

BARRIERS, SUCCESSES, AND PROVIDER PRODUCTIVITY
IN A MEDICAL HOME DEMONSTRATION PROJECT
IN TWO PORTLAND-AREA SAFETY NET CLINICS

By

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Abstract

In 2007 CareOregon implemented a medical home demonstration project called Primary Care Renewal (PCR) in several Portland-area safety-net clinics. The PCR intervention consists of six components: patient-centered care, team care delivery, proactive panel management, open access scheduling, integrated behavioral health, and intentional evaluation and change using PDSA cycles. This mixed-methods study used quantitative methods to evaluate the effect of PCR on provider productivity and qualitative methods to evaluate barriers and successes in implementation of PCR in two family medicine clinics. Pre- and post-intervention panel data was used to create multivariable models analyzing the effect of PCR on total monthly patients seen and total monthly relative value units accumulated by each provider (n=8). This quantitative analysis found that PCR was associated with a non-significant increase in the productivity of the two pilot providers (visits/month p-value=0.458, RVUs/month p-value=0.075). PCR was associated with a downward trend in productivity for six later starting providers (visits/month p-value=0.901, RVUs/month p-value=0.307). Each care team participated in a group interview to discuss barriers and successes in implementing the six components of PCR. This qualitative analysis found distinct differences among the care teams, specifically differences in team knowledge, support, leadership, and teamwork. These findings indicate that a team with these qualities can succeed both in implementing all the PCR components and increasing productivity.

Introduction

Poor Quality Healthcare in the U.S.

Since 1979 the U.S. Department of Health and Human Services (DHHS) has identified poor quality healthcare as a national concern. The Institute of Medicine found that, “during the last decade alone, more than 70 publications in leading peer-reviewed journals have documented serious quality shortcomings”¹. In 2000, a DHHS taskforce developed Healthy People 2010, “a comprehensive, nationwide health promotion and disease prevention agenda” with the goals of 1) increasing quality and years of life and 2) eliminating health disparities². A study of the Veteran’s Affairs population found that patients receive about half of recommended care³ and among the remarkably low proportion of those who do receive recommended care, disparities exist by sex, age, race or ethnicity, and income⁴. Despite almost universal access to primary care in most other industrialized countries, “socially deprived population subgroups [in the United States] are more likely than more advantaged people to lack a regular source of care”⁵. The Health Care Quality Survey conducted by The Commonwealth Fund in 2006 found that patients who seek care at community health centers are less likely than those who use private doctors’ offices to receive high quality care. These patients are more likely to be uninsured, low-income and racial or ethnic minorities⁶. Poor quality healthcare is a concern even for populations with consistent access to care, such as veterans, and is an even greater problem among socially disadvantaged groups.

Call for quality improvement by many organizations

Evidence of poor quality healthcare in the U.S. is a concern to many healthcare-related organizations. In addition to the DHHS Health People 2010 report, many professional

and government advising groups have investigated the quality of healthcare in the United States and made recommendations for changes in healthcare to address the poor quality.

Institute of Medicine- Crossing the Quality Chasm

In 2001, the Institute of Medicine published *Crossing the Quality Chasm*, “a call for action to improve the American health care delivery system as a whole, in all its quality dimensions, for all Americans”¹. This landmark report highlights “the absence of real progress toward restructuring health care systems to address both quality and cost concerns”¹ and calls for major change in healthcare delivery based on a commitment to six aims for improvement. Within this framework, healthcare should be:

- Safe- avoiding injuries to patients from the care that is intended to help them;
- Effective- providing services based on scientific knowledge to all who could benefit and refraining from providing services to those not likely to benefit;
- Timely- reducing waits and sometimes-harmful delays for both those who receive and those who give care;
- Patient-centered– providing care that is respectful of and responsive to individual patient preferences, needs and values and ensuring that patient values guide all clinical decisions;
- Efficient – avoiding waste, including waste of equipment, supplies, ideas and energy; and
- Equitable – providing care that does not vary in quality because of personal characteristics such as gender, ethnicity, geographic location and socioeconomic status¹.

Future of Family Medicine

Many groups have responded to the IOM's call for improved quality. In 2004, the Future of Family Medicine report was published by seven family medicine organizations and marks family medicine as a major player in the improvement of healthcare in the United States (Martin et al., 2004). This report developed a "New Model" of practice for family physicians. The model lists characteristics of the ideal family medicine practice including a personal medical home, patient-centered care, team approach, elimination of barriers to access, advanced information systems, redesigned offices, whole-person orientation, care provided within a community context, emphasis on quality and safety, enhanced practice finance, and a commitment to provide family medicine's basket of services ⁷.

The recommendations established by the Institute of Medicine report and the Future of Family Medicine report have been embraced by many primary care practices as a framework for improved care delivery. Not surprisingly, practical system-level changes are easier to implement and measure than more philosophical recommendations. The most commonly reported changes include integration of health information technology, open access scheduling, and chronic disease management ⁸. Literature searches indicate that open access scheduling is the most extensively studied intervention ^{9; 10,11,12} with reports of major quality improvement including drastic decrease in wait time for an appointment, increased continuity of care, increased preventive and chronic health care delivery, increased patient satisfaction, and increased provider satisfaction even with just

this one intervention. Although one or two interventions may seem more feasible than attempting to adhere to all the recommendations, achievement of the quality improvement recommendations will require multiple changes in most practices.

Patient-Centered Medical Home- A concept for the future of Primary Care

Forty-year-old Concept

The Patient-Centered Medical Home is a concept that addresses the need for multi-level change in health care delivery. In March 2007, a joint commission from the American Academy of Family Physicians (AAFP), the American Academy of Pediatrics (AAP), the American College of Physicians (ACP), and the American Osteopathic Association (AOA) proposed the Patient-Centered Medical Home (PCMH) as a foundation for healthcare reform. This model is built on the historic medical home concept first developed by the AAP in the 1960s to improve the health management of children with special healthcare needs and was expanded in a 2004 policy statement to include: accessible, continuous, comprehensive, family-centered, coordinated, compassionate, and culturally-sensitive care¹³. The principles set out under the PCMH model include:

- A personal physician
- Physician-directed, team delivered medical practice
- Whole-person orientation
- Coordinated, integrated care
- Quality and safety
- Enhanced Access
- Adequate Payment

¹⁴. Under these principles, the PCMH involves a “physician-led integrated team of healthcare professionals providing coordinated acute, chronic, preventive and end-of-life care facilitated by information technology tools and based on a foundation of safety and quality improvement” ¹⁵.

Does it Work? The Commonwealth Fund Report

Clinics building medical homes using these principles strive to deliver comprehensive, coordinated, and continuous care to their patients. The Commonwealth Fund Health Care Quality Survey defines a medical home as “a health care setting that provides patients with timely, well-organized care and enhances access to providers” and found that respondents with medical homes report four features:

1. A regular provider or place of care;
2. No difficulty contacting his or her provider by phone;
3. No difficulty getting care or advice on weekends or evenings;
4. Office visits are always well organized and on schedule. ⁶.

The investigators report that health disparities decrease and sometimes disappear altogether for patients who receive healthcare from a medical home. This study also shows that community health centers and free clinics are less likely to have attributes of a medical home ⁶.

As demonstrated by the multiple definitions of a medical home discussed above, there is no universal definition in use. Although global agreement of what a medical home is may be important for legislation and health care reform, perhaps more important is

recognition that all of these definitions point back to the Institute of Medicine's call for quality improvement and build on the six aims.

CareOregon Builds a Patient-Centered Medical Home

History of CareOregon

CareOregon is a not-for-profit managed care health plan that serves people with Oregon Health Plan benefits (Medicaid) in Oregon. CareOregon was established in 1993 by a partnership of safety-net providers including Multnomah County Health Department, Oregon Primary Care Association, and Oregon Health & Science University. The health plan opened with 9,500 members in 14 counties in Oregon and currently serves over 100,000 members in 17 counties. CareOregon reports “53% of members receive care from contracted safety net providers who also serve an additional 60,000 uninsured individuals annually”¹⁶. Because CareOregon recognizes that not all low-income Oregonians are eligible for the Oregon Health Plan, CareOregon “is committed to strengthening this vital health care delivery system to assure that they have the funding and infrastructure to expand services and effectively address the needs of uninsured and underinsured Oregonians”¹⁶.

Building a Medical Home- Following Southcentral Foundation's Lead

As part of its commitment to improve the quality of healthcare delivered to uninsured and underinsured patients, CareOregon implemented a system-wide care management program in 2003 to improve health outcomes and decrease costs for patients with chronic disease. Although the care management program has had positive outcomes, CareOregon decided to expand this program to reach as many patients as possible. In 2007, CareOregon implemented a quality improvement funding initiative partnering with

participating clinics to improve the quality of healthcare for all patients¹⁷. This initiative, called the Care Support and System Innovation Program (CSSI), is based on Southcentral Foundation's Native-led redesign of primary care at Alaska Native Medical Center. The Alaska redesign was based on three key concepts: shared responsibility, commitment quality, and family wellness. Using these concepts, "the entire system was built around a whole person, whole family, integrative approach" and "every family had a clearly identified medical home . . . and that medical home did everything possible to fit into the family life/health journey"¹⁸.

CareOregon's CSSI Program established the goal "to foster a culture of evidence-based practice and continuous improvement in CareOregon provider organizations, helping to empower providers over time with the skills, knowledge and resources to be able to create the substantial change necessary to meet IOM goals"¹⁹. The CSSI program has four funding categories: ambulatory care-based projects, hospital-based care projects, innovation projects and projects solicited by CareOregon¹⁷. Ambulatory care funding requires a whole system primary care redesign known as Primary Care Renewal (PCR) that focuses on "improving the lives of significant populations of CareOregon members and other patients"¹⁹.

Primary Care Renewal-A Five Concept Intervention

In fall 2006 CareOregon sent a grant requisition to Oregon community health centers serving a significant portion of CareOregon patients. This grant requisition solicited applications to participate in a program called Primary Care Renewal (PCR). The goal of PCR is to help the community health clinics redesign their primary care delivery systems in order to improve the quality and decrease the cost of care. PCR relies on a multi-

concept intervention with five components that directly affect the way care is delivered and a sixth component that involves continuous process improvement. CareOregon provided training on the following PCR concepts for leadership staff from each participating clinic, as well as training on process improvement and team development for pilot care teams and process improvement coaches from each clinic.

1. Customer-Driven Care- The ultimate goal of primary care renewal is to create a patient-centered model of care. Patient-centered care requires patient involvement in designing the care delivery system. This component includes patient focus groups, satisfaction surveys, and developing methods to ensure patient choice and patient-centered decision making. Community health centers designated as federally qualified health centers (FQHCs) are governed by boards consisting of more than 50% patient-members. Each clinic chosen to participate in PCR first presented the idea of PCR to the patient-board for approval. Additionally, focus groups were held with patient board members as well as other patients to gather information about how patients would like to receive care. Patient satisfaction surveys are used to evaluate the effect of patient-centered changes.

2. Team Care Delivery- Each clinic reorganized staff into care teams. A care team consists of clinicians (physicians, nurse practitioners, and physician’s assistants), a case manager, medical assistants, a behaviorist, and an administrative assistant. Each team cares for a defined panel of patients based on patient-chosen primary care provider (PCP) assignment. This process is called “empanelment.” One goal of team care delivery is to

redistribute work that was previously done primarily by clinicians, but which does not require clinician-level training. Team care requires that each team member work at the top of his or her license, allowing clinicians to spend more time on patient care. Case managers work directly with patients who have complex medical and social needs. This role is filled by nurses in some clinics and by social workers in other clinics. Several medical assistants are assigned to each team and are trained to help clinicians determine what needs to be done for each patient visit, functioning independently to determine patient room set-up needs based on the pre-determined care plan. A behaviorist works with each team to provide both pre-determined behavioral health care as well as spontaneous short behavioral interventions for situations that arise during a visit. The administrative assistant, or team assistant, organizes patient referrals and handles most written communication with patients and referral providers. Each team member contributes significantly to patient care and patients interact with the same team members on each phone call and patient visit. Through consistent team care delivery, patients build relationships with the whole team, not just the clinician, and identify all team members as partners in the health care delivery system.

