needs. Also, higher proportions of patients exposed to 1 component were exposed to other CHT components compared to patients who were not exposed which might suggest that the CHT members work together to coordinate care for the individuals they serve.

The CHW sample was comprised of 210 adults older than the age of 18 who had at least 2 encounters (in-person or via telephone) with the CCT, January 1 to August 19, 2013. In their records, CHWs subjectively appraised clients at each encounter on a set of topics commonly addressed by the CCT using a scale of 0 to 10 (where 0 means a client is in a crisis and 10

means that the client is self-sufficient in the given area). These records included 3 topics related to primary care, including health insurance, prescription drugs, and health education (refer to Table 2 for definitions of each). Paired sample *t* tests showed statistically significant increases in CHW ratings on health insurance ($P = .040$), prescription drugs ($P = .012$), and health education ($P = .004$). The researchers used repeated measures multivariate generalized linear models that took into account the number of encounters with the CCT, age, marital status, self-reported health status, primary purpose of the client's first visit, and the source of their referral to the CCT (within their APCP or outside the APCP). The multivariate models confirmed statistically significant increases in health insurance ($P = .001$), prescription drugs ($P = .000$), and health education ($P = .000$). Although the absolute value of the rating increases appear small, these changes represent meaningful improvement in participant well-being, in which small changes reflect a difference between a crisis situation and progress toward stability in a client's well-being. This suggests that the CHW services can support patients in the management of their overall health.

The researchers conducted qualitative interviews with 9 primary care providers (5 physicians and 4 nursing staff) to explore their perceptions of the CHT model and how the CHT model has affected their practice. Providers indicated that the implementation of the St Johnsbury CHT has helped streamline their practice by allowing them to link patients to other CHT members for support in addressing a full range of needs. Providers reported that they now know what is going on with their patients from many different perspectives—via follow-up communications from other CHT members. They noted that the CHT model has made it easier to ask patients questions about social, economic, and psychological needs related to their health without fearing the responses because now providers have resources where they can refer patients. Finally, providers stated that working with the CHT means that they do “less teaching and more referring,” which makes office visits more focused.

Discussion

In concert with CDC's focus on the promotion of systems-level strategies to improve population health, the purpose of this study was to identify and examine innovations implemented within health care settings, which have the potential to support chronic disease management efforts. The researchers harnessed the strengths of a case study methodology to explore and describe the implementation and outcomes of 2 innovations in a natural context. Doing so allowed the researchers to learn how such innovations may support health care delivery and support primary care providers. This approach, which began with the preevaluation assessment methods, allowed the researchers to further develop practice-based evidence concerning systems-level strategies that can improve chronic-disease outcomes.²³

Case study findings showed that RPC reinforced PCMH principles among participating residents and providers through live learning sessions and other collaborative activities; the skills gained through participation in the collaborative enabled QI team

members to implement practice transformation strategies within their primary care practices and improve their performance in clinical process measures. These findings are consistent with other studies that have shown that patients receiving treatment in primary care settings appear to benefit if their physician takes part in structured education and feedback programs.^{24,25}

Study findings also showed that the St Johnsbury CHT model, which uses an integrated and coordinated approach to the delivery of care across preventive and primary health, improved community-clinical linkages and enhanced coordination of care. Moreover, findings suggest that the CHT model helped to streamline processes for health care providers, facilitating their ability to treat patients' medical issues while referring them to other support services to help meet their social, economic, and psychological needs, which is consistent with other studies.^{26,27}

The results of this study are important because they provide an objective examination of current primary care models in practice in order to develop field-based evidence related to the use of system-level strategies to improve health care delivery and chronic disease management. Few studies have documented the implementation and outcomes of system-level strategies in primary care settings outside of a controlled, research-oriented environment, and this context often does not provide realistic and feasible options for primary care practitioners in managing chronic disease outcomes among patient populations. In light of today's ever evolving health care landscape, the strength of this work is that both case studies provide real world examples of how to enhance the delivery of primary care and provide empirical evidence to support their implementation on a broader scale.

Limitations

A limitation of these case studies is the absence of preintervention data. The use of an observational design without the inclusion of a control group does not allow for the direct establishment of causal links between program implementation and program and patient outcomes, and instead only facilitates the exploration of the strength of relationships. Second, across both case studies, much of the analyses conducted were based on the use of secondary data, which limited the ability of the evaluation team to minimize measurement bias.

Conclusion

Both the RPC and CHT models are examples of innovative methods for primary care delivery, promoting an integrated approach among primary care physicians and health professionals to improve care for patients. The lessons learned from these case studies contribute to the evidence regarding successful system-level strategies for promoting quality care within primary care settings and demonstrate promise in using these strategies to improve patient health outcomes. However, additional research is needed to determine the impact of these interventions on long-term patient health, which features of the intervention have the greatest impact, and how these system-level approaches can be replicated in other clinical settings.