3. Proactive Panel Management- The panel is the group of patients assigned to a particular primary care provider. Panel management first requires intentional “empanelment” of all patients and families, a process in which patients select an assigned primary care provider (PCP). The team assistant contacted patients assigned to the clinicians on that team according to the patient record. The team assistant explained the idea of empanelling whole families together with the same provider. This process

allowed patients to identify a preferred provider and empanel whole families together with the same PCP. Empanelment supports team care delivery so that patients ideally will always have appointments for their assigned providers or another provider on the same team if the assigned provider is not available.

Once empanelment is complete, providers proactively manage their panels on individual and population levels. The team can anticipate health maintenance needs for each patient through a process called “scrubbing.” Before each clinic day the team goes through the chart for each patient on the appointment schedule to identify preventive health tasks (i.e. immunizations, vision screening, pap smear) that are due. The team creates a plan to incorporate these tasks into the visit, called “max-packing” the visit, which reduces the need for return visits. Scrubbing also identifies scheduled physician visits that might be better managed by another team member or more efficiently with a phone call instead of an in-office visit.

Proactive management also involves identification of patient populations with specific health maintenance needs through the use of a patient health registry. For example, the registry identifies all patients with diabetes and the team assistant contacts all of those patients who need a foot exam. Proactive panel management also helps teams to track health outcomes. Using the patient registry, the team collects panel data on measurable health indicators to use in evaluation of proactive management.

4. Same Day Access- This PCR component requires adoption of open access scheduling, a concept that intentionally removes barriers to communication and promotes same day appointments. Each team has a direct phone line for patients to call for scheduling and other needs. Often patient needs do not require a face-to-face visit with a physician and can be managed over the phone by another team member. If the patient needs an appointment, the team can schedule the appointment for the same or next day. Open access should decrease no-show rates and emergency department use for non-urgent services by providing appointments on the day the patient wants to be seen with his or her assigned provider.

5. Integrated Behavioral Health- Each team will include a behavioral health specialist to integrate short behavioral interventions into primary care services. Each clinic is working to create a billing/reimbursement method for patient visits with the behaviorist. During chart scrubbing, the behaviorist helps identify patients that might need behavioral care and incorporates this care into the visit plan. The behaviorist also is available for brief interventions if the provider identifies an issue during a visit that might be handled well by the behaviorist. In a process called a “warm handoff,” the provider can introduce the patient to the behaviorist, promoting immediate access to behavioral health care. This model recognizes that primary care often involves both lifestyle medicine and mental healthcare. Although primary care providers often manage these issues, behavioral health specialists are better trained to do so, allowing clinicians more time to provide primary care. By integrating behavioral healthcare into primary care, access and stigma around mental health are decreased improving behavioral health outcomes.

6. Plan-Do-Study-Act- The PCR intervention also includes an overall commitment to process improvement and excellence. CareOregon provided training for dedicated Process Improvement leadership staff from each clinic, as well as for the pilot care teams, on the Plan-Do-Study-Act (PDSA) change method²⁰. Using the PDSA method, care teams identify improvements they want to make related to the five PCR concepts and try small changes over a short period of time (a “cycle”) with simple outcome measures. Over time, each cycle builds on the previous cycle until a particular improvement outcome is satisfactory to the team. Through PDSA, each care team is able to tailor PCR components into methods that work best for that team, recognizing that different teams have different work-flow styles.

Medical Home Productivity

Reimbursement for Medicare and uninsured patients at federally qualified health centers is based on a standard rate per visit. The clinic boards and some providers at the PCR clinics are concerned that implementing such a complex practice redesign would limit patient visits and provider productivity, and thus reduce reimbursement and clinic income. Sustainability of practice re-design would certainly depend on maintaining or improving provider productivity and reimbursement. The PCR lead administrators at each clinic argue just the opposite: by redistributing clinic work to other team members, providers have more time to spend on direct patient care. Although max-packing visits may initially result in longer patient visits, eventually providers will catch up on past-due preventive and chronic health care tasks, allowing these tasks to be accomplished in a more pro-active, efficient manner. Additionally, max-packing will eliminate multiple

follow-up visits for individual patients, increasing the number of unique patients one provider can see. Thus, PCR should maintain or increase provider productivity as measured by patient visits and relative value units (RVUs).

Provider productivity is most commonly measured by RVUs, a standardized measurement assigned to specific clinical services “intended to reflect the relative time required to perform the service; technical skill and physical effort; mental effort and judgment; and psychological stress associated with the physician’s concern about iatrogenic risk to the patient ²¹. The Centers for Medicare and Medicaid Services evaluate common clinical services and tasks for the elements listed above and assign a relative value unit to each service or task. The time, effort, judgment, and stress required varies among these services; a service requiring less time than another service would have a lower RVU relative to the other service. RVUs are evaluated annually and some services undergo a small inflation in January every year to reflect changes in each of the elements for which each service is evaluated ²². Using RVUs as a measure of provider productivity depends on providers billing their clinical services correctly. Complete patient encounters or visits are another method to evaluate provider productivity. Patient visits do not reflect intensity or number of problems addressed in the visit, but measurement of visits completed is likely to be more accurately recorded than RVUs.

Comprehensive medical home demonstration projects are quite new and little research exists as it relates to provider productivity. A quasi-experimental study evaluating the effect of a care management intervention, similar to the proactive panel management

component of PCR, on provider productivity in a large integrated health care delivery network reports an 8%-12% increase in RVUs after the intervention²³. However, the increase in productivity in PCMHs may not be adequately measured by RVUs or visits completed because of the many services provided by PCMHs that are not recognized as billable services, i.e. telephone and email consults, care management services, coordination of care, etc. This also means that current reimbursement models do not adequately value all of the services provided by a PCMH. Despite this inaccuracy, financial sustainability of such a model currently relies on maintaining provider productivity and related clinic reimbursement.

Study Purpose

Sustainability has multiple components; this study examines provider productivity and the care teams' experience in implementing PCR. This quality improvement initiative attempted to fulfill the Institute of Medicine's six aims, is unique in its breadth of system change and is likely to affect many components of the system. Provider productivity, defined as monthly RVUs and total number of visits completed, directly relates to reimbursement and clinic income. The PCR clinics are very interested in evaluating the effect of PCR on provider productivity to help determine the fiscal sustainability of the intervention. Additionally, such a complex intervention must be sustainable on a practical level. The experiences of the providers and other care team staff are critical in the evaluation of the sustainability of PCR as an ongoing intervention in these clinics as well as to inform future implementation of PCR and other process improvement programs. A mixed-methods design allows qualitative and quantitative analyses to inform each other throughout the study process.

Research Questions

1. Does Primary Care Renewal affect the number of patient visits and RVUs completed by providers on pilot and later starting teams? Based on the preceding argument that re-distribution of clinic work will allow providers to focus on direct patient care, I expect patient visits to remain the same and RVUs to increase.
2. What are the barriers and enhancements to implementing Primary Care Renewal? Although PCR has been described on paper, the actual implementation may vary greatly depending on barriers and enhancements experienced by each care team.

Methods

Study Design

This study used a mixed-methods design with both quantitative and qualitative data²⁴ to evaluate the effect of CareOregon's quality improvement initiative "Primary Care Renewal" (PCR) on provider productivity and to characterize the process and experience of care team members in implementing PCR in two federally qualified health centers (FQHCs) in the Portland area. Quantitative data were collected from the billing system at one community clinic and one university clinic on two productivity measures for each provider (n=27) including clinical RVUs accumulated per month and number of visits completed per month (visits) from January 2006 through April 2008 (t=28 months). At the community clinic, data was collected for 2 pilot providers and 8 later starting providers. PCR was implemented in March 2007 for the community pilot providers, with 14 months of data prior to implementation and 14 months of data post-implementation. PCR was implemented in November 2007 for the community later starting providers, with 22 months of pre-implementation data and 6 months of post-implementation data. Quantitative data analysis was done using STATA 10.1 statistical software package²⁵. The qualitative portion of the study involved a group interview with each care team (n=5 teams) to discuss PCR from their perspective. This analysis will focus on both the effect of PCR on clinical productivity and the process and experience of team members in the implementation of PCR. The study protocol was reviewed and approved by the Oregon Health & Science University institutional review board.

Study Sites

Community Family Medicine Clinic

The Community Family Medicine Clinic was founded in 1975 in Cornelius, Oregon by community leaders in the Latino and medical communities in reaction to the death of a Latina child due to the unavailability of culturally and language appropriate medical services²⁶. This clinic was eventually designated as a federally qualified health center (FQHC) in Washington County, Oregon serving primarily suburban and rural Latino patients²⁷. Eleven clinicians serve the clinic, including six physicians, three family nurse practitioners, one physician's assistant, and one naturopathic physician. These providers completed 12,736 patient visits in 2006. Currently the patient population served by the clinic is approximately 80% Latino, the majority of whom are Mexican or Mexican American²⁸.

University Family Medicine Clinic

The University Family Medicine Clinic was built as a community family medicine residency-training center in an economically diverse neighborhood in southeast Portland in 1995. This clinic became an FQHC-Look Alike in 2004 allowing it to provide care for a larger population of uninsured, Medicaid, and Medicare patients. Southeast Portland is home to a large and culturally diverse immigrant population including Russian, Latino, Chinese, and Southeast Asian families. The clinic serves patients ranging from the newborn to the elderly²⁹. In 2007-2008, 23 clinicians, including ten physicians, two physician's assistants, two family nurse practitioners, and nine resident-physicians, served the university clinic. They completed 15,617 patient visits during this time.

Quantitative Methods

Participant Selection

Two of the five PCR clinics were invited to participate based on interest in the study and affiliation with the academic institution. Providers were the primary unit of analysis, including physicians (MD), physician’s assistants (PA), and nurse practitioners (NP). At the community clinic (Table 1), data was collected on providers working between January 2006 and March 2008 (27 months). The community clinic pilot team, consisting of one MD and one NP, implemented PCR in March 2007. The three remaining care teams at the community clinic (here called “later starting teams”) implemented PCR in November 2007. Of these three later starting teams, one team had two MDs and one NP, another team included two MDs and one PA, and the final team had one MD and one NP, for a total of eight later starting providers.

Table 1. Community Clinic Teams and Providers		
Start Time	Team	Providers
March 2007	Pilot Team	1 MD, 1 NP
		Pilot Total Providers = 2
November 2007	Later Starting Team	2 MDs, 1 NP
November 2007	Later Starting Team	2 MDs, 1 PA
November 2007	Later Starting Team	1 MD, 1 NP
		Later Start Total Providers = 8

At the university clinic (Table 2), data was collected on providers working between January 2006 and April 2008 (28 months). The university pilot team implemented PCR in January 2007 and included one MD, one PA, and three resident physicians (not included in this study). At the university clinic the three remaining care teams (“later starting teams”) did not implement PCR until after the study period.

Table 2. University Clinic Teams and Providers		
Start Time	Team	Providers*
January 2007	Pilot Team	1 MD, 1 PA
		Pilot Total Providers = 2
June 2008	Later Starting Team	2 MDs, 1 PA
June 2008	Later Starting Team	4 MDs, 1 FNP
June 2008	Later Starting Team	2 MDs, 1 FNP
		Later Start Total Providers = 11

*Each University clinic team also has three resident physicians. Not listed because not included in study.

Providers who became employed at the clinics after PCR was implemented or who took more than two consecutive months leave of absence were excluded from the quantitative analysis. The resident physicians at the university clinic were excluded due to factors inherent in resident training that could not be controlled in the analysis. The later starting teams at the university clinic did not implement PCR until after the study period, leaving only one pilot provider eligible for the quantitative analysis. Ultimately, all of the university clinic data was excluded for small sample size (n=1).

The remaining community clinic data were analyzed as two populations: the pilot providers (n=2) and the later starting providers (n=6). These distinctions were chosen based on differences in the PCR intervention between the two different groups within the community clinic that were identified through qualitative analysis. The qualitative data revealed differences in training, leadership, and administrative support that suggested these two groups should be treated as separate populations in quantitative analysis.

Predictor Variables

Data on multiple covariates with potential to influence provider productivity were available for quantitative analysis. Provider-related covariates tested during model building include provider gender, provider years in practice (starting with first year of residency), provider care team, and provider position (physician, physician's assistant, or nurse practitioner). Patient-related covariates were measured with monthly aggregate data for each provider including patient gender, insurance status (Medicaid, Medicare, private insurance, or uninsured/self-pay), and age by clinically appropriate age-ranges (<18 years, 18-40 years, 40-65 years, and >65 years old). Patient-related covariates were tested as ratios of the proportion of each variable. For example insurance status was calculated as the proportion of each provider's panel with a particular insurance type (listed above). Then ratios were created for each category relative to the proportion of uninsured patients. Patient race and ethnicity was not included as a covariate due to inaccurate (not self-report) and incomplete recording of this measure in the billing system. After models were built to explain provider productivity using the available covariates described above, the primary predictor variable, absence or presence of the PCR initiative, was added to the model. An additional explanatory variable was incorporated into the models with RVUs as the primary outcome to account for annual inflation of RVUs, as explained below.

Outcome Variables-Measures of Productivity

In this study two outcome variables were tested: RVUs and number of visits completed. Each outcome variable was measured on a monthly basis for each provider. To account for monthly work hour variability due to vacation and personal leave time, monthly outcome data were adjusted by monthly clinical Full-Time Equivalents for each provider.

Also, both outcome measures were analyzed on a square-root scale to reduce the large variation found in the data. Observations from the two months prior to and the two months after PCR implementation were dropped to account for variation during this transition period.

Analysis

Data were organized as a series of "panels," with one panel for each provider. Data within each panel consisted of monthly measurements of various characteristics of interest.

Analyses were performed using STATA 10.0, which has specialized functions for panel data (xtreg, xtregar). Univariate analyses consisted of using these panel methods applied separately to individual providers to compare outcomes pre- and post-intervention.

Multivariable models included other potential covariates (i.e. provider experience, patient age) and treated the collection of providers as a random effect; models assumed correlation of measurements over time was autoregressive (lag 1). For each group (pilot team or later starting teams) a model was built to explain the effect of expected covariates on each outcome measure. Model building started with all possible covariates and in a step-wise fashion, eliminated covariates based on least significance of the associated test statistic. Once a baseline model was established with significant covariates, a variable accounting for the absence or presence of PCR was added to each model and evaluated for a significant effect.

Qualitative Methods

Data Collection

Qualitative data were collected in a semi-structured group interview³⁰ with each care team for a total of five group interviews. All team members (providers, case managers, team assistants, medical assistants, nurses, and behavioral health specialists) were invited

to participate in the interview together. The interviews were conducted by an MPH student-researcher during pre-scheduled team meetings either in a conference room (at the community clinic) or in the team room (at the university clinic). At the community clinic the pilot team was 15 months post-intervention and the three later starting teams were 7 months post-intervention at the time of their interviews. The university pilot team was 17 months post-intervention. Group size ranged from four to eight team members. Due to scheduling differences, not every team member was able to participate in an interview.

A set of 17 open-ended questions in an interview guide (see Appendix 1) was used to prompt discussion among the team members and additional spontaneous topics were incorporated into the discussion. The questions covered the topics of the purpose of PCR, intentional change methods, the five components of PCR, challenges, successes, and surprises in PCR, and Institute of Medicine's Six Aims for Quality Improvement. The interviews lasted from 30 to 45 minutes each and were digitally audio-recorded and transcribed verbatim by the student researcher. Each participant was identified by role on the team, but not by name.

Qualitative Analysis

Both inductive and deductive methods were used to analyze the qualitative data.

Deductive analysis used a framework approach (*Pope 2000*) to apply the thematic framework of barriers and enhancements within the five components of PCR previously identified in the study objectives to the data. Inductive methods, following grounded theory (*Charmaz 2000; Pope 2000*), helped to derive analytical categories that emerged

from the data. Seven categories were identified including culture of change, staff and patient education, physical environment, individual attitude, available personnel, time, and clinic systems. The transcribed data was coded using in-vivo or open coding to identify themes and theme development³⁰. Within each of the five components of PCR these themes were used to identify barriers and enablers to PCR implementation. Finally, themes were analyzed for trends within and between the two different clinics, different team member roles, and pilot versus control teams.

Quantitative Results

Descriptive Statistics

Eight providers from the community clinic met inclusion criteria for the study. Among the community clinic providers, the pilot team data was analyzed separately from the later starting teams due to differences in the implementation of the PCR intervention between these groups. As found in the qualitative analysis, the later starting teams differed from the pilot team in training, leadership, and administrative support. The university clinic was not included in the quantitative analysis because the later starting teams did not implement the PCR intervention until after the data collection period was complete. Of the providers on the university pilot team only one met inclusion criteria, leaving n=1, which does not provide a large enough panel to provide statistical power.

Of the eight providers included in the final analysis, two were pilot team providers and six were later starting providers. There were five physicians and three nurse practitioners among the community providers. No physicians' assistants were practicing at the community clinic during the entire study period. As shown in Table 3, the pilot team providers averaged 14 years in practice and both providers were female. The patient panel of the pilot providers was 65% female, 57% were children (0 to 20 years old), 3% older adults (>65 years old), 50% were Medicaid recipients and 42% were uninsured. The later starting providers averaged 19.52 years in practice, 285.62 visits per month and 279.9 RVUs per month. Their patients were 63% female, 49 % children (0 to 20 years old), 7% older adults (>65 years old), 44% Medicaid recipients and 41% uninsured.

Table 3. Community Provider Descriptive Statistics		
Community Clinic	Pilot Providers (n=2)	Later Providers (n=6)
Provider Type		
%MD	50	66
Months Observed	27	27
Variable	Mean	Mean
Provider Characteristics		
Mean Years in Practice (SE)	14.00 (1.0)	19.52 (0.73)
% Female	100	80
Patient Characteristics		
%Female	65	63
<i>Age Group</i>		
% Children	57	49
% Young Adult	27	23
% Middle Adult	13	21
% Older Adult	3	7
<i>Insurance Type</i>		
% Medicaid	50	44
% Medicare	3	9
% Private	6	6
% Uninsured	42	41

Univariate Analysis

The univariate analysis compared the mean outcome before the PCR intervention to the mean outcome after the PCR intervention for both pilot and later starting provider groups and also for each individual provider (Appendix 2). Below, figures 1-4, represent univariate analysis by group and then by individual providers. In these figures, solid points represent the mean response (square-root scale); vertical lines extending from each solid point represent one standard error of the mean on this transformed scale. On

average, pilot providers increased visits and RVUs after PCR was started both individually and as a group, though this change was not statistically significant (see Figures 1-4). As a group, later starting providers decreased visits and RVUs on average after PCR started (see Figures 1-2), whereas individually, later starting providers showed varying patterns in change (see Figures 3-4). None of the trends found in univariate analysis were statistically significant.