Appendix A

Sample and Measures for Each Case Study by Construct

Pennsylvania Academy of Family Physicians' (PAFP) Residency Program Collaborative (RPC)

- Practice demographic information
- Patient centered-medical home (PCMH) Monitor self-report survey
- Program implementation data on 24 practices that participated in the collaborative between June 2010 and May 2013:
 - Participation in live learning sessions
 - Duration of time in collaborative
- Five, 60-minute semi-structured telephone interviews with QI team members participating in RPC
- Monthly practice-level (aggregate) data on use of clinical processes:
 - Diabetic eye examinations
 - Nephrology examinations
 - Foot examinations
 - Smoking status
 - Smoking cessation counseling received
 - Blood thinners
 - Statins
- Monthly practice-level data on patients with diabetes and ischemic vascular disease (IVD) on the following outcome measures:
 - Diastolic and systolic blood pressure
 - Hemoglobin A1C
 - Low-density lipoprotein (LDL)

St Johnsbury Vermont Community Health Team (CHT)

- Intake form information on clients who had an encounter with a community health worker (CHW), January 1 to August 19, 2013:
 - Encounter date and type
 - Demographics
 - Client self-report life satisfaction
 - CHW ratings on 13 life conditions (eg, health insurance, housing, and finances)
- Nine, 30-minute semi-structured in-person interviews with healthcare providers (5 primary care providers and 4 nurses)
- Patient-level data on patients ages 18-85 from 2 medical homes with a hypertension diagnosis, January 1, 2012 to September 1, 2013:
 - Demographics
 - Diabetes diagnosis
 - Date of hypertension diagnosis
 - Date of first controlled hypertension status
 - Exposure to CHT 4 core components
 - Weight
 - Height
 - Monthly diastolic and systolic blood pressure
 - Number of emergency room visits
 - Number of inpatient hospital days
 - Prescribed medications

Acknowledgments

We would like to acknowledge Kris Samara and the staff at PAFP and William Warning, MD, for their contributions to the RPC case study. We would also like to acknowledge Laural Ruggles, Pamela Smart, and CHT staff for their contributions to the CHT case study.

Authors' Note

The opinions and conclusions are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention (CDC).

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This work was supported in part by a contract (Contract Number 200-2008-27957) from the Centers for Disease Control and Prevention (CDC).

References

1. Petterson SM, Liaw WR, Phillips RL, Rabin DL, Meyers DS, Bazemore AW. Projecting US primary care physician workforce needs: 2010-2025. *Ann Fam Med*. 2012;10(6):503-509.
2. Foster RS. Estimated financial effects of the Patient Protection and Affordable Care Act, as amended. Centers for Medicare & Medicaid Services. Web site. https://www.cms.gov/ActuarialStudies/Downloads/PPACA_2010-04-22.pdf. Published 2010. Accessed December 2, 2014.
3. Bodenheimer T, Grumbach K, Berenson RA. A lifeline for primary care. *N Engl J Med*. 2009;60(26):2693-2696.
4. Abrams M, Nuzum R, Mika S, Lawlor G. Realizing health reform's potential: how the Affordable Care Act will strengthen primary care and benefit patients, providers, and payers. *The Commonwealth Fund*. Web site. <http://www.commonwealthfund.org/publications/issue-briefs/2011/jan/strengthen-primary-care>. Published January 2011. Accessed December 2, 2014.
5. Dunet DO, Losby JL, Tucker-Brown A. Using evaluability assessment to support the development of practice-based evidence in public health. *J Public Health Manag Pract*. 2013; 19(5):479-482.
6. Leviton LC, Gutman MA. Overview and rationale for the systematic screening and assessment method. *New Dir Eval*. 2010; 125:7-31.
7. Kilo CM. A framework for collaborative improvement: lessons from the Institute for Healthcare Improvements breakthrough series. *Qual Manage in Health Care*. 1998;6(4):1-13.
8. Wagner EH. Chronic disease management: what will it take to improve care for chronic illness? *Eff Clin Pract*. 1998;1(1):2-4.
9. Wagner EH, Austin BT, Davis C, Hindmarsh M, Schaefer J, Bonomi A. Improving chronic illness care: translating evidence into action. *Health Aff (Millwood)*. 2001;20(6):64-78.
10. Phillis RL, Bronnikov S, Petterson S, et al. Case study of a primary care-based accountable care system approach to