Figure 1. Average Visits per Month by Provider Group

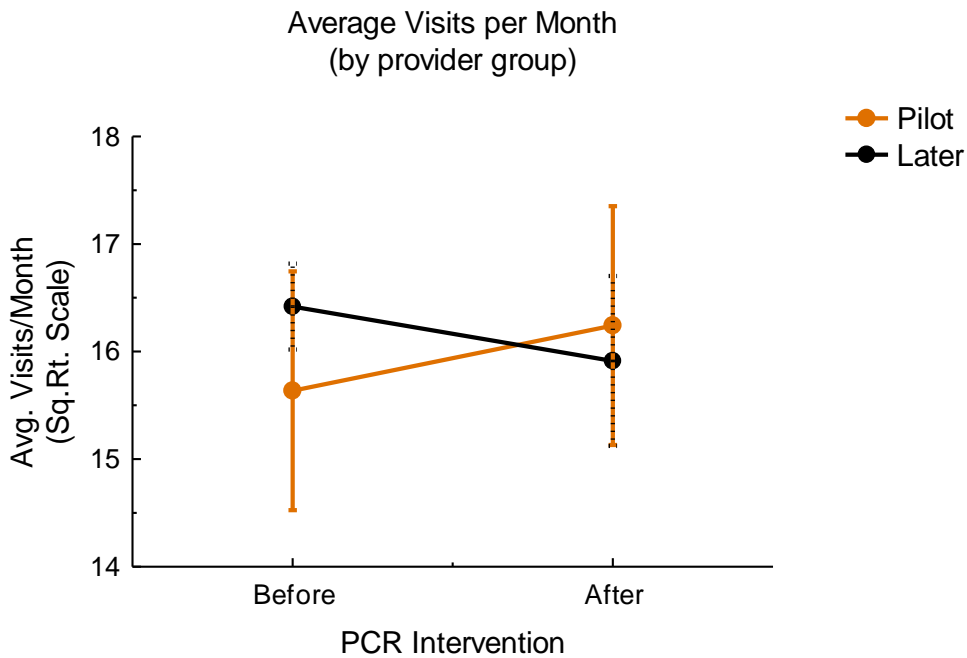


Figure 2. Average RVUs per Month by Provider Group

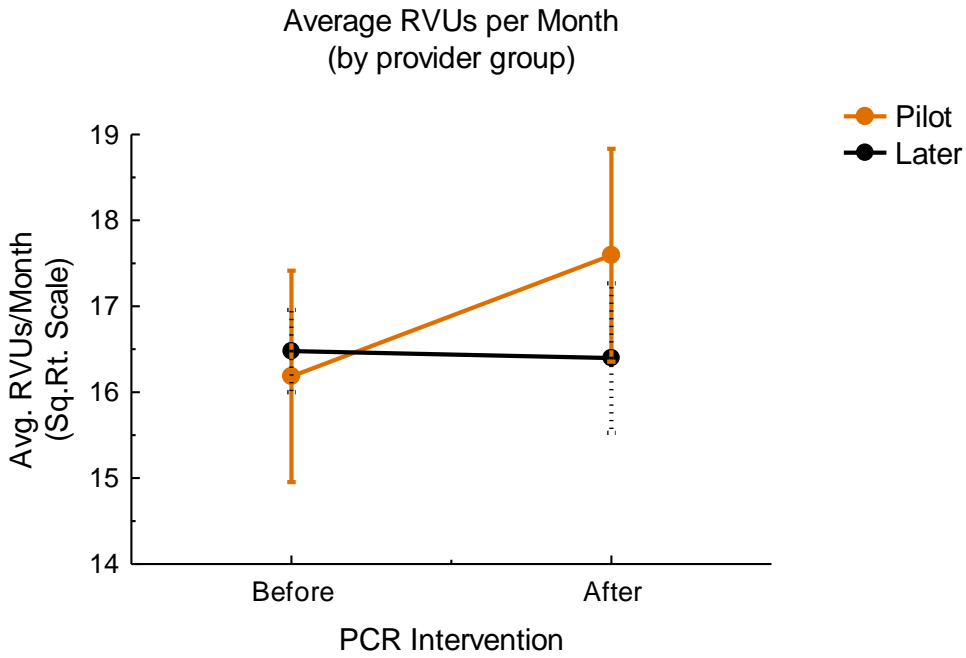


Figure 3. Average Visits per Month by Individual Provider

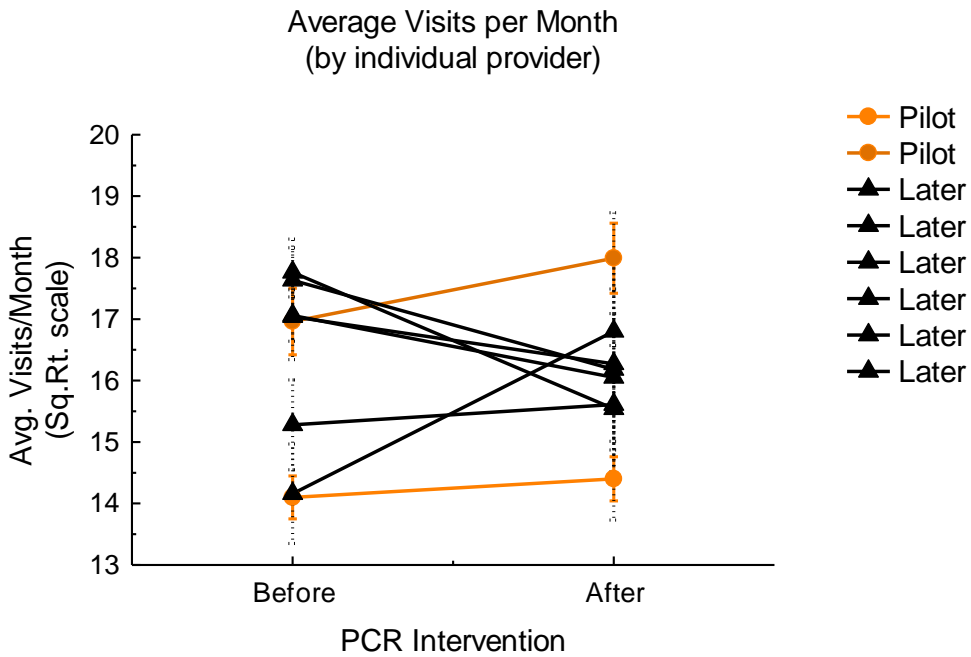
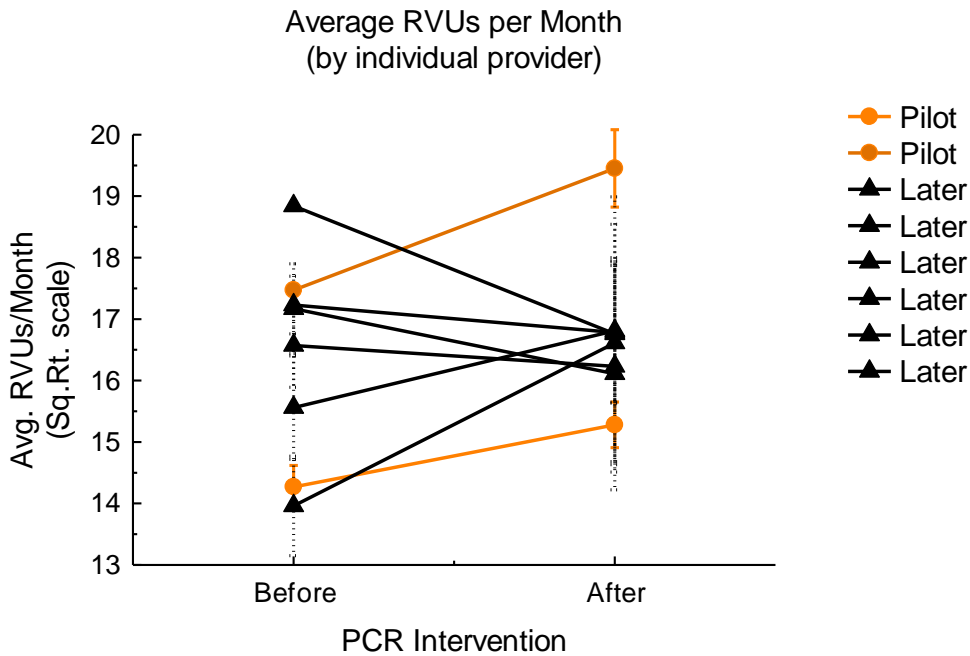


Figure 4. Average RVUs per Month by Individual Provider



Multivariable Model

In model building, provider gender, professional role, years in practice, patient age distribution, patient insurance status distribution, and patient gender distribution were tested for influence on monthly patient visits and monthly RVUs. The RVU models also included a variable to account for annual RVU inflation. Both outcome measures were tested on a square root scale of each measure to stabilize the variance found in both measures. The raw output on the square root scale is reported in tables 4-5 & 8-9. These numbers are back-transformed by squaring the raw output in order to improve interpretability, as shown in tables 6-7 & 10-11. The mean of the square-root transformed data estimates the median effect upon back-transformation³¹. As described above, the pilot providers were treated as a separate population from the later starting providers due to differences in training, leadership, and administrative support between these two groups as identified in the qualitative analysis.

Pilot Providers

Only years of practice were found to affect significantly the outcomes for the pilot team providers. On the square-root scale, mean visits (Table 4) increased 1.62 units (95% CI: 0.9—2.3) for each additional year of practice ($p < 0.001$) while PCR intervention was found not to have a significant effect ($p = 0.458$). Similarly, on the square-root scale, mean RVUs (Table 5) increased 1.84 (95% CI: 1.07-2.62) for each additional year of practice ($p < 0.001$) while the PCR intervention was found not to have a significant effect ($p = 0.075$). Additionally, RVU inflation was included in the RVU model and is estimated to increase RVUs per month by 1.41 (95% CI: -0.14-2.97, $p = 0.075$).

Table 4. Pilot provider results: Visits per month on square-root scale				
Pilot Providers		95% Confidence Interval		P-Value
	Visits/Month*	Minimum	Maximum	
Years of Practice	1.62	0.90	2.33	<0.001
PCR Intervention	0.61	-1.00	2.21	0.458

*Mean response on square-root scale estimated for a provider with 14 years of practice working 1.0 FTE before PCR or RVU inflation was implemented.

Table 5. Pilot provider results: RVUs per month on square-root scale				
Pilot Providers		95% Confidence Interval		P-Value
	RVUs/Month*	Minimum	Maximum	
Years of Practice	1.84	1.07	2.62	<0.001
RVU Inflation	1.41	-0.14	2.97	0.075
PCR Intervention	1.41	-0.14	2.97	0.075

*Mean response on square-root scale estimated for a provider with 14 years of practice working 1.0 FTE before PCR or RVU inflation was implemented.

Before the PCR intervention, the median number of visits per month for a pilot provider with 14 years of practice experience working 1.0 FTE is estimated to be 250.10 visits per month (95% CI: 228.01-273.2). After intervention, the median number of visits per month is estimated to be 259.87 (95% CI: 223.90-298.51). This effect is not significant

(p=0.458) (Table 6). Similarly, before intervention, the median number of RVUs per month for a pilot provider with 14 years of practice experience working 1.0 FTE is estimated to be 274.72 RVUs per month (95% CI: 255.61-294.51). After intervention, the median number of RVUs per month is estimated to be 298.75 (95%CI: 261.19-338.83). Although there is a trend towards an increase in RVUs, this effect only approaches significance (p=0.075) (Table 7).

Table 6. Pilot provider results: Visits per month on original scale			
Pilot Providers		95% Confidence Interval	
	Visits/Month	Minimum	Maximum
Before PCR	250.10	228.01	273.2
After PCR*	259.87	223.90	298.51

*non-significant increase (p-value=0.458)

Table 7. Pilot provider results: RVUs per month on original scale			
Pilot Providers		95% Confidence Interval	
	RVUs/Month	Minimum	Maximum
Before PCR	274.72	255.61	294.51
After PCR*	298.75	261.19	338.83

*non-significant increase (p-value=0.075)

Later Starting Providers

Patient sex affects both monthly patient visits and RVUs for later starting providers

(Tables 8-9). This variable was tested as the ratio of female to male patients on each provider's panel. On the square-root scale, mean visits decreased 1.79 visits per month (95% CI: 0.66-2.92 unit decrease) for every doubling of the female to male patient ratio (p=0.002) while the PCR intervention was found not to have a significant effect (p=0.901) (Table 8). Similarly, on the square-root scale, mean RVUs decreased 2.09 units per month (95% CI: 0.90- 3.28 unit decrease) for every doubling of the female to

male patient ratio ($p < 0.001$) while the PCR intervention was found not to have a significant effect ($p = 0.307$) (Table 9). RVU inflation is estimated to increase RVUs by 1.81 units per month (95% CI: 0.71-2.92, $p < 0.001$).

Table 8. Later provider results: Visits per month on square-root scale				
Providers		95% Confidence Interval		
	Visits/Month*	Minimum	Maximum	p-value
Patient Sex Ratio	-1.79	-2.92	-0.66	0.002
PCR Intervention	-0.10	-1.69	1.49	0.901

*Mean response estimated for a provider with 14 years of practice working 1.0 FTE before PCR or RVU inflation was implemented.

Table 9. Later provider results: RVUs per month on square-root scale				
Pilot Providers		95% Confidence Interval		
	RVUs/Month*	Minimum	Maximum	p-value
Patient Sex Ratio	-2.09	-3.28	-0.90	0.001
RVU Inflation	1.81	0.71	2.92	<0.001
PCR Intervention	-0.90	-2.62	0.82	0.307

*Mean response estimated for a provider with 14 years of practice working 1.0 FTE before PCR or RVU inflation was implemented.

Before PCR was started the median number of visits per month for later starting providers with a patient panel that is 65% female are estimated to be 263.52 (95% CI: 233.71-295.13). After intervention, the median number of visits per month is estimated to be 260.77 (95% CI: 210.40-316.54). As shown in Table 10, this effect is non-significant ($p = 0.901$). Similarly, before PCR was started, the median number of RVUs per month for later starting providers with a patient panel that is 65% female is estimated to be 238.34 (95% CI: 201.95-277.75). After PCR started, the median number of RVUs per month is estimated to be 211.87 (95% CI: 155.20-277.34). As shown in Table 11, this effect also is non-significant ($p\text{-value} = 0.307$).

Table 10. Later provider results: Visits per month on original scale			
Later Starting Providers		95% Confidence Interval	
	Visits/Month	Minimum	Maximum
Before PCR	263.52	233.71	295.13
After PCR*	260.77	210.40	316.54

*non-significant increase (p-value=0.901)

Table 11. Later provider results: RVUs per month on original scale			
Later Starting Providers		95% Confidence Interval	
	RVUs/Month	Minimum	Maximum
Before PCR	238.34	201.95	277.75
After PCR*	211.87	155.20	277.34

*non-significant increase (p-value=0.307)

Qualitative Results

The results from the team group interviews were rich with information that both informed the approach to quantitative analysis (i.e. separating the pilot and the later starting providers) and also yielded data on barriers and enhancements to using each of the components of PCR. Implementation of the PCR components varied across the teams and the clinics. Inductive analysis revealed seven themes across the barriers and enhancements to implementing PCR: culture of change, staff and patient education, physical environment, individual attitude, available personnel, time, and clinic systems. Culture of change refers to the organizational culture of the clinic and willingness or preparedness to change within the construct of PCR. Staff and patient education is defined as any training or teaching necessary to acquire skills or behavior. Physical environment refers to the physical clinic space. Individual attitude includes personal beliefs, understandings, and opinions that may affect the performance of PCR. Available personnel refer to the availability of the appropriate people to get all of the work done. Time is having enough time to incorporate all the components of PCR. Clinic systems

refer to infrastructure within the clinic such as computer systems, patient tracking, and the clinic management hierarchy.

Patient-Centered Care

Because of their status as federally qualified health centers (FQHCs), both clinics felt they started PCR with enhanced patient-centered care (Table 12). More than fifty percent of the governing boards for both clinics are patient-members. Team members from both clinics felt this governance system improved their ability to design patient-centered care.

Much of the implementation of patient-centered care relies on a culture of change that is inherent in PCR. The culture of patient-centered care needs support from both clinic staff and patients. The primary culture barrier encountered is getting feedback from patients on changes in their care as a result of PCR. Patient satisfaction evaluation is the job of PCR quality support staff at the clinic. The quality manager from the community clinic described this barrier, “We’re trying hard to engage patients, but it’s a slow process.”

Clinical staff generally supported the culture of patient-centered care. Although providers already had established relationships with patients, other team members, especially team assistants, case managers, and medical assistants, reported increased interaction and improved relationships with patients. A nurse from the university clinic feels that, “[patients] believe we care” as a result of the improved relationships, enhancing the culture of patient-centered care. Another enhancement of patient-centered care is the expansion of patient visits to include health maintenance tasks so that patients do not have to return for another appointment. All teams indicated that flexibility of the team in expanding visits helped to make care more patient-centered.

PCR Concept	Theme	Barrier/ Enhancement	Example
Patient-Centered Care	Culture	Barrier	Difficult to get patient feedback
		Enhancement	Max-packing visits
		Enhancement	Improved patient relationships
	System	Enhancement	Clinic board >50% patients- members

Team Care Delivery

Five themes were associated with team care delivery (Table 13). As with patient-centered care, the culture of change was important to the implementation of team care delivery. Several teams at the community clinic anticipated problems with learning to work as a team, but ultimately found teamwork to be a positive experience. The university clinic team had a different experience; many of the university team members felt the difficulty in team building was a barrier to team care delivery. The behaviorist on this team describes the situation, “We went through the darkest days forming a team. We didn’t know what we were doing, didn’t know how to work with each other.”

Barriers related to the culture of PCR affect the university team both at the team level and at the clinic level. Individuals filling different team roles were changed multiple times by clinic management within the first months of implementing PCR. The team physician stated, “a big impact [on team care delivery] was that we didn’t have institutional support and didn’t have a stable staff and people kept getting rotated out.” The university team also did not have protected team meeting time. Several university team members stated that this lack of institutional support for PCR was a barrier to team care delivery.

All teams reported enhancements to team care delivery through the culture of change. The culture of change has supported all team members functioning at the top of their licenses. The increased responsibility for most team members has led to patients relying on all team members for different parts of their care. As a result of the increased individual autonomy, many team members report increased job satisfaction and trust for other team members. A nurse from the community clinic reports, “before we spent a lot of time that didn’t take nursing level skill to do. Things that now the case manager and team assistant can do.” Echoing this, a community clinic team assistant said “before I was just checking in the patients [as a receptionist] all day and now I do a little of everything, much more exciting. I help with Oregon Health Plan, referrals, and tracking. It’s nice I’m not stuck on just one thing.” The behaviorists on each of the pilot teams both spoke about the advantages of working with a primary care team with direct access to a medical provider; the university behaviorist feels she “can get the wisdom of everyone on the team . . . we pool our knowledge.” All of these cultural changes enhance team care delivery.

Staff education is another theme associated with team care delivery. Although some of the team members worried about steep learning curves for their newly expanded roles with greater autonomy and responsibility, these team members found the education for each of their new roles to be adequate with constant support from other team members. A community clinic case manager was, “worried about knowing what is urgent without a medical background and learning as I go . . . but co-location makes easy access to the nurses and the team.” Another enhancement was education for the medical assistants so

that they are able to scrub charts independently and set up rooms appropriately and quickly if there are any last minute changes to the care plan. This education is enhanced by consistently working with the same provider and allowing the medical assistants to know his or her provider's preference for room set-up based on the care plan.

The physical environment was a barrier to team care delivery for the community clinic and an enhancement to team care delivery for the university clinic. At the community clinic the team work space was created by rearranging the already crowded provider work room and doubling or tripling the number of people (the rest of the team members in addition to the providers) working in the same space. This challenge affects both physical workspace and the ability to have phone conversations with patients due to the noise level. A community provider explained, "The space is a challenge . . . I love the access to the case manager and the team assistant, I can overhear and chime in, but it's too tight, too much going on and it's certainly chaotic." The university clinic has had a different experience related to the physical environment. This clinic was originally designed with "pods," a unit of physical space that included one large workroom associated with multiple exam rooms. There are four pods in the university clinic, allowing easy re-organization into four care teams. This physical environment enhanced team care delivery.

Individual staff attitudes affect team care delivery. Several providers preferred to work independently, a barrier to team care delivery. A provider at the university clinic "didn't realize how the team thing would be so challenging, how independently I was used to

working . . . And that me working independently was not really as good as working with everybody else.” Ultimately, this provider felt she was able to change her independent tendencies and saw the advantage of depending on her teammates. A team at the community clinic reported that one of the team providers prefers to work alone, doing most of the tasks that other providers have delegated to their teammates. This independent attitude limits team care delivery. Even though a provider on a different community team has the attitude that PCR “is not that innovative of a model . . . it’s as if you were working in a private practice and you have a small office and you know who’s doing what all talk to each other,” she describes team care delivery very positively:

You take a big community clinic that’s chaotic and break it into functional units that work with the same efficiency like a small private practice. I don’t think there’s anything innovative about it, but it can work and I think that’s nice.

Although this provider does not feel that PCR as a concept is particularly special, she acknowledges the benefits of the practice model, enhancing team care delivery.

Several clinic systems enhance team care delivery. Non-provider team members have learned how to handle paperwork, tracking, referrals, non-medical communication and other tasks. One provider at the community clinic stated, “I know that if I pass something off, it is taken care of and I don’t have to worry at all . . . referrals, refills. Not all these pieces dangling.” The community pilot team provider states:

Team care delivery totally changed the way I come into clinic . . . now I have a team assistant and case manager bringing me re-fills, consult notes, lab values, patient concerns on a daily basis . . . things are better, no looming stack of charts that are haunting me and patients uncared for.

Improved phone communication is another way clinic systems have enhanced team care delivery. Patients are able to call direct lines to their assigned team and can get through on the phone for information or an appointment much more quickly. A medical assistant at the university clinic reports that her “patients are a lot happier because they have a team and not just wondering who they can get on the phone. They get called back about labs and referrals.” Another university clinic team member says, “The patients feel like they have a secret knock because they can call the direct [team] line.”

PCR Concept	Theme	Barrier/ Enhancement	Example
Team Care Delivery	Culture	Barrier	Team-building is hard
		Barrier	Lack of institutional support for consistent team members and protected meeting time
		Enhancement	Increased job satisfaction
		Enhancement	Patients rely on all team members
		Enhancement	Working at the top of licenses
	Education	Barrier	Steep learning curve for new jobs with greater responsibility
		Enhancement	Team medical assistants know each provider's preference for room set up
		Enhancement	Team medical assistants able to scrub charts and set up rooms appropriately and quickly if there are any changes in the plan
	Environment	Barrier	Loud, chaotic work environment due to limited physical space in community

			clinic
		Enhancement	University clinic already designed around "pods."
	Attitude	Barrier	Provider prefers to work alone
		Enhancement	PCR helps large chaotic clinic function like private practice by breaking into smaller groups
	System	Enhancement	Non-provider team members help with paperwork, tracking, referrals, non-medical communication, and other tasks
		Enhancement	Improved patient phone communication

Proactive Panel Management

Proactive management is another PCR component that depends on both patients and clinic staff to accept a culture of change through PCR (Table 14). The culture of PCR assumes that families prefer to be empanelled together, but both clinics found that not all families want to be empanelled together. Some families have established relationships with different providers for different family members and wish to maintain those relationships. Others prefer to have same-gender providers for male and female children. Because proactive panel management includes caring for families as a unit, this preference can be a barrier. Another barrier related to culture of PCR came up during a discussion of the six aims for quality improvement. Several teams thought that effective, evidence-based care might take longer to achieve through PCR than the other aims, a barrier to proactive panel management. During the same discussion, a provider at the university clinic pointed out that scrubbing improves equitability of care by ensuring health maintenance for all patients regardless of the reason for the appointment. Another

enhancement for proactive panel management is that each team has established a method of chart scrubbing that works well for that team. In recognizing that there is not necessarily one best method that works for all teams, different teams have tweaked the scrubbing system to find a method that works for those team members, using the culture of change.

The clinic system contributes both barriers and enhancements to proactive panel management. Both clinics used a combination of paper and electronic charts during PCR implementation. Due to discrepancies in the primary care provider listed in the different chart systems, the university clinic had a difficult time determining the “correct” PCP. This clinic system was a barrier to empanelment, an important step in proactive panel management. The electronic charts and registries used by the clinics were also an enhancement. Both clinics were able to use the electronic systems to create population-level databases and provide population-level management to their patients. A community clinic provider describes population-level management using the registries:

I can look at the panel- who needs a flu shot, who needs retinal photos, let's contact the group. I have a sense of how many diabetics and hypertensives and teenage girls I have. We're looking at asthma in the fall- we can call them up and get them in for flu shots.

Some providers are using population management with less traditional populations. One community clinic provider has used proactive management to improve the organization of care for pain patients to “make sure the patient has

what he needs for contracts, refills, et cetera . . . very helpful for me that [other team members] really know who the pain patients are and what they need.”

Time was initially a barrier for proactive panel management, especially scrubbing charts. For the university clinic, this was a scheduling problem that had to be fixed at a departmental level. A provider on this team was also concerned that expanding visits to add preventive care would decrease overall productivity, directly affecting her incentivized salary. The team members at the university clinic felt that they had to advocate forcefully to communicate to their department that proactive management takes time and that time is important in order for PCR to be successful. The pilot team at the community clinic also found that time was a barrier for proactive panel management. They have more control over daily schedule and were able to do PDSA cycles on the amount of time needed for scrubbing. Both clinics were able to overcome the time barrier through advocating for more time scheduled for scrubbing and becoming more efficient at this task over time. Eventually this barrier became an enhancement once the teams had maximized the scrubbing process, allowing more time for the provider to do patient care.

Table 14. Qualitative Results: Proactive Panel Management			
PCR Concept	Theme	Barrier/ Enhancement	Example
Proactive Panel Management	Culture	Barrier	Not all families want to be empanelled together
		Enhancement	Scrubbing ensures health maintenance for all patients regardless of reason for appointment
		Enhancement	Each team is able to work out its own scrubbing schedule
	System	Barrier	Difficult to determine "correct" PCP in paper and electronic charts
		Enhancement	Use patient registries to provide population-level management
	Time	Barrier	Concern that PCR may decrease productivity and affect incentivized salary?
		Barrier	Scrubbing and huddling takes time
		Enhancement	Scrubbing makes preventive care easier and allows providers more time for patient care

Open Access Scheduling

The culture of change affects open access scheduling because this scheduling system is very different from traditional appointment scheduling, a change in the culture of scheduling (Table 15). A barrier related to this culture was that it took time for providers to have the confidence to not schedule follow-up appointments. A community clinic provider reports that once she had the confidence to not re-schedule and just tell her patients when to call back, she “started having more people come back for follow-up and less no-shows. I finally stopped worrying about the 10% no-show rate, it’s not that abnormal.” A cultural change enhancement to open access is that teams are using the telephone to manage follow-up that does not require in-person care.

Another important theme for open access is education both for patients and clinic staff.

Most education issues for open access relate to the team phone line. The team assistants and case managers at the community clinic and medical assistants and case managers at the university clinic handle the calls to the direct team telephone line. Patients can call this line to make same day appointments and sometimes team members will override the same day appointment schedule and make a next day or other future appointment.

However, if a patient only calls the front desk and does not know to ask for the team specific line, he or she may be told to call back the morning of the needed appointment.

One case manager described this situation: “It’s the bottleneck, because everyone is calling at the same time and if you’re lucky you can get through.” These patient and staff education issues limit open access scheduling. These barriers have been countered with several patient education programs. The university clinic team created a handout to give to patients about open access including the direct telephone line for the team. Some of the community clinic teams created “call-back cards,” cards with the provider’s name and direct team phone line with space to write instructions about when to call back for a same day appointment. The community clinic teams also use chart tracking to identify patients who need upcoming appointments. The case managers will call these patients and remind them to make an appointment in the appropriate week. All of these patient education initiatives have enhanced open access scheduling.