- medical home transformation. *J Ambul Care Manage.* 2010; 34(1):67-77.
11. McCarthy D, Mueller K, Tillmann I. Group Health Cooperative: Reinventing primary care by connecting patients with a medical home. Web site. http://www.commonwealthfund.org/media/Files/Publications/Case%20Study/2009/Jul/1283_McCarthy_Group%20Health_case_study_72_rev.pdf. Published July, 2009. Accessed December 1, 2014.
 12. Nielsen M, Langner B, Zema C, Hacker T, Grundy P. Benefits of implementing the primary care patient-centered medical home: a review of cost and quality results. Web site. http://www.pcpcc.org/sites/default/files/media/benefits_of_implementing_the_primary_care_pcmh.pdf. Published 2012. Accessed December 2, 2014.
 13. Institute for Healthcare Improvement. *The Breakthrough Series: IHI's Collaborative Model for Achieving Breakthrough Improvement*. IHI Innovation Series white paper. Boston, MA: Institute for Healthcare Improvement; 2003.
 14. O'Dell S, House M, Losby JL, Chappelle E. Implementation Guide for Public Health Practitioners: The Residency Program and Community Health Center Collaborative. Web site. http://www.cdc.gov/dhds/evaluation_resources.htm. Published 2014. Accessed December 2, 2014.
 15. Department of Vermont Health Access. *Vermont Blueprint for Health Implementation Manual*. Williston, VT: Department of Vermont Health Access; 2010.
 16. Frieden TR. A framework for public health action: the health impact pyramid. *Am J Public Health.* 2010;100(4):590-595.
 17. Ingram M, Schachter KA, Sabo SJ, et al. A community health worker intervention to address the social determinants of health through policy change. *J Prim Prev.* 2014;35(2): 119-123.
 18. Sabo S, Ingram M, Reinschmidt KM, et al. Predictors and a framework for fostering community advocacy as a community health worker core function to eliminate health disparities. *Am J Public Health.* 2013;103(7):e67-e73.
 19. Rosenthal LE, Brownstein JN, Rush C, et al. Community health workers: part of the solution. *Health Aff.* 2010;29(7): 1338-1342.
 20. Brownstein JN, Chowdhury FM, Norris SL, et al. Effectiveness of community health workers in the care of people with hypertension. *Am J Prev Med.* 2007;32(5):435-447.
 21. Osuji T, House M, Mirambeau A, Elmi J. *Implementation Guide for Public Health Practitioners: CHT Implementation Guide*. Web site. http://www.cdc.gov/dhds/evaluation_resources.htm. Published 2014. Accessed December 3, 2014.
 22. Mirambeau AM, Wang G, Ruggles L, Dunet DO. A cost analysis of a community health worker program in rural Vermont. *J Community Health.* 2013;38(6):1050-1057.
 23. Institute of Medicine. *A Population-Based Policy and Systems Change Approach to Prevention and Control of Hypertension*. Washington, DC: National Academies Press. Web site. http://books.nap.edu/openbook.php?record_id=12819&page=R1. Published 2010. Accessed December 1, 2014.
 24. Walsh JM, McDonald KM, Shojania KG, et al. Quality improvement strategies for hypertension management: a systematic review. *Med Care.* 2006;44(7):646-657.
 25. Coleman K, Austin BT, Brach C, Wagner EH. Evidence on the Chronic Care Model in the New Millennium. *Health Aff.* 2009; 28(1):75-85.
 26. Martinez J, Ro M, Villa NW, Powell W, Knickman JR. Transforming the delivery of care in the post-health reform era: What role will community health workers play? *Am J Public Health.* 2011;101(12):e1-e5.
 27. Viswanathan M, Kraschnewski J, Nishikawa B, Morgan LC, Thieda P, Honeycutt A. *Outcomes of Community Health Worker Interventions*. Evidence Report/Technology Assessment No. 181. AHRQ publication 09-E014. Rockville, MD: Agency for Healthcare Research and Quality; 2009.

Author Biographies

Jan L. Losby, PhD, MSW, is a Behavioral Scientist at the Centers for Disease Control and Prevention, Division for Heart Disease and Stroke Prevention.

Marnie J. House, EdD, MPH, is a Senior Technical Specialist at ICF International.

Thearis Osuji, MPH, is a Manager at ICF International.

Sarah Abood O'Dell, MPH, is a Manager at ICF International.

Alberta M. Mirambeau, PhD, MPH, CHES, is a Health Scientist at the Centers for Disease Control and Prevention, Division for Heart Disease and Stroke Prevention.

Joanna Elmi, MPH, is a Health Scientist at the Centers for Disease Control and Prevention, Division for Heart Disease and Stroke Prevention.

Eileen Chappelle, MPH, is a Health Scientist at the Centers for Disease Control and Prevention, Division for Heart Disease and Stroke Prevention.

Dara F. Schlueter, MPH, is a Senior Associate at ICF International.