The only clinic system barrier identified is that most teams reported difficulty integrating proactive management with the open access model, which allows only same day appointments. The community clinic pilot team balanced these two concepts by

scrubbing the charts immediately before each morning and afternoon clinic session, allowing for the most recent appointment schedule to be used in this process. Other teams find this schedule hectic and prefer to scrub in advance of a particular clinic day, but this leads them back to difficulty in last-minute schedule changes. The greatest clinic system enhancement is that both clinics used open access scheduling for at least six months before PCR was implemented. Prior experience with the open access system helped both clinics integrate this component into PCR. A community clinic provider summarized open access: “It’s a great thing, decreasing no-shows, same day access,” a sentiment generally repeated by most providers.

Table 15. Qualitative Results: Open Access Scheduling			
PCR Concept	Theme	Barrier/ Enhancement	Example
Open Access Scheduling	Culture	Barrier	Hard to have confidence to not schedule follow-up appointments
		Enhancement	Telephone follow-up for issues that do not require in person care
	Education	Barrier	Front desk often does not send patients to direct team phone line
		Barrier	Not all patients know about direct team phone line
		Enhancement	Distribution of call-back cards with instructions for day to call for an appointment and scheduling number
	System	Barrier	Difficult to integrate scrubbing ahead of time with same-day appointment access
		Enhancement	Case managers use chart tracking to call patients and remind them to make an appointment
		Enhancement	Open Access already implemented before PCR started

Behavioral Health Integration

Most providers have accepted that the culture of PCR includes integrated behavioral health (Table 16). However, one community clinic provider states:

I am not clear on the benefit [of integrated behavioral health] . . . it seems more of the same patching things up. I don't feel like there's an ongoing relationship that helps patients follow through on suggestions made by the behaviorist . . . I think better work happens with continual relationships and I don't see how that's happened so far.

This provider explains that, "I don't have the resources but I have the relationships. I need someone with the resources to talk in my ear." This provider's resistance to the culture of PCR is a barrier to integrated behavioral health.

The culture of PCR contributes to several enhancements for behavioral health integration. The behavioral health specialist can scrub the charts with the team and help identify ahead of time the patients that might need behavioral interventions or counseling. The behaviorist at the university clinic finds that integration helps "prevent [patients] from getting out of control. Used to be an intervention at the crisis and now its well ahead of the crisis." Providers can also use "warm handoffs" which involve introducing a patient with a behavioral or mental health issue that came up during the visit and needs to spend extra time discussing it with the behaviorist for counseling either immediately or scheduled in the near future. A nurse at the community clinic likes the warm handoff because they "immediately see the connection between the behaviorist and the patient instead of sending the patient out to potentially make an appointment and maybe never (have) the patient (return)." The community clinic behaviorist summarized another cultural enhancement of behavioral health integration:

It makes all the difference for the patient to know a face and have mental health care in some ways de-stigmatized. We don't have to worry about lost communication. The patients like that, knowing there's a team taking care of all levels of bio-psycho-social.

Several personnel-related barriers were identified for behavioral health integration. The community clinic has not had a behavioral health provider continuously since PCR was implemented. Because the majority of the community clinic patients are Spanish-speaking, the behavioral health provider must be bi-lingual and trained in culturally competent mental health care. The number of behaviorists that meet these criteria is limited, and the community clinic has only had a full-time behavioral health specialist since March 2008. A community clinic provider commented, "I don't use it as much as I should, but love it when I do." Another community provider is "trying to remember to use her." Lack of behaviorist personnel has limited the establishment of relationships between the behaviorist and the team, as well as the behaviorist and patients. This also has been a barrier to behavioral health integration.

The university clinic has had greater success with behavioral health integration due to a constant behavioral health personnel since the beginning of the PCR intervention. The case manager on the university team states:

Behavioral health integration is our shining star . . . our behavioral health provider hasn't left us! She's helped patients continue to get care here at [our clinic] who would not have been able to get care here due to behavioral issues.

This continuity has led to additional behavioral health enhancements. The university

clinic is located near Cascadia, Oregon’s largest non-profit mental health and addictions counseling center, and they often provide care to the same patients. A university clinic provider states that the consistent behaviorist has “been really helpful to tighten our relationship with Cascadia. We can help each other keep track of our mutual patients.” Another unexpected enhancement was more personal for the providers; one provider says, “it feels like a total luxury to have someone so accessible to talk about my feelings about trouble patients or a troubled family.”

Table 16. Qualitative Results: Behavioral Health Integration			
PCR Concept	Theme	Barrier/ Enhancement	Example
Behavioral Health Integration	Culture	Barrier	Belief that provider-patient relationships are stronger than with behaviorist limits on the use of behaviorist.
		Enhancement	Behaviorist scrubs with team to identify potential needs in advance of appointment
		Enhancement	"Warm Handoff" for patients with behavioral needs that arose during the appointment
		Enhancement	Familiarizes and de-stigmatizes mental health care for patients
	Personnel	Barrier	Mostly Spanish-speaking patients require a language and culture appropriate behaviorist
		Barrier	Lack of established relationships between patients and behaviorist
		Enhancement	Behaviorist helped to improve relationship with a local mental health and addictions center
		Enhancement	Consistency - Same behaviorist on staff since PCR began

Plan-Do-Study-Act

PDSA cycles were used very little or not at all by all teams except for the community clinic pilot team. Barriers to PDSA implementation were identified in multiple themes

(Table 17). The culture of change in PCR is critical for PDSA cycles to function. One later starting community clinic team felt that they lacked a team leader, which contributed to difficulty promoting the use of PDSA within this team. Another cultural barrier was the belief that the purpose of PDSAs is to help teams with organizational and communication issues. The case manager for this team explained that, “Our team is really organized in making referrals” and “has no problem with communication, has a good connection,” and for this reason this team does not need to do PDSA cycles. This cultural barrier is also related to an education barrier because only the pilot teams at each clinic received in depth training in conducting PDSA cycles, likely contributing to the beliefs stated above. One later starting team at the community clinic received a brief training in PDSA, but the other two teams received no training in PDSA.

Individual attitudes contributed to the implementation of PDSA cycles. The providers on one of the community clinic teams that did not do any cycles explained that neither of them was interested in doing PDSAs. One provider had experience with PDSA cycles at another job and did not like the structure: “It felt too tight, not allowing for back and forth.” The other provider explains:

This team is not statistics or research oriented, just outcome oriented, just clinical intuition. If we want to do something, we do it, if patients like it, we keep doing it . . . We are one of the most innovative teams, but we don’t write it up, send it out, have a protocol.

These provider attitudes are a barrier to the implementation of PDSA cycles on this team. Conversely, the community clinic pilot team provider is very interested in the structured,

evolving changes through PDSA cycles. This team was able to use PDSA regularly. She states, “The most excitement in team work is around these new changes that make a difference in patient care.” This provider’s attitude enhances the implementation of PDSA methods on her team.

The personnel-related theme was a source of several barriers to PDSA implementation. The teams that did not consistently use PDSAs all reported insufficient personnel to support regular PDSA use. All of the later starting teams at the community clinic felt the absence of PCR leadership staff at their team meetings led to minimal administrative support for PDSA cycles. A later starting community team is frustrated by their perceived lack of administrative support and time for meetings as compared to the pilot team. The university pilot team reports, “PDSAs have not been as robust as intended.” Although this team would like to do PDSAs and some team members even expressed guilt over not making them a priority, lack of data analyst support and fluctuating team members have contributed to less than ideal use of PDSA cycles.

The final theme that affects PDSA implementation is time. The later starting teams at the community clinic do not meet on a regular basis; they are scheduled to meet one to two times per month, but often not all team members are able to attend due to other scheduled responsibilities. One later starting community team is very interested in doing PDSAs, and has tried to do two change cycles, but feels they do not have much designated planning time to organize and integrate PDSAs. Another later starting community team has two providers with heavy clinic administrative responsibilities.

This team meets less frequently than the other later starting teams and has not completed any PDSA cycles. In contrast to the other teams, the community pilot team meets weekly and the team provider says they have “made change a weekly event.”

Table 17. Qualitative Results: PDSA Cycles			
PCR Concept	Theme	Barrier/ Enhancement	Example
PDSA	Culture	Barrier	Lack of team leader limits use of PDSA
		Barrier	Belief that PDSA is only for teams with bad organization & communication
	Education	Barrier	Only 3/5 teams were trained in PDSA methods.
	Attitude	Barrier	Provider not interested, bad previous experience, feels PDSA is too rigid
		Enhancement	Provider is very excited about change
	Personnel	Barrier	No administrative support for PDSA
		Barrier	No Data Analyst
		Barrier	Team member instability
	Time	Barrier	Most teams do not have enough time to meet weekly
		Enhancement	One team uses PDSA weekly

Discussion

Provider Productivity

This study found that primary care renewal has no significant effect on provider productivity as measured by patient visits or RVUs after 13 months (pilot providers) or 13 months (later starting providers) of intervention. Although ideally PCR will increase productivity over time, importantly, productivity has not decreased either. The stability of productivity found in the community clinic is reassuring from a reimbursement perspective. Little research has been done on provider productivity in other medical home demonstration initiatives. The most recent report from the TransforMED project indicated difficulty collecting financial data to evaluate the impact of their medical home intervention on productivity³². An informal interview with several providers from this project published in *Medical Economics* reported no change in reimbursement³³, similar to the findings in this study.

The reason for no change in provider productivity is not entirely clear; however, different explanations may exist for the two different outcomes. Although the absolute number of patient visits did not change, the number of unique patients may have increased by doing more in one visit and minimizing the need for follow-up visits. This situation would open up visits to be filled by other patients, improving access to primary care for more patients. Through proactive panel management, more health maintenance tasks should be done in each visit. The qualitative data on chart scrubbing and max-packing visits support this theory. This study evaluated a change in RVUs, which depends on providers coding appropriately. RVUs are a proxy measurement for complexity of and number of

tasks done in a visit, but are not a direct measure of proactive panel management.

Additionally, as found in the qualitative analysis, although more tasks are done, some tasks are done by other team members, and may not be reflected by RVUs.

Because the measure of productivity in this study is limited to in-person provider encounters, patient encounters with other team members are not accounted for.

Qualitative analysis revealed that an accurate measure of productivity in a PCR clinic should include care manager, team assistant, nurse, and behaviorist visits, as well as telephone and email consultations. To fully utilize the Patient-Centered Medical Home model, all forms of patient care must be valued and reimbursed accordingly¹³. In January 2008 CareOregon began to reimburse for telephone consultation and behaviorist visits, a step towards appropriately valuing all aspects of PCR.

PCR Components

Successes: Patient-Centered Care & Team Care Delivery

All teams implemented Patient-Centered Care and Team Care Delivery. Some teams felt team-building was more difficult than others. The university pilot team was surprised and overwhelmed by the challenge of team-building. Several community providers still prefer to work alone and do not rely on their teams as much as they could. Team Care Delivery is not a provider-centric model, which has been shown to be a challenge in other medical home projects³². Conversely, most team members are quite satisfied with their team-building processes and expressed increased job satisfaction and trust for each other. Although some individuals and one team described specific challenges in team-building,

all teams have implemented Team Care Delivery and patients are benefitting from this change.

Tension Between Proactive Panel Management & Advanced Access

Most teams reported difficulty balancing proactive panel management with open access scheduling because they perceived a conflict between the need to scrub charts ahead of time while the daily clinic schedule could change until the last minute. The community pilot team used PDSA cycles to address this problem and came up with a method to resolve this conflict by scrubbing immediately before each clinic session. The theory behind proactive management suggests that eventually all established patients will be caught up with health maintenance tasks and the need for last minute care plan changes will decrease. The challenge to reverse the current reactive practice to become a more proactive system while maintaining acute access to care in a primary care setting is unified under the idea of the patient-centered medical home. Ideally, a medical home can provide well-planned preventive and chronic disease maintenance as well as always be available to handle non-life threatening acute needs. This challenge is central to the success of creating a patient-centered medical home and should be the focus of the ongoing implementation of PCR.

Behavioral Health Integration

The university team was successful in integrating behavioral health because this clinic was able to hire a behaviorist when PCR was implemented. Additionally, all of the university team members were interested in using integrated behavioral health. Conversely, the community clinic struggled to find a language and culturally appropriate behaviorist. This barrier reflects ethnic disparities in mental healthcare that have been documented in other studies, with access to appropriate providers listed as one of the

causes for this disparity³⁴. At the time of the interviews, the position had only been filled for three months; many providers were interested in using the behaviorist, but had not yet consistently remembered to use her. Several other providers did not want to use the behaviorist because they felt behavioral health care would be better accomplished by a primary care provider with an established patient relationship. Lack of patient relationships and difficulty remembering to use the behaviorist could both be attributed to the fact that the behaviorist had only been working for a few months. Increased time as part of the team may improve both of these situations.

Biggest Challenge: PDSA

Four of the five teams reported difficulty or lack of interest in using PDSA cycles. Three of these teams cited lack of clinic support and data analysis as barriers to using PDSA methods. One of the teams was not interested in using a formal change process with data collection and analysis. All but one team had at least one team member who attended the PDSA training workshop. The only team that used PDSA cycles on a regular basis also was able to meet on a weekly basis with clinic PCR leadership staff and a data analyst. Training in PDSA is not sufficient to ensure success. As found in other studies on PDSA use, time, interest, team leadership, and administrative support are also very important for PDSA success^{35, 36}.

Team Dynamics and Leadership

A benefit to mixed methods research is the association that can be made between quantitative and qualitative outcomes. There are clear differences between the four community teams that cannot be controlled in the quantitative analysis. Qualitative data

from the community team interviews indicate obvious differences in the team “personalities” and leadership dynamics between each team within one clinic.

Pilot Team

The pilot team is very excited about PCR and believes in the potential for improvement through teamwork. Team members identify the pilot physician as their leader and are excited to follow her lead. The pilot team physician describes her team:

We’re a hot team, really comfortable with each other, pass info back and forth, and bounce things off one another. I am approachable if there are questions. The other provider on the team, we’ve developed an even closer working relationship. I know what’s going on with her patients and vice versa.

This team understands the dynamic process of teambuilding and notes, “PDSAs help define the team” (team assistant) and “the most excitement in team-work is around these new changes [with PDSAs] that make a difference in patient care” (MD). Many team members recognize the synergy of using all of the components of PCR. Through PCR “there is a team to help [patients] access my schedule” (MD). Integrated behavioral health “may actually help physical wellness. You don’t have to worry about lost communication. Patients like . . . knowing there is a team taking care of all levels of biopsychosocial” (Behaviorist).

As a result of these changes, the pilot team physician “can come in each day and have the team plan out the day,” knowing “the whole team has the ability to talk to each other”

(MD). Other team members also have increased satisfaction as a result of the strong team relationship. The team assistant states, “Now I do a little of everything, much more exciting. I help with Oregon Health Plan, referrals, tracking. It’s nice that I am not stuck on just one thing.” The behaviorist states, “I never would go back to working in isolation. The ability to talk to the doctor right away about what’s going on with the patient . . . is best care.”

Individual personalities also are important for the success of PCR. The behaviorist for this team notes, “This [PCR] model fits well with [the pilot team doctor] because [she] is relational and it takes that [quality] as a personality to work. This is not the case with every provider. Relationship-based care, everyone in the team with the same attitude and wanting to help people can make [PCR] work.” The team physician also identifies the role of individual attitudes on the success of PCR. She states:

Individual enthusiasm for PCR is really helpful. If you have a bad attitude about it, it’s not going to work. If you think, ‘How can I make this work for me and my patients?’, it’s going to work. Stay curious and committed to the [PDSA] cycling ideas. Stay involved as a group and team build.

The pilot team has a strong leader and members who value working together to make a difference. They are ready and willing to change how they deliver health care. This team recognizes the effect of their own beliefs and attitudes about PCR and teamwork on their ability to make change.

Later Starting Team A- Too many jobs

This team has two physicians and one nurse practitioner. Both physicians have significant administrative duties limiting their clinical and team time. One physician is also the PCR project leader for the entire clinic. The team considers the PCR leader-physician to be their leader because she has so much PCR knowledge, but she has little time to share this knowledge with her own team. This team meets very infrequently as a team while the PCR leader meets almost weekly with the pilot team.

The nurse practitioner on this team works more clinical hours than the physicians but does not see herself as a team leader. Although the nurse practitioner is generally positive about PCR, she also is not confident in her own ability to implement PCR and does not recognize the team's successes in PCR. She feels that her biggest challenge in PCR is "integrating it all and not falling back into old ways . . . remembering this new model and not getting into the old way [of practicing]." During the interview, the NP is quick to say that the team has not done any PDSA cycles or proactive panel management and that she does not use integrated behavioral health as much as she should. Other team members report that this team uses scrubbing daily and has started some population management with their patients with diabetes. Additionally, none of the later starting teams had a behaviorist available to them until just a few months prior to the interview. They are possibly still adjusting to incorporating this element into their practice routine.

The care manager started out working on the pilot team as a medical assistant.

Interestingly, she has a much more positive outlook for PCR: "Coming from the pilot

team, I just felt like [PCR] was going to be a good change.” This difference in attitude about PCR is clear during the interview. While the care manager started PCR on the pilot team and has a positive tone when she talks about PCR, the other members of this later starting team are self-conscious and self-deprecating about their perceived lack of success in implementing PCR.

Later Starting Team B-Jealous

This later starting team presents an interesting example of a motivated group with a fair amount of knowledge about PCR, but which is limited by perceived lack of leadership and jealousy. The clinicians include two physicians and a physician’s assistant, but none has assumed the role as a team leader. The PA specifically notes, “We are lacking a team leader.” One physician quit her job after only one month of PCR intervention. The other physician has missed several months due to paternity leave (and thus was not available for the interview), though according to the other team members he prefers to work alone and does not utilize PCR teamwork strategies like huddling.

Conversely, the PA has been present consistently and is very aware of all the possibilities for PCR. In fact she is very excited about PCR, but she and other team members are jealous of the resources and support given to the Pilot team. She states, “The pilot team gets more attention” and “We are infected with pilot team energy, but the pilot team is the golden child, so that is negative” (PA). They feel they could be more successful implementing PCR if they had similar support.

Despite the jealousy, this team has implemented all elements of PCR except for PDSA cycles. This is the only other team in addition to the pilot team to receive training

specifically for PDSA use. They have tried two cycles, but feel, “There is not much meeting time to plan PDSAs,” and, “Would like to have [PCR quality improvement administrators] around” to help with PDSAs (PA). Although this team expresses frustration about PDSAs, they also have ideas for improving the situation including doing a whole clinic PDSA and changing an all-clinic weekly meeting to protected weekly team meeting time. They also describe ideas for specific PDSA cycles.

The PA does not identify as the team leader although she has similar drive and knowledge about PCR as the pilot team physician leader. She strongly values team care delivery stating, “The team approach has been great,” and, “Support from the team is incredible. The team is flexible and dedicated to teamwork and sees the value of PCR.” Given time and clinic-level support, this PA might become a team leader. Unfortunately she had to quit her job due to moving across the country several months after the interview was conducted.

Although this later starting team feels inferior to the pilot team and desires increased administrative support similar to the pilot team, they have potential to be a unified team with a strong leader. Despite lack of support they have implemented all PCR components except PDSA. This team’s experience suggests that while upper level support is necessary for PDSA implementation and would likely improve team morale, a team with strong leadership and teamwork can utilize the other PCR components successfully.

Later Starting Team C- Rogue Team

This later starting team exemplifies a team with strong leadership and teamwork but which selectively uses only some PCR components. The case manager states, “Something I am proud of this team- we don’t follow [PCR] protocol, but we look at the numbers and we are really close to the pilot team. We are really organized . . . even if we don’t take into consideration [some] aspects of PDSA.” The nurse practitioner describes how the team-works:

I know that if I pass something off [to the team] it is taken care of and I don’t have to worry at all. All kinds of benefits . . . having MAs who know my style and anticipate what I want. Before there was never a consistent MA, now the whole team can anticipate what I want and follow-up is very quick. All this stuff happens, referrals, refills. Not all the pieces dangling.

An MA states, “For me [team care delivery is] easier; if I need something or to make a change I can get help from any team member. It’s a good process.” The physician feels, “We have a really good team,” and gives an example of teamwork: “Activation energy is better. For example, these letters for families for non-medical reasons, stating various things, and I never used to write them. Now the team assistant writes them in five minutes and it’s over.” The care manager, a former MA, explains that before PCR, “the MAs wanted to work one way and the providers want to get the information and the MAs were frustrated because we didn’t have complete info for the provider. Now the connection is really good [between MAs and providers].”

This team has one physician and one nurse practitioner and both provide strong team leadership. The nurse practitioner initially did not think PCR would work and did not like the idea of it, however since working with her team, mostly has changed her mind.

She states:

I didn't anticipate what it would mean to have ready access to referrals and reports. We never used to hear back [from referrals]. It's such a benefit to have [reports] right there within days of the actual appointment. It's so wonderful. I don't think I realized how much I had accommodated not knowing and how much it affected my practice and how much waiting happened because of that. It's so nice to clip along and be efficient.

The physician has good knowledge about PCR but questions the novelty and importance of it:

To me it's not that innovative of a model- it's private practice. It's as if you were working in private practice: you have a small office, you know who's doing what, and you all talk to each other. Take a big community clinic that's chaotic and break it into functional units that work with the same efficiency like a small private practice. I don't think there's anything innovative about it, but it can work and I think that's nice.

Although both providers agree that working as a team improves patient care, they are not interested in using many of the elements of PCR. Both clinicians express dislike for PDSAs and for this reason, the team does not use formal PDSA cycles by choice. The physician states, "I can see the value [of PDSAs], but my style is that if you see

something isn't working, it's nice to change without a problem" (MD). The nurse practitioner explains, "I don't feel like I like that kind of structure. I did [PDSA cycles] at my other job for other things. It felt too tight, not allowing for back and forth . . . maybe we didn't run them as short as you could, ran them for two weeks knowing it wouldn't work. It's really labor intensive." However, they are both interested in changes that are good for patient care and informally make changes as needed. The physician describes this process:

Teams can come up with ideas and organically shifted when it's clear it needs changing, so that's how we do it . . . We are not stats or research oriented, just outcome oriented, just clinical intuition. If we want to do something, we do it. If patients like it we keep doing it. Not interested in the numbers of doing it. We are one of the most innovative teams. Don't write it up, send it out, have a protocol.

The care manager adds, "Our team is functional and I think the problem before was disorganization. Our team is really organized . . . no problem with communication, good connection. That is the point of PDSAs."

Team members use the integrated behavioral health component variably, including the care manager. He explains, "Sometimes I have patients who call and need to talk to somebody . . . and I try to see if the behaviorist is available to talk with a patient. When that happens we have a good connection." The physician uses warm handoffs intermittently but feels they are "successful" when she does use them. The nurse practitioner does not like the integrated behavioral health component and feels it does not

improve patient care. She would prefer a model where she can consult a behaviorist for recommendations but personally provides mental health care to her own patients. She states:

I am not clear on the benefit. When I look at what happens with those encounters it seems more of the same patching things up and I don't feel like there's an ongoing relationship that helps patients to follow through on suggestions made by the behaviorist. I haven't seen it to be helpful in an ongoing way. This is partly my own bias. I think better work happens with continual relationships and I don't see how that's happened so far . . .

I can think of a patient who I handed off a few months ago who was relieved when I recognized that the behaviorist encounters weren't working and she wanted to talk to me, not [the behaviorist]. I don't have all the resources but I have the relationships. I need someone with the resources to talk in my ear. I can get that information but it tends to be a very long visit. I need to do it more efficiently so it works better.

Neither provider scrubs charts; rather, the case manager, team assistant, and MA scrub the day before and leave notes for the clinicians if there are questions. While the clinicians are not involved in scrubbing they are willing to depend on the other team members for this and other patient-care tasks. Ultimately this team likes working together to attain improved patient care. For this team, the goal of PCR is "to improve access for patients to providers and to feel really connected to who is taking care of them" (MD), and "to connect the patient to the clinic or provider as part of a family"

(TA). Although this team does not use all the components of PCR or follow the recommended methods for implementing other components, they are the two later starting clinicians with an increasing trend in productivity.

Leadership

These findings related to team leadership are echoed in the literature on patient-centered medical homes (PCMH). A PCMH with poor leadership “most often results in a dysfunctional medical practice with a great deal of rework and inefficiency”³⁷. A study of facilitators and barriers to the use of care management processes reported that strong leadership was one of the two most commonly listed facilitators and poor leadership was one of the greatest barriers to adoption of care management processes³⁸. The New Demonstration Project, a national project to support practices converting to PCMHs, found that physicians who focused on leadership development were able to: “save thousands of dollars annually; get the right people in the right positions; minimize staff turnover; get more done with a smaller, happier staff; reduce key process inefficiencies; and achieve greater patient satisfaction”³⁷.

Team Dynamics and Productivity

Although there is no direct evidence for an association between particular team “personalities” and productivity outcomes, this association must be explored. As shown in Figures 1 & 2, as a group the pilot providers had an increase in both measures of productivity, while the later starting providers had a decrease in both measures of productivity after implementing PCR. As discussed above, the pilot team worked well as a team and had strong leadership. Looking at the univariate analyses for each provider individually (Figures 3&4), both pilot team providers had increases in both measures of

productivity. Additionally, two later starting providers increased productivity. One of these providers is the PCR project leader with great PCR knowledge but poor teamwork. The other provider is part of the later starting “rogue” team that works well together, and has great leadership, but prefers to implement PCR on their own terms. This observation elicits more questions about the necessary team qualities for success. The pilot team has great knowledge, support, teamwork, and leadership. They were able to implement all PCR components and have an increase in productivity. The PCR project leader was able to increase productivity, but her team did not implement all components and generally feels unsuccessful. The rogue provider has great leadership and teamwork and increased productivity despite selectively implementing PCR components that she preferred and dropping others she does not like.

Productivity is only one component in the evaluation of PCR sustainability, and increased productivity is not a primary goal of PCR. These findings indicate that a team with ideal knowledge, support, leadership, and teamwork can succeed both in implementing all the PCR components and increasing productivity. Perhaps more importantly, these findings show that not every team will have these ideal qualities. This study only evaluates productivity and ability to implement all PCR components. These measures are surrogate endpoints that lead to important questions about the effect of PCR on quality of care and overall sustainability of the intervention.

Future Research

Given this limitation, ideally the next steps for future research would focus on direct measures of quality of care and sustainability. Each of the components of PCR could be quantified to evaluate for changes in the quality of care: patient satisfaction, use of non-provider team member appointments, preventive and chronic care tasks completed, open access measures, emergency room use, PDSAs completed, and many others. Other measures of sustainability of PCR regarding finances, team viability, and patient satisfaction would be important to evaluate in future studies. Ultimately, the effect on patient morbidity and mortality will be very important. With the use of electronic records and patient registries, quantitative health measures will be available for analysis to evaluate the effect of PCR on patient health outcomes.

Limitations

The nature of experimental intervention in working clinics is that the intervention is not always implemented according to plan. One of the study clinics implemented PCR in the later starting teams several months later than originally planned and unfortunately not until after the study period was over. Based on this delay, the quantitative analysis was not possible for the limited data from this clinic. Thus, the quantitative analysis in this study is only representative of one clinic. Despite this limitation, this analysis is still quite valuable given the lack of other data in the literature on this subject.

The design of this study, although quasi-experimental, is not randomized because the intervention was a pilot project for CareOregon. All clinics awarded grants for PCR had the same five-component intervention. Clinics that are interested in such medical home demonstration projects are more likely to apply for this grant. Clinics that are not interested may find different outcomes related to provider productivity and barriers and enhancements to implementation. Additionally, the two clinics in this study had already started using open access scheduling before the PCR intervention was implemented. Clinics that have not already taken this step may experience additional challenges related to implementing open access scheduling that were not apparent in this study.

The goal of PCR was to improve quality and decrease cost of care for uninsured and underinsured patients in Oregon. The majority of patients who receive care at the clinics in this study are uninsured or have public insurance. The potential effect of PCR on provider productivity and the barriers and enhancements to implementation of a medical

home model are not likely to be significantly different in clinics that serve patients with primarily private insurance.

Because the data was collected from billing sources, where patient race or ethnicity is inconsistently and unreliably (not self-reported) recorded, this variable was not available for inclusion in the quantitative analysis. As the Commonwealth Fund Report has shown, race and ethnicity are important factors in health disparities research (*Beal, 2007*).

Ideally, future studies on PCR, especially clinical outcomes research, will be able to include this variable.

Conclusion

Primary Care Renewal is a broad clinic-based intervention with the potential to create patient-centered medical homes that fulfill the Institute of Medicine's six aims for quality improvement. In our short-term evaluation, PCR has no significant effect on provider productivity, indicating that visit and RVU-based reimbursement is maintained. As other services including telephone and email visits, care management, behavioral healthcare, and care coordination become more valued and reimbursed, productivity will likely increase with PCR. Successful implementation of PCR depends on strong teamwork, leadership, support, and knowledge. Future studies to evaluate clinical outcomes and patient experience, as well as qualities necessary for team success, will help determine the capacity of PCR to create a medical home.

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Appendix 1

Interview Questions

1. What is the goal of Primary Care Renewal (PCR)?
2. What is the purpose of doing Plan-Do-Study-Act cycles (PDSAs)?
3. Do you think the PDSAs are fulfilling that purpose as part of PCR?
4. How has your work changed as a result of patient centered care?
5. How has your work changed as a result of open access scheduling?
6. How has your work changed as a result of team care delivery?
7. How has your work changed as a result of proactive panel management?
8. How has your work changed as a result of integrated behavioral health?
9. Before you started PCR, what did you think would be the biggest challenge?
10. Now that you have started, what do you think the biggest challenges have been?
11. Before you started PCR, what did you think would be the most useful change?
12. Now that you have started, what do you think are the most useful changes?
13. Is there anything you were worried about before you started PCR?
14. Did those concerns turn out to be true after you started PCR?
15.
 - a. Is there anything you wish you had known before PCR started?*
 - b. How has the experience of the pilot team affected your team's implementation of PCR?*
16. Have you heard of the Institute of Medicine's six aims for quality improvement?
 - a. If so, which ones do you think are the most important?

17. Do you think Primary Care Renewal helps your clinic achieve the six aims for quality improvement? Please explain.

*Question 15-a will be asked of pilot teams and 15-b will be asked of later teams.

Appendix 2

Average Visits/Month Before and After PCR by Pilot or Later Starting Group on Square Root Scale											
		Before PCR			95% CI		After PCR			95% CI	
Team	Provider	Months	Visits	Std Error	Min	Max	Months	Visits	Std Error	Min	Max
Pilot	All	12	15.64	1.11	13.47	17.8	11	16.24	1.11	14.06	18.42
Later	All	22.33	16.42	0.4	15.64	17.2	3.17	15.91	0.79	14.37	17.46

Average Visits/Month Before and After PCR by Pilot or Later Starting Group on Original Scale											
		Before PCR			95% CI		After PCR			95% CI	
Team	Provider	Months	Visits	Std Error	Min	Max	Months	Visits	Std Error	Min	Max
Pilot	All	12.00	244.61	1.23	181.44	316.84	11.00	263.74	1.23	197.68	339.30
Later	All	22.33	269.62	0.16	244.61	295.84	3.17	253.13	0.62	206.50	304.85

Average RVUs/Month Before and After PCR by Pilot or Later Starting Group on Square Root Scale											
		Before PCR			95% CI		After PCR			95% CI	
Team	Provider	Months	RVUs	Std Error	Min	Max	Months	RVUs	Std Error	Min	Max
Pilot	All	12	16.18	1.23	13.77	18.6	11	17.59	1.24	15.17	20.02
Later	All	22.33	16.48	0.48	15.55	17.41	3.17	16.4	0.87	14.69	18.1

Average RVUs/Month Before and After PCR by Pilot or Later Starting Group on Original Scale											
		Before PCR			95% CI		After PCR			95% CI	
Team	Provider	Months	RVUs	Std Error	Min	Max	Months	RVUs	Std Error	Min	Max
Pilot	All	12.00	261.79	1.51	189.61	345.96	11.00	309.41	1.54	230.13	400.80
Later	All	22.33	271.59	0.23	241.80	303.11	3.17	268.96	0.76	215.80	327.61

Average Visits/Month Before and After PCR by Individual Provider on Square Root Scale								
		Before PCR			After PCR			
Group	Provider	Months	Visits	Std Error	Months	Visits	Std Error	p-value
Pilot	6	12	14.1	0.35	11	14.4	0.36	0.55
Pilot	7	12	16.96	0.54	11	17.99	0.57	0.21
Later	1	20	17.76	0.4	3	15.54	1.03	0.06
Later	3	20	17.63	0.67	3	16.18	1.74	0.44
Later	4	17	14.16	0.81	3	16.8	1.93	0.22
Later	5	18	17.06	0.42	3	16.05	1.04	0.38
Later	9	20	15.28	0.73	3	15.61	1.88	0.87
Later	10	19	17.04	0.7	3	16.27	1.76	0.69

Average Visits/Month Before and After PCR by Individual Provider on Original Scale								
		Before PCR			After PCR			
Group	Provider	Months	Visits	Std Error	Months	Visits	Std Error	p-value
Pilot	6	12	198.81	0.12	11	207.36	0.13	0.55
Pilot	7	12	287.64	0.29	11	323.64	0.32	0.21
Later	1	20	315.42	0.16	3	241.49	1.06	0.06
Later	3	20	310.82	0.45	3	261.79	3.03	0.44
Later	4	17	200.51	0.66	3	282.24	3.72	0.22
Later	5	18	291.04	0.18	3	257.60	1.08	0.38
Later	9	20	233.48	0.53	3	243.67	3.53	0.87
Later	10	19	290.36	0.49	3	264.71	3.10	0.69

Average RVUs/Month Before and After PCR by Individual Provider on Square Root Scale								
		Before PCR			After PCR			
Group	Provider	Months	RVUs	Std Error	Months	RVUs	Std Error	p-value
Pilot	6	12	14.27	0.35	11	15.28	0.37	0.06
Pilot	7	12	17.47	0.6	11	19.45	0.63	0.03
Later	1	20	18.84	0.43	3	16.76	1.11	0.1
Later	3	20	17.17	0.73	3	16.11	1.89	0.61
Later	4	17	13.96	0.81	3	16.61	1.93	0.22
Later	5	18	17.23	0.47	3	16.78	1.15	0.72
Later	9	20	15.56	0.84	3	16.81	2.18	0.6
Later	10	19	16.57	0.68	3	16.23	1.72	0.86
Average RVUs/Month Before and After PCR by Individual Provider on Original Scale								
		Before PCR			After PCR			
Group	Provider	Months	RVUs	Std Error	Months	RVUs	Std Error	p-value
Pilot	6	12	203.63	0.12	11	233.48	0.14	0.06
Pilot	7	12	305.20	0.36	11	378.30	0.40	0.03
Later	1	20	354.95	0.18	3	280.90	1.23	0.1
Later	3	20	294.81	0.53	3	259.53	3.57	0.61
Later	4	17	194.88	0.66	3	275.89	3.72	0.22
Later	5	18	296.87	0.22	3	281.57	1.32	0.72
Later	9	20	242.11	0.71	3	282.58	4.75	0.6
Later	10	19	274.56	0.46	3	263.41	2.96	0.86